Johannes Harris. S. T. D

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Lexicon Technicum:

Or, An UNIVERSAL

English Dictionary

OF

ARTS and SCIENCES:

Explaining not only the TERMS of ART, but the ARTS Themſelves.

VOL. I.

By *JOHN HARRIS*, D.D. and F.R.S.

The Third Edition.

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TO
His Royal Highneſs.

GREAT SIR,

I *Juſtly eſteem it a Peculiar Happineſs, that* You *were pleas'd to accept of the Patronage of this Work; for hereby you exempt me from that Hardſhip which attends moſt Dedicators, of inventing the Virtues they Celebrate.*

But tho' your Intrinſick Excellence and Real Worth takes away all Poſſibility of Flattery, yet being convinced that whatever I can ſay, falls ſhort of your Merit, I Bluſh as much at my Incapacity of giving You Your juſt Due, as I ſhould at aſcribing more than He deſerved to another.

Your Early Years, GREAT SIR, *ſhew'd Your* Skill *and* Conduct *in Arms, as well as the Greatneſs of Your Courage and Love for Glory; and 'twas an uncommon Happineſs your Bravery was more than once bleſt with, by Your own Perſonal Valour to Save Your Royal Brother, Rout the Enemies Troops, and Change the Fate of the Battle.*

After this, when Your Happy Alliance with Your Royal Conſort, *Our preſent Gracious and Moſt Excellent* QUEEN, *had made You* Ours, *tho' you were always ready to offer your Self to Command Our Armies or our Fleets, yet when we deny'd our Selves the Happineſs of your Conquering for us* Abroad, *you ſet your Self to ſhew us an Illuſtrious Example of Virtue and Goodneſs at* Home; *and prov'd you Self to be as much above* Pride *and* Revenge here, *as you would have been without* Fear *or* Surprize there.

The Epiſtle Dedicatory.

Great within Your Selves Alone, Your Royal Conſort *and* Your Self, *like the beſt of the Old* Roman *Generals and Conſuls, liv'd Retired indeed, but neither unactively nor unuſefully: Virtue and Piety You taught, by the beſt way of Recommending it, Your own Bright, Great, and Glorious Examples; And raiſed up the Conjugal Happineſs to ſuch a Degree of Perfection, as the World never knew before, and which could You have been* Unbeloved, *would have render'd you almoſt the Envy of every one.*

Then, MIGHTY SIR, *did You employ your Noble Mind in Studies of the greateſt Uſe and Benefit to Mankind here,* Mathematicks *and* Mechanicks; *and as Your Cloſet was always the Reſort of the uſefully Learned and Ingenious, ſo were you ſtill their Encourager and Patron.*

But when the Providence of GOD called Your Illuſtrious Princeſs to Empire, *and Your Self to Publick Buſineſs and Mighty Emptoyments, You ſoon* Both *ſhew'd You cou'd Command with as much Wiſdom and Conduct, as you could before Obey with Reſignation, and make our Nation Truly Happy by the Gracious and Excellent Adminiſtration of your Government.*

The Glorious Effects of which that we may long Enjoy, and that Our Gracious QUEEN, *and* Your ROYAL HIGHNESS, *may be Bleſſed with Iſſue to Inherit theſe* Great Dominions, *that I doubt not but GOD hath raiſed up* HER SACRED MAJESTY *to ſecure in laſting Peace and Happineſs to us, is,*

GREAT SIR,

The moſt Sincere and Conſtant Prayer

of Your ROYAL HIGHNESS'S

Moſt Obedient and Moſt Humble Servant

JOHN HARRIS.

THE PREFACE.

THE beſt Account I can give of the folloiwng Work, will be to lay before you in a ſhort View what it contains, wherein it differs from other Books which may ſeem to be of the ſame Nature, and from whence I have collected the Subſtance of it. That which I have aimed at, is to make it a Dictionary, not only of bare *Words* but *Things*; and that the Reader may not only find here an Explication of the *Technical* Words, or the Terms of Art made uſe of in all the *Liberal Sciences*, and ſuch as border nearly upon them, but alſo thoſe *Arts themſelves*; and eſpecially *ſuch*, and *ſuch* Parts of them, as are moſt Uſeful and Advantageous to Mankind. In this, which was the chief of my Deſign, I found much leſs Help from Dictionaries already publiſhed, than one would have expected from their *Titles*: *Chauvin*'s *Lexicon Rationale*, or *Theſaurus Philoſophicus*, is a well printed Book, and the Figures are finely Graved; but 'tis too much filled with the School Terms, to be uſefully inſtructive; and is as defective in the Modern Improvements of Mathematical and Phyſical Learning, as it abounds with a Cant which was once miſtaken for *Science*.

The *Grand Dictionaire Des Arts & Sciences, par Mrs. de l' Academie Francoiſe*, hath no Cuts nor Figures at all, and is only a bare Explication of Terms of Art; and it ſeems rather to have been deſign'd to improve and propagate the *French Language*, than to inform and inſtruct the Humane Mind in general. And, which I have often wonder'd at, 'tis filled every where with *Simple Terms*, ſo that you are told what a Dog, a Cat, a Horſe and a Sheep is; which, tho' it may be uſeful to ſome Perſons who did not know *that* before, and may ſhew very well, that ſuch Deſcriptions can be given in *French*; yet how the bare Names of Animals and Vegetables, of Metals and Mineral, can be reckoned as *Terms of Art*, and conſequently make the greateſt part of *a Dictionary of Arts and Sciences*, I confeſs I cannot ſee: And therefore, tho' this and Mr. *Furetiere*'s *Dictionary* may be Books very well done in their Way, and are certainly very uſeful for thoſe who would be perfectly acquainted with the *French* Tongue; yet I did not find much Aſſiſtance from them, with regard to my Deſign.

And much leſs Help was there to be had from a Book called, The *New World of Words, or an Univerſal* Engliſh *Dictionary*; for there I found the Compiler had the *Ill Luck* to Collect many *Foreign* Faults, and to underſtand little or nothing of the *Arts* and *Sciences* himſelf.

Mr. *Ozanam*'s *Dictionaire Mathematique*, is indeed as good a Book as *Vitalis*'s is a bad one; and had *Mathematicks* been a Science I was the leaſt acquainted with of any other, I ſhould have been generally as well ſupplied from *Ozanam*, as deceived by *Vitalis*; whoſe laſt Edition, in two Volumes at *Rome*, after ſo many Years time to conſider upon the Matter, is, I think, not better than the Firſt, becauſe it hath more Matter, and leſs to the Purpoſe.

The *Chymical* and *Phyſical Dictionaries* of *Johnſon*, *Caſtellus*, and *Blanchard*, have a great many Words and Terms that are not to be met with elſewhere: And the laſt hath had four Editions in our own Language; but tho' many things are well enough done in him, yet ſome can hardly be ſaid to be ſo; ſo that in many Places I have been obliged to put his Name to what my *Amanuenſis* or *Aſſiſtant* tranſcribed from him, leſt the Reader ſhou'd miſtake it for my own Words.

I write not this only to diſparage the Performances of others, or to build my ſelf a Reputation on their Ruins, but I think my ſelf obliged to acquaint the Reader with the plain Truth of Things, without Favour or Affection, that ſo he may be informed where to meet with Satisfaction in his Enquiries and Reading, an dwhere not; and perhaps if this were oftner done, both the Time and the Expence of gaining true Knowledge would be much ſhortned.

There are ſome other leſſer Dictionaries which are of good uſe, and which have been ſerviceable to me on Occaſion, which I ſhall mention below; but I muſt next acquaint the Reader, That *much the greater Part* of what he will find here is collected from *no Dictionaries*, but from the beſt Original Authors I could procure in all Arts and Sciences, and is the Reſult of ſome Years Labour and Conſideration.

I have been very Full and Particular in the *Mathematicks*, becauſe it is the only Solid Foundation on which a Uſeful Enquiry into Nature and all Phyſical Learning can poſſibly be built; and becauſe 'tis alſo of the greateſt Uſe and Advantage to Mankind in all Reſpects.

In *Geometry*, under the Name of each Figure you have the Eſſential Properties of it briefly and plainly demonſtrated, and the Application to the Practice ſhewed; ſo that by the Help of very eaſy References

References from one Place to another, you will find the Demonſtration of all ſuch uſeful and important Propoſitions in that Noble Science, as are uſually given by *Geometrick* Writers,

Under ſuch Words as *Parabola*, *Ellipſis*, *Hyperbola*, *&c.* in the *Conick Sections* you will find the Properties of each Figure or *Section* demonſtrated, with Methods for their Deſcription on a Plane; as alſo the Properties of the *Cycloid*, *Conchoid*, *Logarithmick-Line*, *Ciſſoid*, *Quadratrix* and *Spiral Lines*, *&c.* Some general Conſiderations of the Nature of *Aſymptotes*, the Nature and Properties of *Catacauſtick* and *Diacauſtick* Figures, of the *Involute* and *Evolute*, of the *Linea Celerrimi Deſcenſus*, *&c.* And under the Word *Conſtruction*, you have the Conſtruction of *Cubick* and *Biquadratick Equations* by the *Parabola*; together with the Inveſtigation of *Baker*'s *Central Rule*, and its Uſe and Application.

Under ſuch general Words as *Trigonometry*, *Surveying*, *Spherical Geometry*, *Projection*, *&c.* you will find Entire Treatiſes on theſe Heads; and which, if I miſtake not, are as ſhort and plain as any yet extant.

In *Algebra* you will meet, under the proper Heads, every thing that is uſually found in Treatiſes of this Nature, and perhaps ſomething more. And under *Fluxions* you have a ſuccinct Account of the *Nature* and *Algorithm* of them, and ſome Improvements which are not to be had elſewhere. And in ſeveral Places under the proper Words, you have an Account of what we now call the *New Methods, or Univerſal Ways of Inveſtigation*; as particularly, a Method of drawing of *Tangents* to all ſorts of *Curves*, a Method *de Maximis & Minimis*, *&c.* of finding the *Centers of Gravity and Oſillation*; of finding the *Unciæ*, *&c.* All the Parts alſo of *Common Arithmetick* are explained here, and its Application to *Anatociſm*, *Compound Intereſt*, and *Annuities*; together with the Doctrine of Surds, the Method of Extraction of Roots by *Converging Series*, and the entire Doctrine of Promotion; all kinds of Progreſſion, Fractions, Logarithms and Decimals: And I have alſo, from the beſt Authors I could get, collected an Account of the Ancient Weights and Meaſures of all Nations, and adjuſted them with our own; and have given you very large and uſeful Tables of the Values of all Modern or preſent Foreign Weights, Meaſures and Coins, compared with our own. I have inſerted alſo, from Dr. *Wallis*, a large Account of *Sexageſimal Fractions*. You will find here alſo the Deſcriptions and Uſes of both the Celeſtial and Terreſtial Globe; the Doctrine of the Sphere, according to the New and Old Hypotheſis; together with the Demonſtration and Practice of Spherick Projections *in Plano*; and moſt

of

of the uſeful things in *Aſtronomy*, as the *Phanomena*, *Paralaxes*, *Magnitudes*, *Motions* and *Diſtances* of the *Planets* and their *Satellites*; and in particular, the Incomparable Sir *Iſaac Newton*'s *Theory of the Moon*, and a very large Account of *Comets* from the ſame Author. You will have alſo the Ground and Practice of *Dialling*; the Nature and Uſe of *Opticks*; the taking all *Heights* and *Diſtances*; the *Menſuration* of *Surfaces*; *Gauging*; the *Art* of *Chronology*, *Geography*, *Coſmography*, *Muſick*, &c.

In *Gunnery* you have the Method of Shooting in Great Guns and Mortars, with Captain *Halley*'s and *Anderſon*'s Tables; and as to *Fortification*, I have conſulted the beſt Books and Drawings; and I believe the ſeveral Parts of a fortified Place are pretty well deſcribed, and the Plate belonging to this *Art*, at the End of the Book, comprehenſive, and done according to the beſt of the Modern Ways.

The Figures alſo of the Five Orders of Pillars in *Civil Architecture*, are, I hope, as inſtructive as they cou'd be of that Size; and as for the Terms of Art here, I took them from the beſt Author, as *Vitruvius*, *Vignola*, *Palladio*, and the *Parallel* by Mr. *Evelyn*.

Navigation is alſo largely treated of, and the whole *Art* taught under the Words *Plain* and *Mercator*'s *Sailing*, *and Traverſes*: And as to the *Variation of the Compaſs*, I have given you a very full and exact Account of it, from the Excellent Mathematician Capt. *Halley*, together with his Ingenious Hypotheſis for the Solution of its Variation; and Practical Rules to find the Variation of the Compaſs at Sea.

And as to a Ship, I have endeavoured to be very full and particular in deſcribing the ſeveral Parts of her, both in the *Dock*, when *Building*, and when *Rigg'd*, and *under Sail* at Sea: For I have conſulted the beſt *Draughts*, *Sections* and *Models* I could get a ſight of, have got what Helps I could from Captains and Maſters of Ships, and have often gone on Board my ſelf, to get the more ready Knowledge of this Affair; and I have compared it all with what we have already Printed of this Nature in Books and Deſcriptions of Ships; ſuch as *Manwaring*'s *Sea Dictionary*, *Boteler*'s *Sea-Dialogues*, *Philips*'s *Section of a Firſt Rate*, &c.

I have given alſo, from ſeveral Eminent Hands, and ſeveral Ways, the *Laws of Motion*: As from Dr. *Wallis*, Sir *Iſaac Newton*, Monſieur *Varignon*, Mr. *John Keil*, &c.

And the Doctrine of *Mechanicks*, *Nature* and *Properties* of *Staticks*, the Laws of *Pendulums*, and of *Projectiles*.

And

And I have been very large in that moſt Uſeful Science *Hydroſtaticks*, giving an Account of the Principles and Practice of the *Art*, both Mathematically and Experimentally: And under the Word *Specifick Gravity*, I have given you all that the Honourable Mr. *Boyle* hath advanced on that Subject, in his *Medicina Hydroſtatica*; to which a large Table of the *Specifick Gravities* of different Bodies is added; and all his *Hydroſtatical Paradoxes* are inſerted in their proper Place.

I have deſcribed alſo, chiefly from Mr. *Derham*, the way of *Calculation* of *Automata*, or Clock and Watch-work; and explained the Terms of *Art* uſed in *Painting* and *Sculpture*.

As to *Phyſick* and *Natural Philoſophy*, and thoſe admirable Helps to the underſtanding of Nature, which *Geometry*, applied to *Phyſical Enquiries*, hath of late afforded us, and to which indeed we are chiefly indebted to that Prodigious Mathematician Sir *Iſaac Newton*: I have endeavoured to give you every where the Marrow and Subſtance of it under proper Heads: And under the Term of Art, or Word, expreſſing any particular *Quality*, I have collected all I could meet with to explain it, and to clear up its Nature and Properties; as you will find at large under ſuch Words as *Electricity*, *Solidity*, *Elaſticity*, *Effluviums*, *Magnetiſm*, *Light and Colours*, &c. As to which laſt, I'm ſorry I had not time to take no more from Sir *Iſ. Newton*'s Excellent Book of *Opticks* lately publiſhed; what I could, I have inſerted, as I had before done the Subſtance of what he had publiſhed in the *Philoſophical Tranſactions* on that moſt Noble Subject; and which convinces us that we were all miſtaken in our Notions about it before, for want of proceeding in a right Method of Enquiry.

The *Phænomena* of the *Rain-bow*, or *Iris*, are here accounted for from the Learned and Ingenious Capt. *Halley*, now *Savilian Profeſſor* of Geometry in *Oxon.*

The Account of *Snow* I give you from Dr. *Grew*: And one of *Ice* from the *French.*

I have collected what I could meet with as to *Sound*; but I wiſh that Quality were a little better conſidered.

You have here a very full Account of all the *Phænomena* and *Properties* of the *Air* and *Atmoſphere*, as its *Gravity*, *Spring* or *Elaſticity*, &c. and a full Deſcription of, and the Uſe of ſuch Inſtruments as have been invented to enable us to judge of them; as the *Barometer*, *Thermometer*, *Hygrometer*, &c. all which is chiefly from the Honourable Mr. *Boyle* and the *Philoſophical Tranſactions.*

The Account of *Springs* and Fountains is from Capt. *Halley* and Dr. *Woodward*: And from the former of theſe Learned and Ingenious

nious Gentlemen I have given you a new Theory of *Tides*, or a Solution of the *Phænomena* of the Ebbing and Flowing of the *Sea*, which is very plain, certain and intelligible, and built on Sir *Is. Newton's* Principles.

In *Botany* I have been as large as I could be, without giving Deſcriptions of Plants, which is contrary to my Deſign: But you have here, from our Mr. *Ray*, *Morriſon*, and Monſieur *Tournefort*, I believe, a pretty exact *Botanick Lexicon*, which was what we *really* wanted before: Together with an Account of all the ſeveral *Kinds*, and *Subalternate Species* of *Plants*, and their *Specifick Differences*; in which I have followed Mr. *Ray*'s Method, as appearing to me to be the beſt and moſt Natural.

A Table of *Foſſils* I have given you from the Accurate Dr. *Woodward*, Profeſſor of Medicine in *Greſham*-College: And a Scheme of *Metals* and *Stones* from Biſhop *Wilkins*'s Real Character.

I have alſo given you a large Account of *Vegetation*, which is very curiouſly and exactly done from the Experiments and Obſervations of Dr. *Woodward*.

You have here alſo a good Account of the Nature and Property of the *Wind*, from Capt. *Halley*: And a Deſcription of Mr. *Papins*'s *Wind-Gun*, from Mr. *Boyle*.

From which laſt Excellent Gentleman I have alſo taken what I ſay about the Nature and Properties of *Cold*.

And likewiſe from Capt. *Halley* and Sir *Is. Newton*, is collected all that which you will find under the Word *Heat*.

In *Chymiſtry*, the Knowledge of which is one great help towards the Underſtanding of Nature, I have been large and particular; explaining the Chymical Principles, Veſſels, and Degrees of Fire; and have omitted no Proceſs nor Operation of Uſe, that I cõuld either meet with in Books, or get from my Friends; as the Reader will ſoon ſee, by conſulting the Book it ſelf, under ſuch Words as *Phoſphorus*, *Bolonian Stone*, *Sympathetick Inks*, *Tranſmutation*, &c.

In *Anatomy* I have been very large and full, deſcribing all the Parts of an Humane Body, both Internal and External: And tho' indeed the Figures for this Part are much leſs than I could have wiſhed them to be, (for the Book hath ſo much out-run the Expence the Undertakers at firſt propoſed, that they would not be brought to have larger Cuts;) yet I hope the Deſcriptions, in moſt Places, will prove tolerably Accurate and Inſtructive; eſpecially under ſuch general Words, as *Blood*, *Circulation*, *Bones*, *Heart*, *Ear*, *Eye*, *Viſion*, *Arteries*, *Veins*, *Bile*, *Lympha*, *Chyliſication*, &c. in all which I have conſulted the Beſt Authors.

In

The PREFACE.

In *Logick*, *Metaphyſicks*, *Ethicks*, *Grammar*, *Rhetorick*, &c. I have been deſignedly ſhort; giving uſually the bare Meaning only of the Words and Terms of Art, with one or two Inſtances to explain them, and illuſtrate them.

In *Hiſtory* and *Chronology*, you have what properly belongs to them as *Arts*; as an Account of the *Civil* Computation of Time; the Original and Reduction, one to another, of the ſeveral *Æra*'s, *Epocha*'s, *Periods*, &c.

In *Heraldry* I have given you the entire Art of *Blazoning* and *Marſhalling* a *Coat of Arms*; and explained all the *Ordinaries*, *Charges*, *Bearings*, &c. by Figures: But have ſaid nothing of Families (any further, than that ſuch a Coat belongs to ſuch a Name) my Deſign being only to explain the *Art* and its *Terms*.

As to the Deſcription of the *Mathematical* and *Philoſophical Inſtruments*; ſome of them (as the moſt uſeful) are largely done, but the others as briefly: For as it would have taken up a large Volume to have deſcribed them all; ſo for many of them, the Reader would not have been much the better. But the *Globes* and *Quadrants* are largely treated of, as are *Teleſcopes*, *Microſcopes*, *Baroſcopes*, *Hygroſcopes*, and the *Pneumatick-Engines*, or *Air-Pumps*; becauſe theſe are of vaſt Uſe and Benefit to Mankind, and have ſerved to improve and raiſe up the Knowledge of Nature to that good Height it is now arrived to, and I hope will carry it yet much further.

And as I have uſually taken particular Care to give all Authors their juſt Due, from whom I have taken any conſiderable Part of my Materials, without Partiality, ſo I have deſignedly done Juſtice to ſuch Ingenious and Induſtrious Artificers, as do truly deſerve the greateſt Encouragement for their Skill and Accuracy, in the making of thoſe Inſtruments: Such are Mr. *John Rowley*, *Mathematical Inſtrument-maker*, under St. *Dunſtan*'s-*Church* in *Fleet-ſtreet*: Mr. *Yarwell* late, and Mr. *Marſhal* now, *Perſpective-Makers* in *Ludgate-ſtreet*: Mr. *Hawkesbe*, who makes *Air-Pumps* and all *Pneumatick-Engines*, in *Wine-Office Court* in *Fleet-ſtreet*: And Mr. *John Patrick*, the *Torricellian Operator* in the *Old-Baily*, who makes all kinds of *Barometers* and *Thermometers*; as you will find I have done in the proper Places: And I can't here omit mentioning the Ingenious Mr. *Wilſon*, which I could not do in the Book, becauſe thoſe Sheets about the *Microſcope* were Printed off before I had ſeen Mr. *Wilſon* or his Glaſſes: But I muſt now do him that Juſtice to ſay, That of all the *Microſcopes* I have ever ſeen for Commodiouſneſs, various Uſes, Portability, and Cheapneſs, I never met with any thing like Mr. *Wilſon*'s Glaſſes. They are particularly deſcribed in the *Philoſophical Tranſactions*, *N.*

As

The PREFACE.

As to the *Law Part* of the Dictionary, I did my ſelf actually conſult the beſt Books and Dictionaries I could get recommended to me; and from thence I tranſcribed, abridgedly, all that ſeem'd neceſſary to be inſerted here; and ſince that, I have had it carefully examined and corrected by a Gentleman of known Ability in that Profeſſion.

And thus having given you a ſhort Account of what you may expect to find in this Work, and which may perhaps ſatisfy the Reader that it is a Book uſeful to be *read carefully over*, as well as to be conſulted like other Dictionaries occaſionally: I ſhall next fairly acquaint you wherein it is defective, and what Improvements may be made of it hereafter, in an additional Volume.

The Catalogue, Right-Aſcenſions, Declinations, *&c.* of the *Fixed-Stars*, is very imperfect; the Reaſon of which is, That Mr. *Flamſteed*, upon whom I thought I might depend, was pleaſed to refuſe me any Communication of that kind; elſe I would have given thoſe Things under the Name of each Star or Conſtellation.

There are alſo, I doubt, here and there ſome Words which my *Amanuenſis*, or *Aſſiſtant*, tranſcribed from other Dictionaries, which are not ſo well explained as they ſhould be, and which (among ſo many Thouſand Words as I had to range into Order) have eſcaped a Review; but I have corrected as many of them as I could in each Sheet as the Book was printing off.

I would have had alſo at the End of the Book, a particular *Alphabet* for each *Art* and *Science* by it ſelf; and ſome more and larger Copper-Plates in *Anatomy*, and of the *Outſide*, *Rigging*, and the *Section* of a *Ship*: But the Undertakers could not afford it at the Price propoſed, the Book having ſwelled ſo very much beyond the Expectation: But whatever Alterations, Amendments, Improvements and Additions ſhall be hereafter, as I queſtion not but many of the latter ſort Time will produce, if God pleaſe to Bleſs me with Health and Leiſure, theſe ſhall all be printed in a Volume by themſelves, and ſo by no Means be prejudicial to the firſt Impreſſion.

LEXICON TECHNICUM;

OR AN

UNIVERSAL *ENGLISH*

DICTIONARY

OF

Arts and Sciences.

ABACOT, the Cap of State, uſed in old time by our *Engliſh Kings*, wrought up in the Figure of two Crowns.

ABACTORS, the ſame with *Abigei*, ſuch as ſteal and drive away whole Flocks of Cattle, or the greateſt part of any Herd or Flock; in which the Lawyers diſtinguiſh them from *Fures*, who only ſteal a Sheep or two, *&c.*

ABACUS, ſometimes ſignifies the A, B, C, ſometimes a Table of Numbers for caſting up Accounts, which was anciently of Braſs, and called then, *The Table of* Pythagoras. It ſignifies alſo, ſometimes the Numeral Figures, which uſed to be drawn on a Table covered with ſmall Sand or Duſt, as *Perſius* hints in theſe Verſes.

Nec qui Abaco numeros & ſecto in pulvere notas
Scit reſiſſe vafer ——.

ABACUS, in Architecture, is the four ſquare Table that makes the Capital on the Top of a Column, eſpccially thoſe of the *Corinthian* Order: and is a Drip or *Corona* to the Capital. It ſupports the nether Face of the Architrave and whole Trabeation. In the *Corinthian* and *Compoſite* Orders, the Corners of it are called, the *Horns*, the middle part the *Sweep*, and the *Curvature* the *Arch*; which commonly has a *Roſe* carved in the middle. See Vol. 2.

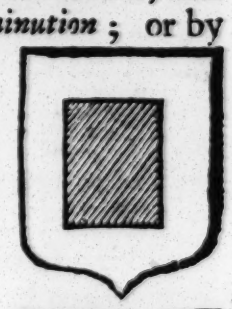
ABAFT, or *Aft*, a Sea Term, ſignifying always thoſe Parts which are towards the Stern of the Ship: So they ſay, Such a Maſt hangs *Aft* or *Abaft*, that is, towards the Stern. And becauſe the Maſter's or Captain's Cabbin is uſually in the hinder part of the Ship under the Quarter Deck, 'tis a common Complement to a Perſon come on Board a Ship, *Sir, will you pleaſe to walk Aft.*

ABALIENATION, a Term in the old *Roman* Law, ſignifying a ſimple Sale of the Goods of one Citizen to another: Theſe Goods were called, *Res mancupii*, or *mancipii*; and were Eſtates either in Slaves or Cattle, and ſometimes Land of Inheritance; but they muſt be in *Italy*.

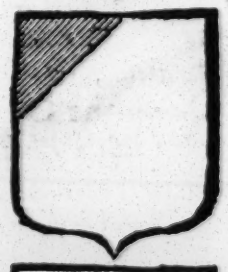
ABAPTISTON, or *Ana-baptiſton*, an Inſtrument uſed by Surgeons, the ſame with *Modiolus*, which ſee.

ABATE, *Abatement*, ſignifies in Law the taking Poſſeſſion of Land by a Perſon that hath no right to it, after the Death of the Anceſtor, and before the Entry of the right Heir. Alſo to *Abate a Writ*, ſignifies to deſtroy it for a time, thro' want of good Ground, or other Defect. So to *Abate a Nuſance*, is to deſtroy it, *&c.*

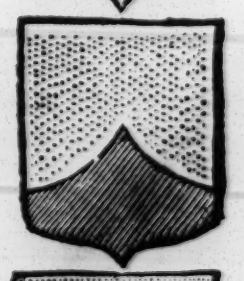
ABATEMENT *of Honour*, in Heraldry, is an accidental Mark annexed to a Coat of Arms, whereby its Dignity is abaſed by reaſon of ſome diſhonourable Quality or Stain in the Bearer, and 'tis either by adding a *Mark of Diminution*; or by *Reverſion* of the whole Eſcutchon. The *Marks of Diminution* are, 1. A *Delf Tenn*, which is a Square born in the middle of the Field, thus; and belongs to one that hath revoked his Challenge, or eaten his Words.



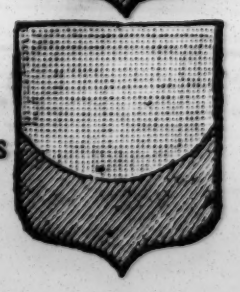
2. A *Point Dexter parted Tenn*: due to him that is a *Braggadocio*, or boaſts of more than he did, or can do.



3. A *Point in Point Sanguine*, thus; due to him that is Lazy and Sloathful in the Wars.



4. A *Point Champain Tenn*: which is due to him that kills his Priſoner after Quarter demanded and his Commander's Leave to give it; born thus.

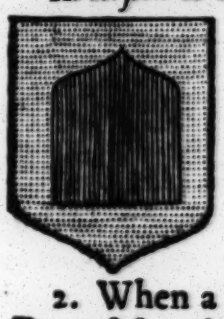


5. A *Plain Point Sanguine*, born thus; due to one that is a Lyar, and tells falſe Stories to his Sovereign.

6. A *Goar Siniſter Tenn*, born thus; and is due to him that is proved a Coward: But a *Goar Dexter* is not an Abatement.

7. A *Guſſet Sanguine*, born thus; where are two Guſſets one on each ſide. The Guſſet is an Abatement proper for an Effeminate Laſcivious Man; and is then born on the right ſide; but if he be given to too much Wine, the Guſſet is on the left ſide; if to both, he ſhould bear two Guſſets, as in this Example.

Reverſion is two fold, 1. When a Man bears in his own Eſcutcheon another Reverſed, as thus; which is due to a rude and uncivil Treater of Maid or Widow; or as ſome ſay, for Deflowering her only; and alſo, for one that runneth away from his Sovereign's Banner.



2. When a Man's own Eſcutcheon is entirely Reverſed, which is due to a Traitor.

N. B. Theſe Abatements are never charged with any thing; are always born ſingle, and their Colour is never of Metal, but always either *Murrey* or *Tawney*.

ABATOR, (in the common Law) is he that *abateth*, that is, intrudeth into a Houſe or Land void by the Death of the former Poſſeſſor, and not yet entered, or taken up by his Heir.

ABBROCHMENT, is the foreſtalling of a Market or Fair, by buying up the Wares before they are expoſed to Sale in ſuch Market or Fair, and then vending them again by Retail.

ABBUTTALLS, are the *Buttings* and *Boundings* of Lands any way, ſhewing how they lie in reſpect to other Places.

ABDICATION, a Term of the *Roman* Law, ſignifying ſeveral things; as the Abandoning of a Son, when he was expell'd his Father's Houſe and refuſed to be owned as his Child. *Abdicare Magiſtratum*, or *ſe Magiſtratu*, was to abandon or lay down the Office of a Magiſtrate. We meet there alſo with *Abdicare ſe ſtatu ſuo*; which ſignifies, a Man's renouncing his Condition to become a Slave, and to be degraded from the Priviledges of a *Roman* Citizen.

ABDICERE, ſignifies, to debar a Man from his Demands, or not to allow them: Thus *Abdicere vindicias* was in the *Roman* Law not to allow a Man the Poſſeſſion of thing in Controverſie, as *Addicere vindicias* is the very contrary.

Tho' the Word *Abdication* ſignifies ſtrictly an actual and voluntary Renouncing, yet in a larger Senſe, at common Law, it may be properly uſed where there is only an *Implicit Renounciation*; as when a Perſon does ſuch Actions which are inconſiſtent with the nature of his Truſt, he does in conſequence renounce it; and this was the late famous Caſe of a certain Prince, where this known and ancient Common-Law-Term was revived; tho' indeed 'tis more generally uſed among the Civilians.

ABDOMEN, the lowermoſt of the three *Venters* in an Human Body; properly the *Lower Belly*: It contains in its Region the Stomach, Guts, Liver, Spleen, Bladder, *&c.* within it is covered with a Membrane called the *Peritonæum*. The lower part of it is called the *Hypogaſtrium*. The foremoſt part is divided into the *Epigaſtrium*, the Right and Left *Hypocondria*'s, and the Navel. Tis bounded above by the *Cartilago Enſiformis* and the *Diaphragm*, ſideways by the ſhort or lower Ribs, and behind by the Vertebres of the Loins, the Bones of the *Coxendix*, *Pubis* and *Os Sacrum*. It hath ten Muſcles which both cover it and ſerve to excrete the *Fæces* and *Urine*, and to expel the *Fœtus* in Women: You will find them under their proper Names.

ABDUCTOR *Indicis*, is a Muſcle of the fore-Finger, which is not to be ſeen till the *Abductor Pollicis* is raiſed; by ſome it is reckoned amongſt the *Interoſſei*; it ariſes Fleſhly from the *Os Metacarpi* that ſuſtains the Fore-finger, and deſcending over the firſt Internode of the ſaid Finger becomes Tendinous, joyning with the Tendon of one of the Lumbrical Muſcles, and is inſerted with it together with the Tendon of the former Muſcle. Its Name intimates its Uſe, in drawing the Fore-finger from the reſt.

ABDUCTOR *Oculi*, a Muſcle of the Eye, ſo called from its Action in retracting or drawing off the Eye from the Noſe: It is alſo called *Indignabundus*, becauſe it is made uſe of in ſcornful Reſentments.

ABDUCTOR *minimi digiti*, is a Muſcle which appears in ſome Bodies divided into two or three Muſcles, having each a differing Series of Fibres; the firſt of which ſeems to be a *Flexor primi Internodii minimi digiti*; the ſecond an *Abductor* of the ſame; the third *Abductor Secundi & Tertii Internodii*; but this Diviſion is not conſtant. It ariſes fleſhly, firſt, from the *Ligamentum Tranſverſale* and fourth Bone of the *Carpus*; Secondly, from the third Bone of the *Carpus*; and then, Thirdly, from the ſuperior Parts of the ſubjacent *Os Metacarpi*: The two firſt continue fleſhy to their Inſertions; the former terminating at the ſuperior Part of the firſt Bone of the Little-Finger forwards; the latter ending at the ſame part of the ſaid Bone laterally; the Third becoming Tendinous like the *Interoſſei*, is inſerted like them with the Tendon of the *Extenſor Minimi Digiti* at the ſuperior part of the third Bone of the Little-Fingar. Its Uſe is to draw the Little-Finger from the others.

ABDUCTOR *Pollicis*, is a Muſcle of the Thumb, which ariſes broad and fleſhy from the internal part of the *Ligamentum Tranſverſale Carpi*, whence deſcending it leſſens it ſelf, and becomes Tendinous, at its Implantation to the ſuperior and external part of the ſecond Bone of the Thumb laterally. This draws the Thumb from the Fingers, from whence it derives its Name.

ABDUCTOR *Pollicis Pedis*, is a Muſcle which ariſeth fleſhy from the *Os Calcis* internally and laterally, in half its Ptogreſs becoming Tendinous, it joins with another fleſhy beginning, ſpringing from the *Os Cuneoforme Majus* that ſuſtains the *Os Metatarſi* of the Great Toe; both which making one Tendon are inſerted to the external part of the *Os Seſamoides* of the Great Toe laterally. This pulls the Great Toe from the reſt. ABDU-

ABDUCTOR *Minimi Digiti Pedis*, is a Muſcle which ariſeth outwardly Tendinous, but inwardly Fleſhly, from the external part of the *Os Calcis*, becoming Tendinous in half its progreſs on the outſide of the Foot; it joyns with the other fleſhy part of this Muſcle ariſing fleſhy from the outſide of the *Os Metatarſi* of the Little Toe, and making one Tendon as its Inſertion to the upper part of the firſt Bone of the Little Toe externally and laterally. Its Uſe is to draw off the Little Toe from the reſt.

ABDUCTORES, in the general are the ſame with *Abducent Muſcles*.

ABDUCENT *Muſcles*, are univerſally thoſe which ſerve to open or pull back divers parts of the Body, as the Arms, Legs, Eyes, Noſtrils, Lips, *&c.* Theſe are called alſo *Abductors*. Their Oppoſites are uſually called *Adductors* or *Adducent Muſcles*.

ABETTORS, is a common Law Term, and ſignifies thoſe that without Cauſe procure others to ſue out falſe Appeals of Murder, or Felony againſt Men, in order to render them infamous.

ABETTORS, in Murder, are thoſe which adviſe or procure a Murder to be committed; in the ſame ſenſe there are *Abettors* in Felony and Treaſon; in the laſt of which they are all *principals*, there being no Acceſſories in Treaſon.

ABELITION, the Licence given to a Criminal Accuſer, to deſiſt from further Proſecution.

ABEYANCE, in Law ſignifies a Thing's being *in Poſſe* only and not in *Actu*: Thus ſuppoſe a Leaſe made to *A.* for Term of Life, and the Remainder to the right Heir of *B.* who is living at the time of the Grant; in this caſe, tho' the Remainder paſs preſently from the Grantor, yet it veſts not preſently, or takes hold in the Grantee, that is the Heirs of *B.* but is Indeterminate, *in Potentia*, *in Nubibus*, in *Abeyance*, *viz.* in Conſideration of Law: So when the Parſon of a Church dies, and the Church is void; the Fee is in *Abeyance*, becauſe it is not determined who ſhall ſucceed him.

ABISHERISING, and in ſome Copies, *Miſherifing*, is (in Common-Law) being acquitted of *Amerceaments*, before whomſoever, of Tranſgreſſion prov'd.

ABJURATION, formerly was an Oath which a Perſon who had committed Felony, and who, to avoid the Law, had betaken himſelf to Sanctuary, took to depart the Kingdom for ever: It was a Law enacted by *Edward the Confeſſor*, but is ſince changed by the Statutes, 21 *H.* 8. *c.* 2. 22. *H.* 8. *c.* 14. 32. *H.* 8. *c.* 12. But the Senſe of the Word *Abjurate*, originally, in the *Roman* Language, as it is uſed by *Cicero* and other good Writers of that Age, was, *To deny a thing upon Oath*; to deny that a Man had *promiſed*, *committed*, *detained*, or *did owe* any thing, upon his Oath. Thus with him *Abjurare Creditum* was to forſwear a Debt, or to deny on Oath that he ow'd the Debt.

ABLACATION, the weaning of a Child that hath ſucked its full time. Alſo a kind of Grafting, when the Cyon remaineth on its own Stock, and the Stock you graft it on, together, till ſuch time as they are ſurely incorporated; then the Cyon is cut from its *own*, and lives only by the *other* Stock.

ABLAQUEATION, a laying open or baring the bottom of the Trunk, and Roots of Trees, that ſo being expoſed to the Air, the Sun, and the Rains, they may the better fructify, or bear fruit the enſuing Year.

ABLATIVE *Caſe*, is the laſt of the ſix Caſes of Nouns and Participles in Grammar, and is ſo called, becauſe it uſually takes away one thing from another. 'Tis called alſo the *Latin Caſe*, becauſe almoſt peculiar to the Latin Tongue, and is uſually connected with ſome Prepoſitions, which ſerve to determine it.

ABLUTION, the Preparation of a Medicine in any Liquor, to cleanſe it from its Impurities.

ABLUENT *Medicines* are the ſame with *Abſtergent*, which ſee.

ABNODATION, in Agriculture, ſignifies the pruning of Trees, and cutting off Knots and Knobs.

ABOLITION, in Metaphyſicks, is an utter Deſtruction of any Being.

ABOLITION of a Law, is the perfect repealing it, or the entire taking of it away, ſo that it ſhall never have Force again.

ABOMASUS, one of the Stomachs of *Ruminant* Animals or ſuch as chew the Cud; of which are reckoned four, the *Venter*, *Reticulum*, *Omaſus*, and *Abomaſus*.

ABORIGINES, are ſuch Nations as the *Italians*, who pretend antiently to be without Original or Derivation from any other Nation or People.

ABORTION, the bringing forth of a Child (or *Fœtus*) before its due time.

ABORTIVE, is ſpoken of a *Fœtus* brought forth before its time: Hence 'tis alſo an Epithet given to any Deſign or Purpoſe that miſcarries.

ABRENUNCIATION, is a renouncing or forſaking of any thing entirely.

ABREVIATIONS, are Contractions in Writing or otherwiſe, whereby any thing that is written or ſpoken, is contained in, or takes up much leſs Room, than it would do, if written or delivered at large.

ABRIC, with ſome Chymiſts the ſame with *Sulphur*.

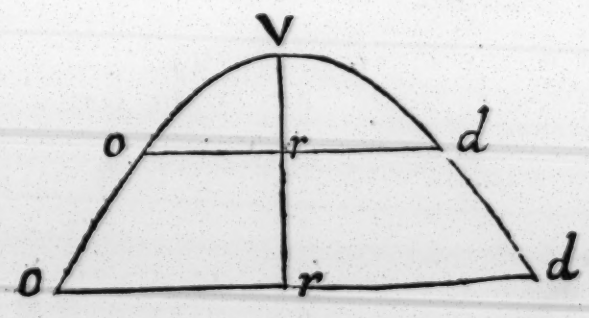
ABRIDGMENT of a Plaint, in Common-Law, is, when one Part of the Plaintiff's Demand is left out, and it is pray'd that the Defendant may anſwer to the other.

ABROGATE, ſignifies to diſanul or repeal; as to *Abrogate* a Law, is, to lay it aſide or to repeal it. So that the

ABROGATION of a Law, is the repealing it, or taking it quite away.

ABSCESSE, an Ulceration ariſing in any Part of the Body after a *Criſis*: The ſame with *Apoſtema*.

ABSCISSÆ, in Conick Section, or other Curvilineal Figure, are the Parts of the Axis cut off by the Ordinates, and accounted downwards from the Vertex of the Section. Thus *V r* or *V R* are the *Abſciſſæ* in this Figure. Theſe are called by ſome Writers, the *Intercepted Axes* or *Intercepted Diameters*.



ABSIS, the ſame with *Apſis*, which ſee.

ABSOLUTE: This Word (which ſignifies free from the Power of another) is variouſly uſed. Sometimes the Terms of a Propoſition are ſaid to be taken *Abſolutely*, that is, without relation to any thing elſe. A Prince is ſaid to be *Abſolute*, when

he makes his *Will* his Law, will in no reſpect be reſtrained or limited by the Laws of his Country. This is otherwiſe called Arbitrary Power; and ariſes from an Imperfection both in the Underſtanding of the Prince, and in the Spirits of the People. But God Almighty is *Abſolute* from the Perfection of his Nature, as containing in himſelf all poſſible Power, and lying under no Limitations nor Reſtraints from any one. *Abſolute* is ſometimes taken alſo in Oppoſition to Terms or Conditions; thus God doth not forgive Men their Sins *Abſolutely*, but on Condition of their Repentance and Amendment; and a Prieſt cannot abſolve Men from the Guilt of their Sins *Abſolutely*, but only declaratively and Miniſterially, on the Condition of the Perſon's Penitence and Reſolutions for Amendment. So (in Law) an *Abſolute* Eſtate is one free from all manner of Conditions.

ABSOLUTE *Number*, in an Equation in *Algebra*, is that which *Vieta* calls the *Homogeneum Comparationis*, and which always poſſeſſeth one entire part or ſide of the Equation, and is always a known Quantity; and the Rectangle or Solid, under the unknown Roots, in Quadraticks and Cubicks. Thus in this Equation $aa+16a=36$. The Abſolute Number is 36, which is equal to the Product of the two Roots or Values of *a*, multiplied one into another.

ABSOLUTE *Equation*, in Aſtronomy, is the Aggregate or Sum of the Eccentrick and Optick Equations. See *Equation*.

ABSORBENTS, are Medicines that temper and qualify the Acid Juices in the Body, by imbibing or drinking them up. Thus *Alkali*'s are ſaid by ſome to abſorb Acids.

ABSTENSION, in Law, is a with-holding an Heir from taking Poſſeſſion of his Land.

ABSTERGENT, or *Abſterſile* Medicines, are ſuch as are uſed to clear the Skin or Superficial Parts of the Body from any Filth, *&c.* obſtructing its Pores.

ABSTERSION, is the Effect produced by Abſterſive Medicines, or in general, any cleanſing or wiping away.

ABSTRACTION, is a Power peculiar to the Mind of Man, in Contradiſtinction to the Souls of Beaſts, and plainly diſtinguiſhes Him from Them; whereby he can make his Ideas, ariſing from particular Things, become general Repreſentatives of all of the ſame kind. Thus, if my Eye repreſents to me Whiteneſs in a Wall, I can *Abſtractedly* conſider that Quality of Whiteneſs, and find it attributable to many other things beſides, as to Snow, to Milk, or the like; and this Quality, whatever it be, thus conſidered apart from the *Concrete*, or the Subject in which it inheres, is ſaid to be taken in the *Abſtract*.

ABSTRACT, is frequently uſed alſo for a ſmall Draught or Epitome of any greater Work.

ABSTRACT *Numbers*, are thoſe which are conſidered as *Pure Numbers*, without being applied to any Subject; and ſo *Abſtracted Mathematicks*, is uſed in Oppoſition to *Mixt Mathematicks*; the former ſignifying pure *Geometry* or *Algebra*; and the latter Opticks, Dialling, Navigation, *&c.* where Phyſical Conſiderations are connected with the Mathematical.

ABSTRUSE, ſecret, dark, not eaſily intelligible.

ABUNDANT *Numbers*, are thoſe whoſe Parts added together, make more than the whole *Number* which they are Parts of; as *v. g.* Twelve, whoſe Parts being 1, 2, 3, 4, and 6, theſe all added together make Sixteen: Thus alſo the Parts of 20 make 22, *&c.*

ABUS, ſee *Apſis*.

ABYSS, is any vaſt deep Place, which either hath no Bottom, or elſe hath none diſcernable, or at leaſt is ſuppoſed to have none.

The Learned Dr. *Woodward*, in his *Natural Hiſtory of the Earth*, P. 117. tells us, That there is a mighty Collection of Waters incloſed in the Bowels of the Earth, conſtituting an huge Orb in the Interiour or Central Parts of it; and over the Surface of this Water, he ſuppoſes the Terreſtrial *Strata* to be expanded: This is what *Moſes* calls *the Great Deep*, and what many Authors call *the Abyſs*. And that there is ſuch a vaſt Collection of Waters lodged in the Bowels of the Earth, is confirmed by abundance of Obſervations.

The Water of this vaſt Abyſs the Dr. aſſerts, doth communicate with *that* of the Ocean by means of certain Holes, *Hiatus's* or *Chaſms* paſſing betwixt it and the Bottom of the Ocean: And this and the Abyſs he ſuppoſes to have one common Centre, around which the Water of both of them is placed; but ſo, that the ordinary Surface of the Abyſs is not level with that of the Ocean, nor at ſo great a diſtance from the Centre as that is, it being for the moſt part reſtrained and depreſſed by the *Strata* of Earth lying upon it; but wherever thoſe *Strata's* are broken, or ſo lax and poroſe that Water can pervade them, there the Water of the Abyſs doth aſcend, fills up all the Clefts or *Fiſſures* whereinto it can get Admittance or Entrance, and ſaturates all the Interſtices and Pores of the Earth, Stone, or other Matter all around the Globe, quite up to the Level of the Ocean.

ACADEMY, is a kind of higher School or Univerſity, where young Men are inſtructed in the Liberal Arts and Sciences. 'Twas ſo called at firſt from *Academia*, the Name of a Place near *Athens*, and built, ſay ſome, by *Cadmus* the *Phœnician*; others, by one *Academus*, whence it had its Name: 'Twas planted with Trees; and here *Plato* taught his Diſciples Philoſophy, who from hence are called *Academicks*. *Cicero* alſo call'd one of his Country Seats by this Name, where he had fine Groves, and pleaſant Walks for the Entertainment of his Philoſophical Friends; and here he wrote his Books, *D. Nat. Deorum* and *De Amicitia*, and his *Offices*, which therefore he called his *Academical Treatiſes*.

ACADEMICKS; ſo the Followers of *Plato* were anciently called, becauſe they ſtudied in the *Academia*. Afterward it became the Name of a Sect of Sceptical Philoſophers, who maintained, That all things were uncertain, and that Reaſon and Truth were changeable, ſo that Men ought to doubt of every thing, and believe nothing.

ACANTABOLUS, the ſame with *Volſella* (excepting that the *Volſella* is crooked) a Surgeon's Inſtrument to take out any thing that ſhall happen to ſtick in the *Oeſophagus* or Gullet; 'tis ſomething like a Pair of Plyers, and may be reckoned as a kind of *Forceps*.

ACANTHA, is with ſome Anatomiſts the moſt backward Protuberance of the Vertebres of the Back; and is otherwiſe called, *Spina Dorſi*.

ACARNAR, the ſame with *Acherner*.

ACATALECTICK *Verſe*, is one exactly perfect, where not ſo much as one Syllable is either redundant or deficient.

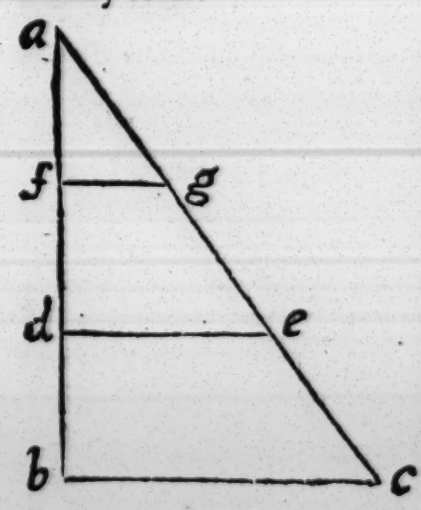
ACCEDAS *ad Curiam*; a Writ made out of the Chancery, and Returnable in the King's Bench or Common Pleas, and directed to the Sheriff, requiring him to go to the Court of ſome Lord, or Franchiſe, (where a Plaint is ſued for taking of Cattle as a Diſtreſs, or any falſe Judgment ſuppoſed to be made in any Suit in ſuch a Court, which is not a Court of Record) and there make a Record of the ſaid Suit, in preſence of the Suitors of the ſaid Court, and alſo of four other Knights of the ſame County; and to certify it unto the King's Court, at the Day limited in the Writ.

ACCEDAS *ad Vice Comitem*, is a Writ directed to the Coroner, requiring him to deliver a Writ to the Sheriff, who having a *Pone* delivered to him, ſuppreſſes it.

ACCELERATION of the Deſcent of heavy Bodies was firſt diſcovered by *Galilæus*: And if due Attention be given to our excellent Sir *Iſaac Newton*'s Second Law of Motion, *Axiom*, or *Law of Nature*, as it may be called, *viz. That the Mutation of Motion is always proportionable to the Force impreſſed, and always is according to that ſame Line of Direction*, the Reaſon of the Acceleration of the Deſcent of heavy Bodies, will be very clear and intelligible.

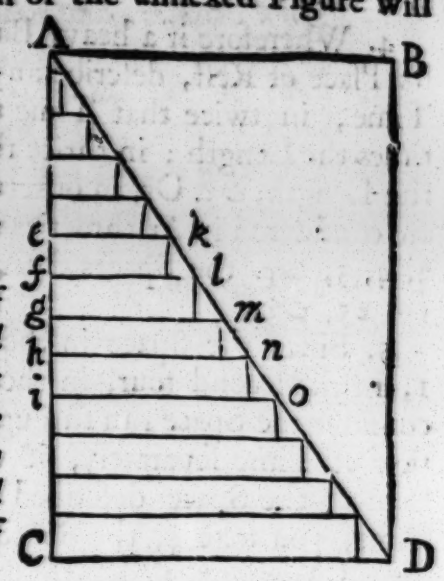
For, ſuppoſing Gravity (whatever it be) to act uniformly on all Bodies, at equal Diſtances from the Earth's Centre, and that the Time in which any heavy Body falls to the Earth, be divided into equal Parts infinitely ſmall: Let Gravity encline the Body towards the Earth's Centre, while it moves in the firſt infinitely ſmall Part of the Time of its Deſcent: If after this, the Action of Gravity be ſuppoſed to ceaſe, the Body would go towards the Earth's Centre equally, with a Velocity equal to the Force of that firſt Impreſſion, (by Sir *Iſaac*'s firſt Axiom.) But now ſince the Action of Gravity ſtill contiunes; in the ſecond Moment of Time the Body will receive a new Impulſe downward, and then its Velocity will be double of what it was in the firſt Moment: In the third Moment or Particle of Time, it will be Triple; in the fourth Quadruple, and ſo on continually. Wherefore ſince thoſe Particles of Time are ſuppoſed infinitely ſmall, and all equal to one another, the *Impetus* acquired by the Falling Body, will be every where as the Times from the Beginning of the Deſcent. And ſince the Quantity of Matter in the Body given, continues the ſame, the Velocity will be as the Time in which it is acquired (as you will find proved in the *Laws of Motion*.)

And after the ſame manner may it be proved, That the Motion of Aſcending Projectives ſhall be equably retarded; for ſince the Force of Gravity acts continually and equally againſt the Motion firſt begun, it muſt diminiſh or abate the Motion, according to the Time of the Aſcent, till at laſt it wholly ceaſe.



Let the Right Line *a b* expreſs the Time of any heavy Body's Deſcent, and let *b c* at right Angles to it, denote the Velocity acquired at the end of the Fall. Draw *a c*, and any where the two Parellels *f g*, *d e*, ſo they ſhall expreſs the Velocities acquired in the Times of Deſcent *a f* and *a d*. For becauſe of ſimilar Triangles, *ab. ad* : : *bc. de* : : and as *ad. af* : : *d e. fg*. wherefore 'tis plain, the Velocities are as the Times of Deſcent; that is, as the Lines or Elements of the Triangle *a b c*, drawn parallel to the Baſe *b c*.

The Conſideration of the annexed Figure will teach us, *That if an heavy Body be thus uniformly accelerated in its deſcent; the Space which it deſcribes from the beginning of the Time of its Motion, ſhall be juſt the half of that which it would have deſcribed, had it gone on for the ſame Time with a Velocity equal to what it had acquired in the end of its fall.*



Let (as before) *A C* repreſent the Time of the Deſcent, *D C* the Velocity at laſt acquired; and compleat the Triangle *A C D*. Let alſo the Time *A C* be diſtinguiſhed into an indefinite Number of ſmall Parts, as *e f*, *f g*, *g h*, *h i*, &c. and draw the Parallels *e k*, *f l*, *g m*, *h n*, *i o*, &c. to the Baſe *C D*. Then will *e k* be as the Velocity of the heavy Body, in the infinitely ſmall part of Time *e f*, and *f l* will be the Velocity in the ſmall Time *f g*, &c.

But now 'tis proved in the Laws of Motion, (ſee that Word) That the Space or Length deſcribed by any moving Body, in any given Time, and with a given Celerity; is *as the Rectangle under the Time and the Celerity*, wherefore the Space deſcribed in the Time *e f*, with the Celerity *e k*, will be as the Rectangle *f k*; and the Space deſcribed in the Time *f g*, with the Celerity *g m*, will be as the Rectangle *g l*, &c. wherefore the Space run thro' in the Sum of all theſe Times, will be as the Sum of all the Triangles; that is, as the Triangle *A C D*, which contains them all. Again, the Space run thro' by the deſcending Body in the Time, *A C*, with the uniform Celerity *D C* (*by the 7th Article of* Mr. Keil's *Laws of Motion above referred to*) will be as the Rectangle *A B C D*. Wherefore the Space run over by the deſcending Body in the given time, and uniformly Accelerated) is to the Space deſcribed by the ſame Body, in the ſame Time with an uniform Celerity equal to what it at laſt acquires : : as the Triangle *A D C*. is to the Rectangle *A B C D*. But the Triangle is one half of the Rectangle; wherefore the Space deſcribed by the Accelerated deſcending Body from the beginning to the end of its Motion, in a given Time, is juſt the half of the Space which would be deſcribed by the ſame Body if it had gone on, for the ſame Time, with a Velocity equal to what it had acquired in the end of its Fall. *Q. E. D.*

From whence it will follow, 1. That the Space run over with the Velocity *C D* in half the Time *A C*, will be equal to the Space deſcribed by the falling Accelerated Body, in the whole Time *A C*.

2. As the Triangle *A C D* repreſents the Space paſſed thro' in the Time *A C*, ſo the Triangle *A i o*, will repreſent the Space deſcribed by the falling Body in the Time *A i*; and the Triangle *A e k*, will repreſent that deſcribed in the Time *A e*, &c. Wherefore

3. Tis

3. 'Tis plain, the Spaces deſcrib'd, or the Diſtances run thro' in the Fall, will always be as the Squares of the Times: For the ſimilar Triangles *A C D*, *A i o*, *A e k*, &c. are to one another as the Squares of their Homologous Sides *A c*, *A i*, *A e*.

4. Wherefore if a heavy Body deſcending from its Place of Reſt, deſcribe any Length in a given Time, in twice that Time it will deſcribe four times the Length; in thrice the Time, nine times the Length, *&c.* Or, in other Words, if the Times are conſidered in Arithmetical Proportionals, 1, 2, 3, 4, 5, *&c.* the Spaces deſcribed will be 1, 4, 9, 16, 25, *&c.*

5. Since the Space in the firſt part of Time is 1, in the ſecond four, in the third 9, *&c.* if you conſider the Space run through in the ſecond Particle of Time ſeparately, it will be as 3; and if from 9, the Space deſcribed in the third part of Time, you take 4, the Space before deſcribed in the 2d Moment, there will remain 5, *&c.* wherefore ſuppoſing the Moments or Parts of Time equal, the Spaces deſcribed by the Deſcent of an heavy Body beginning from Reſt, in each Moment conſidered ſeparately, will be as the natural odd Numbers, 1, 3, 5, 7, 9, 11, 13, 15, 17, *&c.*

6. And ſince the Velocities acquired in falling, are as the Times, the Spaces run through will be alſo as the Squares of the Velocities; and both Times and Velocities will be in ſubduplicate *Ratio* of the Spaces deſcribed by any falling Body.

ACCELERATORES *Urinæ*, are a pair of Muſcles belonging to the *Penis*, whoſe uſe is to expedite the Urine and the *Genitura*: Our accurate Mr. *Cowper* ſaith, Authors have been miſtaken in aſſigning the Origination of theſe Muſcles, either to the *Sphincter Ani*, or to the Tubercles of the *Oſſa Iſchii*; for they ariſe Fleſhly from the ſuperior Part of the *Urethra*, as it paſſes under the *Oſſa Pubis*, encompaſſing the external Part of the Bulb of its cavernous Body; both theſe Muſcles meet on the inferior Part, and march on according to the Length of the Skin in the *Perinæum*, when parting from each other, they aſcend to their Inſertions on each ſide the *Corpora Cavernoſa Penis*. He thinks alſo, that they aſſiſt the *Erectores Penis*, by driving the Blood contained in the Bulb of the Cavernous Body of the *Urethra* towards the *Glands* in a greater Quantity, whereby it becomes diſtended: The Veins which carry off the Refluent Blood from the *Corpus Cavernoſum Urethræ*, being at that time compreſs'd by the ſwelling of theſe Muſcles.

ACCENSION, is the enkindling or ſetting any Body on Fire.

ACCENT *in Grammar*, is a Mark placed over a Syllable, to ſhew 'tis pronounced with a ſtronger or weaker Voice. The Greeks, who were the greateſt obſerver of Accents, diſtinguiſh them into the *Acute one* mark'd thus, (´), the *Grave* one thus, (`), and the *Circumflex* thus, (~). But of late one *Hennin*, a *Dutchman*, hath written a Book to prove the Accents were not ancient among the Greeks, and that that Language ought not to be pronounced according to them: He pretends no Accents are to be found in any MSS. above 800 Years old, and takes them to be an Invention of the *Arabs* about the time of *Mahomet*'s Death. He ſays, the *Maſſoretes* of *Tiberius* brought them into the Bible about the Sixth Century, and that they were perfected by *Rabbi Judah Ben David Ching*, born in *Fez*, about the Eleventh Century.

ACCENTS, in Grammar, ſhew how to judge of the Meaſure of Time; in which each Letter, Syllable, Word, or Expreſſion is pronounced; the Elevations and Depreſſions of the Voice, the Silence or Repoſe of the Voice at the End of Words or Sentences, *&c.* Theſe Accents may be very numerous: There are in the Hebrew Grammars more than thirty of them, and *Servius Honoratus* reckons eight in the Latin.

The *Acute Accent* ſhews when the Voice is to be raiſed, and is expreſſed thus (´).

The *Grave Accent* ſhews when the Voice is to be depreſſed, and is figured thus, (`).

The *Circumflex Accent* is compos'd of both the *Acute* and the *Grave*, and is expreſſed thus, (^).

The *Long Accent* ſhews that the Voice is to ſtop upon the Vowel that has that Mark, and it is expreſſed thus, (¯).

The *Short Accent* ſhews that the time of Pronunciation ought to be ſhort, and is marked thus. (˘).

Hyphen, is an *Accent* in Grammar, that implies two Words are to be joyned, as *male-ſanus*.

Diaſtole, is an *Accent* in Grammar, which ſhews that thoſe Words or Sentences to which it is adjoyned are to be ſeparated, its Mark is (,).

Apoſtrophe, is an *Accent* in Grammar, ſhewing there is a Vowel to be rejected, and is expreſſed thus, (') and placed over the Head of the Letter.

ACCENT *in Muſick*, is a Modulation of the Voice, to expreſs the Paſſions either Naturally or Artificially.

ACCEPTANCE, in Law, is an agreeing to ſome Act already done, which without ſuch Agreement, might have been undone or avoided; as if a Man and his Wife ſeized of Land in Right of his Wife, do joyn and make a Leaſe by Deed, reſerving Rent, and the Husband dying, the Wife *accepts* or receives the Rent: By this *Acceptance* in her, the Leaſe is made good, and ſhall bar her from bringing a *Cui in vita*.

ACCEPTILATION, in *Civil-Law*, is the ſame with *Acquittance* in *Common-Law*, being a Verbal Diſcharge from the Creditor to the Debtor.

ACCESS or *Acceſſion*, the Fit or *Paroxyſm* of a Diſeaſe.

ACCESSIBLE *Height*, is either that which may be mechanically meaſured by the Application of a Meaſure to it, or elſe an Height whoſe Baſe and Foot can be approached to; and from thence a Length meaſured on the Ground.

ACCESSORIUS *Williſſii*, is a Nerve which ariſes from the *Medulla Spinalis*, about the beginning of the ſixth Pair of the Neck; as it aſcends to the Head, it receives on each ſide a Twig from the firſt five Pair of Nerves of the Neck; as they riſe from the *Medulla Spinalis*; then it enters the Skull, and paſſes out of it again with the *Par Vagum*, and is wholly ſpent upon the *Muſculus Trapezius*.

ACCESSORY, in the Common-Law, is a Perſon adviſing or procuring before the Fact, or aiding and aſſiſting, receiving or protecting after it, one that hath committed Felony; who therefore ſhall have Judgment of Life and Member, as well as the Principal which did the Felony, but not till the Principal be firſt attainted, convict, or outlawed thereupon. A Man alſo may be Acceſſory to an Acceſſory, by aiding, receiving, *&c.* an Acceſſory to Felony. In the *Statute-Law* 'tis ſuch an one

as abetts, adviſes, aids or receives one that commits Felony, which is made ſo by Statute.

ACCIDENT: This Word is uſed by Logicians in three Senſes.

1. In Oppoſition to the *Eſſence* of any Thing, whatever doth not eſſentially belong to it may (tho' a Subſtance it ſelf) yet be an *Accident* or Adjunct to that Thing, or belong to it only accidentally, as the Cloths a Man hath on; the Money in his Purſe, *&c.* Theſe indeed are more properly called *Adjuncts*; and by the School-men are diſtinguiſhed by the Name of *Verbal Accidents*.

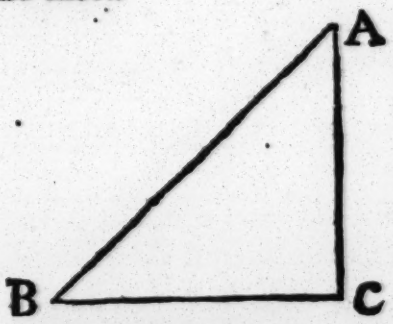
2. In Contradiſtinction to the *Eſſential Properties* of any Subject, many Qualities are called *Accidents*; becauſe they are there not *Eſſentially* but *Accidentally*. This in the Schools is called *Accidens Prædicabilis*, and implies a *Common Quality*, which may or may not be in any Subject, as any particular *Colour*, &c.

3. In Oppoſition to *Subſtance*, a Thing is called an Accident, when it is its Eſſence or Nature to *Inhere* or ſubſiſt in ſome Subſtance, and cannot be alone: And thus it is with all Qualities whatſoever. This is called *Accidens Prædicamentale*, and the nine laſt *Prædicaments* are in this Senſe Accidents.

In reference to its *Cauſe* alſo, or at leaſt as to our Knowledge of it, a Thing is frequently ſtiled an *Accident*, by which we mean an Effect either caſually produced, or which to us apppears to have been ſo.

ACCIDENTS (in Heraldry) are the *Points* and *Abatements* in an Eſcutcheon; which ſee.

ACCIDENTAL *Point*, in Perſpective is a Point in the *Horizontal Line*, where Lines parallel among themſelves, tho' not perpendicular to the Picture, do meet.



ACCLIVITY, is a Steepneſs reckoned upwards on a Slope Line, as *Declivis* is a ſteepneſs downwards. Thus *B A* is an *Acclivity*; *A B* a *Declivity*.

ACCOMODATE, ſignifies amongſt Geometers, to fit in a Line or Figure into a Circle, *&c.* ſo as the Conditions of the Propoſition or Problem require. See *Apply*.

ACCOMPT, a Writ in Law ſo called, lying againſt a Bailiff or Receiver, who will not give up his Accounts, or come to an Account for what he hath received. If the Auditors aſſigned him, find that he is in Arrears, they have Power by the Statutes of *Weſtm.* 2. *C.* 10. to award him to Priſon till he have made Satisfaction: But if they won't allow him reaſonable Charges, or if they charge him with more than he hath received, any Friend of his may ſue out a Writ *Ex Parte Talis*, from the Chancery, directed to the Sheriff, to take out four Main-Pernors, to bring his Body before the Barons of the Exchequer on a certain Day, and to warn his Lord or Maſter to appear there at the ſame time.

ACCORD, in Law, is an Agreement or Contract from one Man to another, to give him Satisfaction for ſome Treſpaſs or Damage done, which when executed and Performed, is a good Bar in Law againſt an Action of Treſpaſs for that Damage or Offence.

ACCRETION; nearly of the ſame Senſe with Augmentation, and is properly an Addition of Matter to any Body externally: This is uſually ſaid of the encreaſe of Bodies without Life, and is ſometimes called *Appoſition* or *Juxta Poſition*. But ſome will have the encreaſe of Living Bodies to be by *Introſumption* and *Aſſimilation* of the *Aliementary* or nouriſhing Particles.

Dr. *Havers* in his *Oſteologia* gives this Account of *Accretion*, that the Nutritious Particles being ſeparated by the Glandules placed every where on the ſides of the Arteries, are carried into thoſe ſmall Nervous Pipes, or Interſtices of the Fibres where the Spirits move, ſo that they fall in the way of the Spirit's Motion: Theſe Spirits he ſuppoſes to have a twofold Motion; one direct, the other *Rotatory* or turning round their *Axes*. While an Animal is capable of Accretion, and the Particles of which the ſolid Parts conſiſt are not entirely united at their Extremities, but are capable of receding one from another, both end-ways and laterally; the Spirits act upon the Nutritious Particles (which are of a Viſcous Nature) by their Rotary Motion, by which they carry them to the ſides of the Fibres and Bony Strings, driving ſome againſt the ſides of their Parts, and forcing them out laterally: Others they drive into the Interſtices between the Extremities, thereby lengthning every Series of them; where they are placed and fix'd, and thus the Parts of an Animal Body increaſe both in Thickneſs and Longitude. But after the Particles are united at their Extremities, and no longer capable of making Room to lode the Nutritious Parts out of the way of the Spirits direct Motion; then the Spirits come to act upon the Nutritious Matter by that Motion, and to drive it ſo through the Nervous Channels, that it has not the liberty of ſtopping and adhering; and ſo the Accretion of the Animal ceaſes.

ACETABULUM, is that Cavity in the Huckle Bone which is appointed to receive the Head of the Thigh Bone within it: Alſo certain Glandules in the *Chorion* are call'd *Acetabula*, concerning which (ſee *Cotyledones.*)

ACERB, is a Taſte betwen Sowre and Bitter, ſuch as moſt Fruits have before they are ripe.

ACETUM *Radicatum*, is the ſharpeſt part of Vinegar, when the Phlegm is drawn off.

ACETUM *Philoſophorum*; ſo ſome Chymiſts call that ſour Liquor which is made be diſſolving a little Butter or Icy Oyl of Antimony in a conſiderable Quantity of Water.

ACETUM *Alcaliſatum*, is diſtilled Vinegar ſalturated with ſome Alkalizate Salt.

ACHAMECH, with ſome Chymiſts ſignifies the Droſs of Silver.

ACHERNER, a bright fixed Star of the firſt Magnitude, in *Eridanus*, whoſe Longitude is 10. 31. of ♓, Latitude 59. 18.

ACHOLITE or *Acolite*, an inferior Church Servant, who, next under the Sub-Deacon, followed or waited on the Prieſts and Deacons, and performing the meaner Offices of lighting the Candles, and carrying the Bread and Wine, and paying other ſervile Attendance.

ACHOR, is a ſort of a cruſted Scab which makes an Iching and Stink on the Surface of the Head, and is occaſioned by a Serous, Salt and Sharp Matter: The difference betwixt an *Achor* and *Favus* conſiſts in this, that in *Achors* the Holes or Cavities are ſmall, and ſometimes not viſible; but

but in a *Fœtus* they are more large and conſpicuous.

ACHLYS, according to ſome, is a kind of Darkneſs in the Eyes, accounted one of the Species of *Amblyopia*, or Dimneſs of Sight.

ACHRONICAL, is uſed in Aſtronomy for the Riſing of a Star when the Sun ſets, or the Setting of a Star when the Sun riſes; in which Caſes the Star is ſaid either to riſe or ſet Achronically; which is one of the three *Poetical Riſings* or *Settings*.

ACIDITY, is the Taſt which Bodies that are *Acid* or Sharp affect the Mouth with: And thoſe Bodies are called

ACIDS, whoſe Particles are ſuppoſed to be longiſh, flexible, penetrating, and attenuating; and which have their Points ſharp and piercing. And theſe are either *Natural Acids*; which have a proper Acidity of their own, without the help of Art, as Juice of Limons, *&c.* or elſe *Artificial Acids*; which are made by Fire in Chymical Operations. So that *Acid Spirits* or *Stygian Liquors*, as the Chymiſts call them, from their Powers to deſtroy or diſſolve Bodies, ſeem to be nothing but an *Acid Salt* diſſolved, aud put into a violent Motion by the Fire: Theſe are called *Acid Menſtruums*. You may eaſily know whether any Liquor contain in it any *Acid Salt* or not, by dropping ſome of it on a little Syrup of Violets ſpread on white Paper; or in a Solution of Blue-bottle Flowers, *&c.* for then the Blue will be immediately turned into a Red or reddiſh purple Colour; whereas if it turn Green, 'tis a ſign the Liquors abounds with Salts of an Urinous or Lixiviate Nature; which how to diſtinguiſh, *ſee thoſe Words*. The Acidity of any Liquor may alſo be concluded by its being able to deſtroy the Blueneſs of a Tincture of *Lignum Nephriticum*: (See *Colours*, and the ways of producing ſudden Changes of them.)

ACIDULÆ, any Medicinal Waters that are not hot, like thoſe at the *Bath*, which are called *Thermæ*.

ACINUS, in Botanicks, doth not ſignify a Grape-ſtone, but the Fruit it ſelf of all ſuch Plants which bear it, in a manner reſembling Grapes: It is ſofter and more Juicy than a *Berry*, and therefore diſtingiſhable from it; as it is alſo becauſe the *Acini* grow in Bunches or Cluſters, and Berries often ſingle.

ACINIFORMIS *Tunica*, is the ſame with the *Uvea Tunica* of the Eye.

ACMASTICK *Fever*, with ſome, is the ſame as *Synochus*.

ACME, in general, ſignifies the Height or Top of any thing; the Word is more eſpecially uſed to denote the Height of a Diſtemper, many of which have four Periods. 1. The *Arche* or beginning. 2. The *Anabaſis*, or Growth and Increaſe. 3. The *Acme*, when the Morbifick Matter is at the Height. 4. The *Paracme*, or the *Declenſion* of the Diſtemper.

ACOLITE, ſee *Acholite*.

ACONTIAS, a ſort of Comets, ſhaped like a Dart or Javelin. Its Head is ſometimes round, and ſometimes oblong or compreſſed; and its Tail or Train is ſlender, but extended to a great Length.

ACOPUM, according to ſome Writers, is a Fomentation of warm and emollient things, to allay the Senſe of Wearineſs, occaſioned by too violent Labour or Exerciſe.

ACOSMY, is an in ill ſtate of Health accompanied with the Loſs of the natural florid Colour of the Face.

ACOUSTICKS, are Medicines or Inſtruments which help the Hearing; as to the latter of which, the uſe of *Otocouſtick* Trumpets is now very common; and no queſtion Inſtruments of this kind are capable of Improvement. Dr. *Hook* in his Preface to his Micrography, ſaith, 'tis not impoſſible to hear a Whiſper at a Furlong or $\frac{1}{5}$th part of a Mile's diſtance: That he knows a way by which 'tis eaſy to hear any one ſpeak thro' a Wall of a Yard thick: And that by help of a diſtended Wire, the Sound may be propagated to a very conſiderable Diſtance almoſt in an Inſtant.

ACQUIETANDIS *Plegiis*, is a *Juſticies*, that lies for a Surety againſt a Creditor, that refuſeth to acquit him after the Debt is paid.

ACQUIETANTIA *de Shiris & Hundredis*, to be free from Suit and Service in Shires and Hundreds.

ACQUITTAL, in Law, ſignifies the Diſcharge of a Tenant from any Entries or Moleſtations, for any manner of Service iſſuing out of the Land to any Lord; that is, above the Miſne. It ſignifies alſo, when two are indicted of Felony, the one as Principal, the other as Acceſſary; the Principal being diſcharged, the Acceſſary by conſequence is alſo acquitted.

ACQUITTANCE, ſignifieth a Releaſe or Diſcharge in writing of a Sum of Money, or other Duty, which ought to be paid or done.

ACRASY, is the Exceſs or Predominancy of one Quality above another, in the Conſtitution of a human Body.

ACRE of Land; its Quantity is four Square Roods; or 160 ſquare Poles; or 4840 ſquare Yards; or 43560 ſquare Feet. By a Statute of 31 of *Eliz.* 'tis ordained, That if any Man erect a new Cottage, he ſhall add 4 Acres of Land to it.

ACRIMONIOUS *Bodies*, are thoſe (in the General) whoſe Particles do eat, fret, deſtroy and diſſolve what comes in their way, or which have a great *Acrimony*.

ACRISY, is ſuch a State or Condition of a Diſeaſe, that no right Judgment can be made of the Patient whether he will recover or not.

ACROMION, is the upper Proceſs of the Shoulder-Blade, or the top of the Shoulder, where the Neck-Bones are joined with the Shoulder-Blades.

ACROMPHALUM, is the Middle of the Navel.

ACRONICAL, ſee *Achronical*.

ACRONYCHAL, is the ſame with *Achronical*, which ſee.

ACROS, with ſome Writers is the Height of a Diſeaſe; and with ſome Anatomiſts, the Tops, or Prominences of Bones, *&c.*

ACROSPIRE, the ſame with *Plume*, which ſee.

ACROSTICKS; are a certain Number of Verſes, whoſe initial Letters make up ſome Perſon's Name, Title, or ſome particular Motto.

ACROTERIA or *Acroters*, ſignify in Architecture thoſe ſharp Pinacles and ſpiry Battlements, which ſtand in Ranges about flat Buildings, with Rails and Balaſters: They ſignify alſo a ſort of *Pedeſtal* to ſupport Statues.

ACTINOBOLISM, is the ſame with the Diffuſion or Diradiation of Light or Sound, by which its carried or flows every way from its Centre.

ACTION *of a Writ*, is a Phraſe of Speech when one pleads ſome Matter, by which he ſhews, that the Plaintiff had no Cauſe to have the Writ which he brought; and yet it may be that he may have another *Writ* or *Action* for the ſame Matter.

ACTION *upon the Caſe*, is a *Writ* brought againſt one for an Offence done without Force, as for not performing Promiſe made by the Defendant to the Plaintiff, or for ſpeaking of Words whereby the Plaintiff is defamed, or for other Miſdemeanor or Deceit, *&c.*

ACTION *mix'd*; is when it is part *Real* and part *Perſonal*; and alſo is a Suit given by the Law to recover the thing demanded, and Damages for the Wrong done.

ACTION *upon the Statute*, is a *Writ* founded upon any Statute, whereby any Action is given to one in any Caſe whereby no Action was before.

ACTIONS *Perſonal*, are Actions whereby a Man claims Debt, or other Goods or Chattels, or Damage for them, or for Wrong done to his Perſon.

ACTION *Popular*, is an Action upon the Breach of ſome Penal Statute, which any Man that will may ſue for himſelf and the King, by Information or otherwiſe.

ACTIONS *Real*, are Actions whereby the Plaintiff claims Title to Lands, Tenements, Rents or Commons, in Fee, or for Term of Life.

ACTIVE PRINCIPLES, according to the Chymiſts, are the Spirit, Oyl and Salt, becauſe their Parts being briskly in Motion do cauſe Action in other Bodies.

ACTUARY, the Clerk that Regiſters the Acts and Conſtitutions of a Convocation.

ACUTE ANGLES: See *Angles*.

ACUTE ANGLED *Triangle*: See *Triangle*.

ACUTE DISEASE, is that which is over in a little time, but not without eminent Danger to the Patient.

ACUTE ACCENT, in Grammar, ſhews when the Voice is to be raiſed, and is expreſſed thus, (').

ACUTE *Angular Section of a Cone*, was the Term that the ancient Geometers uſed for the *Ellipſis*; but *Apollonius Pergæus* firſt demonſtrated, that the Section of any Cone thro' both it Sides, will produce the ſame Figure; whereas they conſider'd it only in that Cone whoſe Section by the Exis is a Triangle acute angled at the Vertex.

ADARIGE, with ſome Chymiſts ſignifies *Sal Armoniack*.

ADDITAMENTS, Things added a-new to the ordinary Ingredients of any Compoſition; or to a *Menſtruum*, to enable it the better to open, and diſſolve any Body.

ADDITION, in general, is the puttinig of two Things or Quantities together; and that Quantity which ariſes or reſults from thence, is call'd the *Sum* or *Aggregate* of thoſe Quantities.

ADDITION in *Algebra* or *Species*, is performed in general, by conjoyning the Quantities propoſed, preſerving their proper Signs. And the proper Mark or Sign of Addition is +, which is always ſuppoſed to belong to the Quantity which follows it.

Thus, if to $3a$ you add $2a$ } the Sum is $3a+2a$ or $5a$, and $A+2b$ when added to $c+bb$ makes $A+C+2b+bb$

Addition in *Algebra* may eaſily be learnt by obſerving the following particular Rules.

1. When *Simple* and *Like* Integers, having *Like* Signs are to be added, collect the Numbers (or Cœfficients) all into one Sum, and to that Sum annex the Letters by which any of the Quantities was expreſs'd; and laſtly, prefix the proper Sign;

Thus, $-b$
$-2b$ and $+bcd$
make $-13b$ $+2bcd$
$+4bcd$ and $-36de$
make $+7bcd$ $-4de$
make $-40de$.

2. *Rule.* When two ſimple and like Quantities have equal Numbers prefix'd, and unlike Signs, the Sum is 0;

Thus, $+3a$ and $-bb$ and $-7dce$
$-3a$ $+bb$ $+7dce$
00 00 00

N. B. The Reaſon of which is plain, if you conſider that all Quantities having Negative Signs, are in Nature directly contrary to ſuch as have Affirmative ones; and therefore will always deſtroy one another. Thus, if a Man have 10 Pounds in Caſh, and run in Debt 13 *l.* that is, if to his Caſh he add 10 *l.* (which is the proper way to expreſs a Debt) there will remains nothing; for the Debt, or -10 *l.* will quite deſtroy the Caſh, or $+10$ *l.* So alſo if a Man owe 10 *l.* and having nothing to pay it, then hath he a -10 *l.* or is 10 *l.* worſe than nothing: And if any Perſon give him 10 *l.* or add a $+10$ *l.* to his -10 *l.* the Sum will be nothing, but however the Man will, tho' worth nothing, be 10 *l.* better than he was before.

So that 'tis a general Rule in *Algebra*, that to add $-$ is the ſame as to take away $+$, and to take away $-$ is the ſame thing as to add $+$, and to take away $+$ is all one as to add $-$.

3. *Rule.* When two ſimple and like Quantities are given, having unlike Signs, and unequal Numbers prefix'd; ſubſtract the leſſer Number from the greater, and to the Remainder annex the Letters due, prefixing the Sign that belongs to the greater Quantity,

Thus, $+3a$ and $-8b$
$-a$ $+2b$
$+2a$ $-6b$

The Reaſon of which is clear from what was ſaid in the laſt Rule.

4. *Rule.* When three or more ſimple and like Quantities have unlike Signs, collect the Affirmative Quantities into one Sum, the Negative into another, then (by the 3d *Rule*) add theſe together, and the laſt Sum is the Sum ſought;

Thus, $-7a$ } $-10a$
$-3a$
$+5a$ } $+14a$
$+9a$
$+4a$ Sum.

5. *Rule.* When two or more ſimple and unlike Quantities are propoſed, write them down one after another without altering their Signs;

Thus, $+3a$
$+3b$
$+3a+4b$

From the due Apprehenſion of, and mature Conſideration on which *Rules*, the Addition of Compound Quantities may be eaſily perform'd;

Thus, $+3ee+7bb$
$-ee-2bb$
$+ff+3ff$
Sum $3ee+7bb-ee-2bb+ff+3ff$
Contracted $+2ee+5bb+4ff$

ADDITION of *Indexes* is performed after the ſame manner with that of Algebraical Quantities.

Thus, to 3 add 3, the Sum is 6, where both are the Indexes of Integer Numbers: But to 3 add $\frac{1}{2}$ the Sum will be 1: To $\frac{1}{3}$ add 3, the Sum will be $\frac{1}{3}$, *&c.*

ADDITION of *Integers*, in Common Arithmetick, is performed by this ſingle Rule:

Set the Numbers orderly one under another, *i. e.* Units under Units, Tens under Tens, Hundreds under Hundreds, *&c.*

Then collect each Column ſingly into one Sum, beginning at the Right Hand, at the place of Units; and if the Units in that Row are leſs than 10, ſet them down under the Line, but if they are more than 10, ſet down only the Overplus, and carry the Tens to the next Row, in which ſet down (under the Line) the odd Tens, and carry the Hundreds to the third Column, *&c.* as you will ſee in the following Examples.

16	34	756	5789	93256
72	68	382	3452	13700
		568	7898	78250
88	102		3257	97662
		1706		15628
			20396	
				297496

But if the Numbers be of different, or of ſeveral *Denominations*, then they muſt be added by ſumming up each Denomination by it ſelf, and ſeeing how many of them will make one of the next Denomination; and bearing ſo many Units forwards as thoſe will come to.

Thus, ſuppoſe the following Pounds, Shillings and Pence were to be collected into one Sum.

l.	*s.*	*d.*
135	17	08
95	11	02
3	05	09
234	14	07

Beginning with the Pence, I ſay 9 and 2 are 11, and 8 makes 19, which becauſe it is 7 above 12, or a Shilling, I ſet down the odd Seven Pence, and carry one Shilling to the next Rank. Say 1 that I carry and 5 is 6, and one is 7, and 7 is 14; I ſet down 4, and I find I have in all 3 Tens, therefore I ſet down one Ten on the Left Hand of the 4, and carry one Pound to the Column of Pounds; where I proceed, juſt as in *Addition of Integers*, and find the whole Sum to be 234*l.* 14*s.* 07*d.*

ADDITION *of Logarithms*: See *Logarithms*, N° 3.

ADDITION *of Vulgar Fractions*: See *Vulgar Fractions.*

ADDITION *of Decimal Fractions*: See *Decimal Fractions.*

ADDITION *in Law*, is that which is given to a Man beſides his proper Name and Sirname, to ſhew of what Eſtate, Degree or Myſtery he is, the place of his Birth or Habitation.

ADDUCENT MUSCLES, are thoſe that bring forward, cloſe, or draw together the Parts of the Body whereunto they are annexed.

ADDUCTORES, the ſame with *Adducent Muſcles.*

ADDUCTOR OCULI, is a Muſcle of the Eye, ſo call'd, becauſe it inclines its *Pupil* towards the Noſe; and alſo *Bibitorius*, it directing the Eye towards the Cup in drinking.

ADDUCTOR POLLICIS, is a Muſcle of the Thumb, which ariſes tendinous in common with the *Abductor Indicis*, and becoming fleſhly, aſcends bliquely to its broad Termination at the ſuperior part of the firſt Bone of the Thumb. This brings the Thumb nearer the Fore-Finger.

ADDUCTOR POLLICIS PEDIS, is a Muſcle of the Great-Toe, which ariſeth partly tendinous and partly fleſhy from the Inferior Parts of the *Os Cuneiforme Tertium*, and dilating its ſelf to a fleſh Belly, marcheth obliquely in the bottom of the Foot, and becomes leſs and tendinous as its Inſertion to the Internal Part of the *Oſſa Seſſamoidea* of the Great-Toe, laterally oppoſite to the Termination of the *Abductor Pollicis Pedis.* This brings the Great-Toe nearer the reſt.

ADEN, is the Term for a Glandule in an Animal Body, which is either *Conglobated*, as the Glands of the *Meſentary*, &c. With ſome alſo 'tis uſed for a Tumour in the Groin, the ſame with *Bubo.*

ADEPS *or* Pinguedo, *Fat*, is a ſimiliar Part of the Body: But *Adeps* and *Pinguedo* differ in this, that *Adeps* is a thicker, harder, and more earthy Subſtance than *Pinguedo*; the Fat which is particularly meant by *Adeps* flows from the Blood thro' peculiar Veſſels into Bags or Bladders appropriate thereunto, as is plain from the Obſervation of *Malpighius.*

ADEPTISTS, or *Adepts*, are ſuch Alchymiſts as pretend to have gain'd the Secret of the *Tranſmutation of Metals*, or to make the *Philoſopher's Stone*: Of theſe Myſtical Inviſible Gentlemen (they ſay) there are 12 always in being; which are kept ſupply'd by new ones when any of the Fraternity pleaſeth to die, or to tranſlate himſelf to ſome place where he can make uſe of his Gold, for in this wicked World it will not procure them Shirts.

ADEQUATE; a thing is ſaid to be adequate to, or adequately to agree with another, when 'tis every way equal to it in Extent, Capacity, Power, *&c.* and all other Properties; and neither exceeds it, nor falls ſhort of it in any reſpect. And thus when the Notions or Ideas that we have of any thing, take in all the Properties of that thing, and that we omit conceiving nothing which belongs to it, we then ſay we have *Adequate Ideas* of ſuch things.

ADEQUATE IDEAS, are thoſe Ideas which perfectly repreſent the Architypes or Images which the Mind ſuppoſes them to be taken from; which it intends them to ſtaed for, and to which it refers them.

ADJACENT *or Contiguous Angles*, ſee *Angles.*

ADIAPHORUS, or *Neutral*, i. e. indifferent; So Mr. *Boyle* calls a kind of Spirit which he diſtilled from *Tartar* and ſome other Vegetable Bodies; which was neither *Acid*, *Vinous*, nor *Urinous*. 'Tis made thus; Firſt, Shavings of Box, Guajacum, or any other ponderous Wood are diſtilled *per ſe* in a Retort; and then the ſowriſh Liquor is rectified to free it from the Phlegm: After this a Quantity of Powder of Coral, *&c.* was thrown into the ſowre Spirit, which it readily diſſolved; and the Acid Parts of the Menſtruum did ſo aſſociate themſelves with the Coral, as to leave a part of Liquor that was by no means of an Acid Nature, but which when gently drawn off the Coral, was of a ſtrong Smell, yet without any Acidity, and in many reſpects of a different Nature from almoſt any other common Spirit.

AD-

ADJECTIVES (in Grammar) are ſuch Words as deſcribe the manner only of the Being of a thing, and have no natural ſubſiſtence of their own, but do ſubſiſt by *Noun Subſtantives*, to which they are joyned.

AD INQUIRENDUM, a Writ in Law commanding an Enquiry to be made (for the better Execution of Juſtice) about the Merits of a Cauſe depending in the King's Court.

ADJOINING ANGLES, in Geometry: See *Angles*, or *Contiguous*.

ADJOURNMENT, is the putting off of any Court or Meeting, and appointing it to be kept at another Place or Time.

ADIPOSA MEMBRANA, is the Baſis of the *Cellulæ Adipoſæ*, is double, and may be divided into two Parts; the one is External throughout which there are a number of little Cells, full of Fat; the other is Internal, which Anatomiſts have miſtaken for the *Membrana Carnoſa*, becauſe it has a greater Number of Blood Veſſels.

ADIPOSA VENA, or *Renalis*, a Vein ariſing from the deſcending Trunk of the *Cava*; which ſpreads its ſelf on the Coat, and Fat, that covers the Kidneys.

ADIPOSI DUCTUS, call'd alſo *Sacculi*, *Veſiculæ Adipoſæ* or *Lobuli*, are Veſſels which convey the Adeps or Fat into the Interſtices of the Muſcles, or to the Parts between the Fleſh and the Skin.

ADIT, is the *Shaft*, or Entrance into any Mine.

ADJUDGE, when a determinate Sentence is paſt in the behalf of another, the Caſe is ſaid to be Adjudged for him.

ADJUNCT: Whatever comes to any Being from without, is called an *Adjunct* to that Being; as being not naturally and eſſentially belonging to it, but adjoyned or ſuperadded to it.

AD JURA REGIS, is a Writ that lies for the *King*'s Clerk againſt him that ſought to eject him, to the Prejudice of the *King*'s *Title* in Right of his Crown.

ADJUTANT, an Officer in the Army, the ſame with an *Aide-Major*, which ſee.

ADMEASUREMENT *of Dower*, is a Writ that lies where a Woman is endowed by an Infant, or by a Guardian, of more than ſhe ought to have.

ADMEASUREMENT *of Paſture*, is a Writ that lies againſt ſuch, as having Common of Paſture appendant to their Free-holds, do ſurcharge it with more Cattle than they ought to do.

ADMINISTRATION, (in Law) is the diſpoſing of a Man's Goods or Eſtate that died inteſtate, or without any *Will*, with an Intent to give an Account thereof.

ADMINISTRATOR, he that has the Goods of a Man dying inteſtate, committed to his Charge by the Ordinary, and is accountable for the ſame. If the Perſon be a Woman, ſhe is called an *Adminiſtratix*.

ADMITTENDO CLERICO, is a Writ granted to him that hath recovered his Right of Preſentation againſt the Biſhop, in the *Common Bench*.

ADMITTENDO *in Socium*, is a Writ for the Aſſociation of certain Perſons to Juſtices of Aſſize before appointed.

ADNATA TUNICA, is the common Membrane of the Eye, called *Conjunctive*, it ſprings from the Skull, grows to the Exterior Part of the *Tunica Cornea*; and that the viſible Species may paſs there, leaves a round Cavity forward, to which is annexed another Tunic, without any particular Name, made up of the Tendons of thoſe Muſcles which move the Eye; by reaſon of its Whiteneſs, 'tis called *Albuginea*.

AD OCTO, among ſome of the Antient Philoſophers, is a Term ſignifying the Higheſt or Superlative Degree; becauſe they reckoned no Degree above the Eighth, in their way of diſtinguiſhing of Qualities.

ADONICK, a ſort of a ſhort Verſe, conſiſting of a *Daſtyle* and a *Spondee*; as *Rara juventus*; 'tis uſually placed at the end of each Stanza of Saphick Verſes. So called from *Adonis*, in whoſe Praiſe they were firſt made.

AD QUOD DAMNUM, is a Writ which ought to be ſued before the King grant certain Liberties, as a Fair, Market, *&c.* to the Prejudice of others.

There is alſo another Writ of *Ad quod Damnum*, if any one will turn a Common High-way, and lay out another as beneficial.

ADRAMIRE: See *Arraign*.

AD TERMINUM *qui præteriit*, is a Writ of Entry that lies where a Man having leaſed Lands or Tenements for Life or Years, and after the Term expired, is held from them by the Tenant, or other Stranger that occupieth the ſame, and deforceth the Leſſor: In ſuch Caſe this Writ lieth for the Leſſor and his Heirs.

ADVANCE DITCH, in Fortification, is a Ditch dugg all along the *Glacis* beyond the *Counterſcarp*, and uſually filled with Water.

ADVANCE GUARD, is the firſt Line or Diviſion of an Army, ranged or marching in Battle-aray; or that Part which is next to the Enemy, or which marches firſt towards them. The whole Body of an Army conſiſts of the *Advance Guard*, the *Arriere Guard*, and the *Main Body*.

Sometime alſo a Party of 15 or 20 Horſe commanded by a Lieutenant beyond, but within ſight of the *Main Guard*, is called an *Advance Guard*, and is deſigned for the greater Security of the Camp.

ADVENT, in the Sacred Calender, is the Time from the *Sunday* that falls either upon St. *Andrew*'s Day, or next to it, till *Chriſtmas*; which Time was wont anciently to be ſpent in a pious Preparation for the Advent, or coming on of the Feaſt of our Saviour's Nativity.

ADVENTITIA BONA, were anciently ſuch as came to a Man unexpectedly *Windfalls*, as we call them now: Hence the Word *Adventitious* comes to be uſed by Philoſophick Writers, and to ſignify ſuch Matter as doth not properly belong to any mix'd Body, but comes to it from ſome other Place. Thus, 'tis a Queſtion, whether in the Freezing of Water, there do not enter in ſome *Frigorifick Particles*, which are *Adventitious* to the Water, from the Air, or Freezing Mixture.

AD VENTREM INSPICIENDUM, is a Writ mentioned in the Statute of Eſſoignes: See *Ventre Inſpiciendo*.

ADVERB, in Grammar, is a Part of Speech undeclined, and without Conjugation; and is uſually joyned with a Verb to expreſs the manner of Action. They are diſtinguiſhed into Adverbs of *Time*, *Place*, &c.

ADULTERATION of any Thing, ſuch as Wine, Medicinal Druggs, Chymical Preparations, *&c.* is a mixing ſome baſer Matter with it, which hinders it from being truly Good and Genuine in its kind.

ADVOCATES, in the Eccleſiaſtical Court, were either *Advocate* of the Cauſes and Intereſt of the Church, retain'd as a Counſeller and Pleader, to maintain the Properties and Rights: Or, *Advocate* or Patron of the Preſentation and Advowſon. Both theſe Offices did formerly belong to the ſame Founder of a Church or Covent, and his Heirs, who were bound to protect and defend the Church, as well as to nominate or preſent to it. But when the Patrons grew negligent, or were Men of no Intereſt or Ability in the Courts of Juſtice, then the Religious began to retain a *Law Advocate*, to ſollicite and proſecute their Controverſial Cauſes. See *Spelman*.

ADVOWSON, in our Common Law, ſignifies a Right to preſent a Benefice, and is as much as *Jus Patronatus* in the Canon Law; the Reaſon why 'tis termed Advowſon (*Advocatio*) is, becauſe anciently thoſe who had a Right to preſent to a Church, were Maintainers of it, or great Benefactors to it: Theſe were ſometimes called *Patroni*, and ſometimes *Advocati*. Now in the General, an Advowſon is where a Biſhop, Dean or Chapter, and their Succeſſors, or any Lay Patron, have a Right to preſent whom they pleaſe, to any Spiritual Benefice, when it becomes void. *Advowſon* is of two ſorts; Firſt, *Advowſon in Groſs*, that is, ſole or principal, not belonging to any Mannor, as a Parcel of its Right: Secondly, *Advowſon Appendant*, which depends upon a Mannor, as appurtenant to it; and this may be ſold by it ſelf, and then it is in *Groſs*: And while it is dependant to the Mannor, 'tis by *Kitchen* called an *Incident*.

ADUST, burnt or parched; the Blood is ſaid to be *Aduſt*, when by reaſon of extraordinary Heat, the thinner Parts are ſteem'd forth, and the thicker remain dreggy and black, as if they were burnt.

ÆGYLOPS, *Angilops* and *Anchylops*, is a Tumour or Swelling in the great Corner of the Eye by the Root of the Noſe, either with or without an Inflammation.

ÆGYTIACUM, ſc. *Unguentum*, in Pharmacy, is a kind of Deterſive Ointment, deſcribed by *Meſue*; and is ſo called from its black Colour, like the Hue of an *Egyptian*.

ÆNIGMA: See *Enigma*.

ÆOLIPILE, is a round hollow empty Ball made of Iron, Braſs, Copper, *&c.* and furniſhed with a Neck, in which there is a very ſlender Pipe opening to the Ball. Sometimes the Neck is made to ſcrew into the Ball, which is the beſt way, becauſe then the Cavity may the more readily be filled with Water. But if there be no Screw, you muſt fill it with Water, thus; Heat the Ball red hot, and then throw it into a Veſſel of Water; the Water will run in at the ſmall Hole, and fill about $\frac{2}{3}$ of the Cavity. And if after this the *Æolipile* be laid on or before the Fire, ſo that the Water and Veſſel become very much heated, the Vaporous Air will be forced out with very great Noiſe and Violence; but it will be by fits, and not with a conſtant and uniform Blaſt. Perhaps they may be ſometimes of uſe to blow the Fire, where a very quick and ſtrong Blaſt is required. And they may ſerve to ſcent or perfume a Room, by filling them with perfum'd inſtead of common Water.

ÆQUATOR: See *Equator*.

ÆQUILATERAL: See *Equilateral*.

ÆQUILIBRIUM, is when either equal Weights at equal Diſtances, or unequal ones at reciprocally proportionable Diſtances from the Centre, make the Arms of any Libra or Balance to hang even; ſo that they do Equiponderate and not out-weigh one another: In ſuch a Caſe we ſay the Balance is *in Æquilibrio*.

ÆQUIVOCAL: See *Equivocal*.

ÆRA: *Lucilus* and ſome others ſay, that *Æra* did originally ſignify a Number ſtamp'd on Money to determine its current Value; and in this Senſe it comes from *Æs* Braſs, from the Plural of which *Æra*, came this femine ſingular *Æra*; and that either becauſe they put the Word *Æra* to each particular of an Account, as we now do *Item*: Or elſe becauſe the Number of Years was anciently among the *Romans* mark'd down in Tables with little Braſs Nails. In reference to which latter Cuſtom, the Word *Æra* came to ſignify the ſame with *Epocha*, *viz.* a certain Time or Date from whence to begin the new Year; or ſome particular way of reckoning Time and Years. And in this Signification the Word is thought to riſe from theſe Initial Letters, *A. E. R. A.* which, among the *Spaniards*, who began their *Æra* from the Reign of *Auguſtus*, ſtood for *Annus erat Regni Auguſti*. The moſt eminent *Æra's* among Chronologers, are the *Æra* of the World's Creation, which, according to the *Julian* Account of Time, began in the Month of *October*, and on the 24th Day. Some place this 3950 Years before Chriſt's Birth, whom *Gaſſandus* ſaith, come neareſt to Truth, and that this *Æra* is confirmed by the *French Aſtronomers*; others account 3983 Years before the Birth, of our Saviour, and with theſe *Petavius* joins. *Kepler* make them 3993; and there are ſome who will have it, that the true Number is 5199.

The *Jewiſh Æra* or *Period*, invented by *Hillel* about the Year of Chriſt 344. This is by no means *Hiſtorical*, but Artificial and Aſtronomical, and is ſuted to the *Jews* falſe Account of the New Moons, Feaſts, Holydays, *&c.* and is of far later ſtanding than the beginning of the World, tho' they uſe it as the Date of the Creation; it begins in *Autumn*.

The *Æra* from the *Deſtruction of Troy*, begins *June* 16. as *Scaliger* proves out of *Ephorus*: 'tis very common in Profane Authors.

The *Æra* of *Nabonaſſar*, begins the 26th of *February* (747 Years before Chriſt) but it varieth in 1461 Years thro' the whole 365 Days; for ſo many he accounts, neglecting the odd Hours, which makes a great *Intercalation*.

The *Æra* of the *Olympiads* begins from the New Moon in the *Summer Solſtice* 777 Years before Chriſt, and the *Æra* of *Iphitus* is only a Collection of the Olympick Years: Theſe two are the *Æra's* chiefly uſed by Greek Hiſtorians.

The *Roman Æra*, from the building of the City, begins *April* 21. and is 752 Years before Chriſt.

The *Chriſtian Æra* from the birth of Chriſt begins *December* 25.

The *Turkiſh Æra* or the *Hegira*, begins the 16th Day of *July*; they account it from *Mahomet's* Flight, *A. D.* 622.

The *Æra* of the Death of *Alexander the Great* is the 12th of *November*, 324 Years before Chriſt: See *Epocha*.

ÆSUSTUM, or calcin'd Copper is made by Stratifying Plates of Copper with Powder of Sulphur

phur in a Crucible, whose Cover or Lid hath a Hole in it to give the Vapours vent, while the Matter is calcining in a strong Fire, till no more Fumes will arise; the Plates must lie separated while hot. In this Stratification the first and last Beds or Layers must be of Sulphur.

ÆSCHYNOMENOUS PLANTS, the same as *Sensitive*, which see.

ÆSTIVAL SOLSTICE, or *Summer Solstice*: See *Solstice*.

ÆTATE PROBANDA, is a Writ of Office, and it lies for the Heir of the Tenant that held of the King in chief, to prove that he is of full Age, directed to the Sheriff to enquire of his Age; and then he shall become Tenant to the King by the same Services that his Ancestors made to the King.

ÆTHER: Dr. *Hook Microgr.* p. 13. calls the Æther that Medium or Fluid Body in which all other Bodies do as it were swim and move. But this seems to me to favour the *Cartesian Doctrine* of an Absolute *Plenum*, which, by many infallible Reasons and Experiments, is proved to be impossible. As therefore we call the *Medium* in which we breath and live, the Air, by which we understand an Elastical Fluid Body, either having its very large Interstices devoid of all Matter, or else filled in part with a Fluid, which is very easily moved out of them by Compression, and which readily returns into them again, when that Compression is taken off: So we agree to call that finer Fluid-Body, if it be a Body, which is extended round our Air and Atmosphere, above it and beyond it, up to the Planets, or to an indefinite Distance; this, I say, we call the *Æther*, tho' what we mean by that Word, we scarce well understand. For that there can be no Fluid whose Parts do resist the Motions of Bodies thro' them (as our Air doth) in the Planetary Regions, we are certain almost to a Demonstration; because the Motion of the Heavenly Bodies is by no means impeded or altered by any such Resistance, but they move as freely as if they were in an absolute Void. But that which is often meant by the Word *Æther* or Æthereal Matter, is a very fine thin Diaphonous Fluid, which some will have to surround the Earth up to as far as the Interstellary World, and which easily penetrates and runs thro' all things, and lets all things run as easily thro' it.

ÆTHIOPS MINERAL, is a Medicine usually made by incorporating well together equal Parts of running Mercury and Flower of Sulphur, and then deflagrating the Mixture.

But 'tis much the best way only to mix them well together in a Glass Mortar, and never to enkindle the Matter at all; the Mercury will perfectly disappear, and the Powder in a little time will turn black.

ÆTIOLOGY, signifies an Account of the Causes and Reasons of Diseases, and of their various Symptoms, in order to their Cure: Wherefore it is by some called *Parthology*.

AFFEERORS, a Term in Law, signifies such as are appointed in Court-leets, *&c.* upon Oath to mulct those who have committed any Fault which is arbitrably punishable, and for which no express Penalty is prescribed by Statute.

To *Affere* an *Amercement*, is properly to lessen and mitigate the Rigour of it.

AFFIANCE (in Law) is the plighting of Troth between a Man and a Woman, upon an Agreement of Marriage to be had between them.

AFFIDAVIT, in Law, signifies an Oath: As to make *Affidavit*, is to testify a thing upon Oath.

AFFORCIAMENT, a Fortress or strong Hold, or other Fortification.

AFFOREST, (a Term in the *Forest Law*) signifies to lay waste a Piece of Ground, and turn it into *Forest*.

AFFRAY, or *Affraiment*, in the Common-Law, is an Affrightment put upon one or more Persons; and this may be wrought, they say, without a Word spoken or Blow given: As if a Man should shew himself in Armour, or furnished with Weapons not usually worn, it may strike a Fear into others that are unarmed; which therefore is a common Wrong, and is inquirable in a *Court-leet*, wherein it differs from an *Assault*, which is always a *Particular Injury*.

AFFRETAMENTUM, the Freight of a Ship from the *French Fret*, which signifies the Tuns.

AFTER-SAILS, in a Ship: See *Sails*.

AGE PRIER (a Term in Common-Law) is when an Action is brought in against an Infant for Land which he hath by descent, for then he is to shew the Matter to the Court, and shall pray that the Action may be stay'd till his full Age of 21 Years, and so by Award of the Court, the Suit shall surcease.

AGENT and PATIENT (in Common-Law) is, when a Man is the Doer of a thing, and the Party to whom it is done; as where a Woman endows her self of the fairest Possession of her Husband.

AGGREGATE, is much the same as the *Sum*, arising from the Addition, Connexion or Collection of several things together.

AGGRESSES, or *Ogresses*, the same with *Pellets*. A Term in Heraldry: See *Balls*.

AGGRESSOR, is he that makes the first Assault, Attack, or that first begins any Quarrel, Encounter or Difference.

AGILD, in Law, signifies free from Penalty, not subject to the customary Fine or Imposition.

AGIST (a Term in Law) signifies to take in, and feed the Cattle of Strangers in the King's Forest, and to gather Money due for the same to the King's use. The Officers doing it are called,

AGISTERS; and their Office is called,

AGISTMENT.

AGITATION, in general, signifies Motion or Action; but 'tis mostly used in a Philosophical Sense for the brisk Intestine Motion of the small Corpuscles of any Natural Body. Thus Fire or Heat agitates the small Particles of all Bodies, and puts them into a rapid Motion.

AGNATION, in the Civil Law, is the Term for that Line of Consanguinity which is between Males descended from the same Father; as *Cognation* is the Line of Parentage between Males and Females, both descended from the same Father. The Use of both these Words is derived from the old *Roman* Law.

AGRICULTURE, is the Art of Tilling, Manuring, and Cultivating the Earth, in order to render it fertile, and to make it bear Plants, Trees and Fruits.

AGRYPNIA, is a kind of *Coma Vigil*, a Watching or Dreaming Slumber, proceeding from some Disorder in the Brain.

AGRYPNOCOMA, the same with *Coma Vigil*.

AIDE DE CAMP, in an Army, is an Officer always following one of the Generals, i. e. the General, Lieutenant General, or Major General, to receive and carry their Orders as Occaſion requires. When the King is in the Field, he uſually appoints young Gentlemen of Note to carry his Orders, and they are called, the *King's Aides de Camp*.

AIDE MAJOR, or *Adjutant*, is an Officer whoſe Buſineſs it is to eaſe the Major of part of his Duty, and to perform it all in his Abſence. Some Majors have ſeveral *Aides Majors*; each Troop of Guards hath but one Major, who hath two *Aides Majors* under him, according to the greatneſs of the Buſineſs: Every Regiment of Foot hath as many *Aides Majors* as it contains Battallions. When the Battallion is drawn up, the *Aide Major*'s Poſt is on the Left beyond all the Captains, and behind the Lieutenant Colonel.

AILE, is a Writ which lies where Land deſcends from the Grandfather to the Son or Daughter of his Son, the Father being dead before the entry by him, and one abates, the Heir ſhall have this Writ againſt the Abator.

AMIABLE NUMBERS; Mr. *Ozanam* calls ſuch as are mutually equal to the whole Sum of one another's Aliquot Parts: As are theſe two Numbers 284 and 220. For 284 is equal to the Sum of all the Aliquot Parts of the ſecond Number 220, which are 1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110. and the latter Number 220 is equal to all the Aliquot Parts of 284, *viz.* 1, 2, 4, 71 142.

AIR. *The Atmoſpherical Air* in which we breath is a Diaphanous, Compreſſible and Dilatable Fluid Body, covering the Earth and Sea to a great Height above the higheſt Mountains; and differs from the Æther (among other things) in this, that it refracts the Rays of the Moon and other remoter Luminaries. This Air ſeems to conſiſt of three differing Kinds of *Corpuſcles*, or ſmall Bodies.

1. Such as are carried up into it in the Form of *Exhalations* or *Vapours* from the Earth, Sea, and all Animal, Vegetable and Mineral Bodies, by means of the Sun's, or the Subterraneal Heat.

2. There are yet a more ſubtle ſort of Particles in the Air, which we may reckon emitted into it from the Heavenly Bodies; and alſo the Magnetick Streams of this Globe of Earth and Water. But

3. There is alſo a Third kind of Particles, which perhaps do moſt properly merit the Name of *Aereal*, as being the proper and diſtinguiſhing Parts of *Air* taken in the ſtricteſt Senſe; and theſe are Corpuſcles which are conſtantly *Elaſtical* or *Springy*. For *Elaſticity* is an Eſſential Property of Air, and 'tis thought no other Fluid hath any thing of it, but only ſo far as it participates of Air, or hath Air contained in its Pores. So that our Air probably doth either conſiſt of, or abound with Parts of ſuch a Nature, that in caſe they be bent or compreſſed by the Weight of the incumbent part of the Atmoſphere, or of any other Body, they do endeavour to free themſelves from that preſſure, by bearing againſt the Bodies that kept them bent; and as ſoon as theſe Bodies are removed to give them way, they unbend themſelves, either quite, or ſo far forth as the Bodies that reſiſt them will permit, and thereby expand the whole parcel of Air, theſe Elaſtical Bodies compoſe.

Dr. *Hook*, in his *Micrograph.* p. 13. ſeems to think the Air to be nothing elſe but a kind of Tinc[illegible] [illegible] [illegible] [

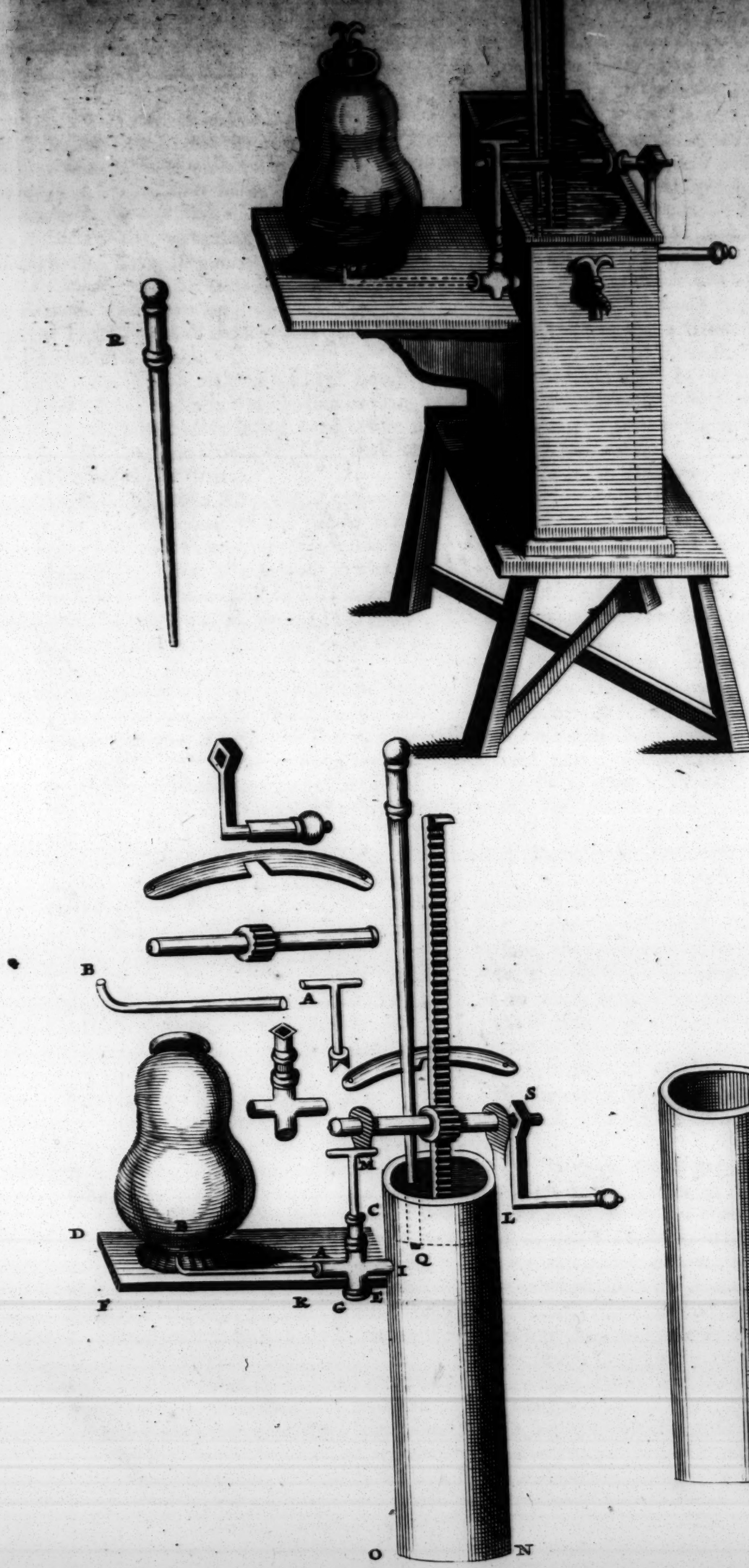

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Fig. 2.

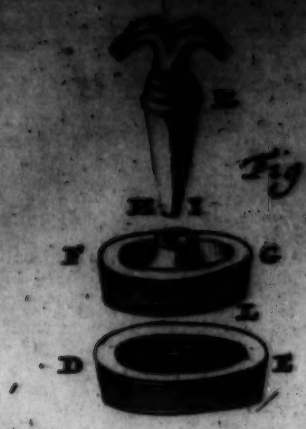
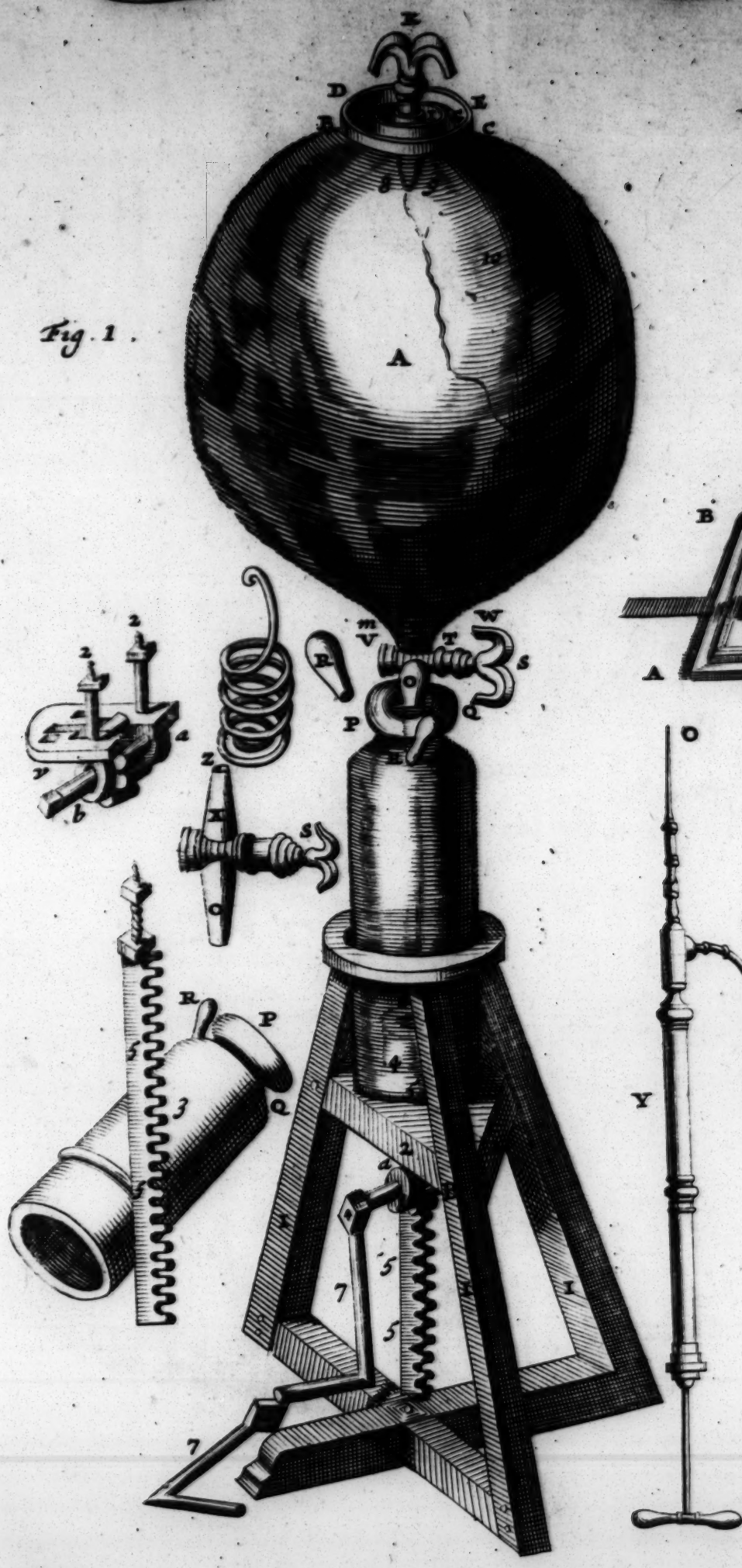
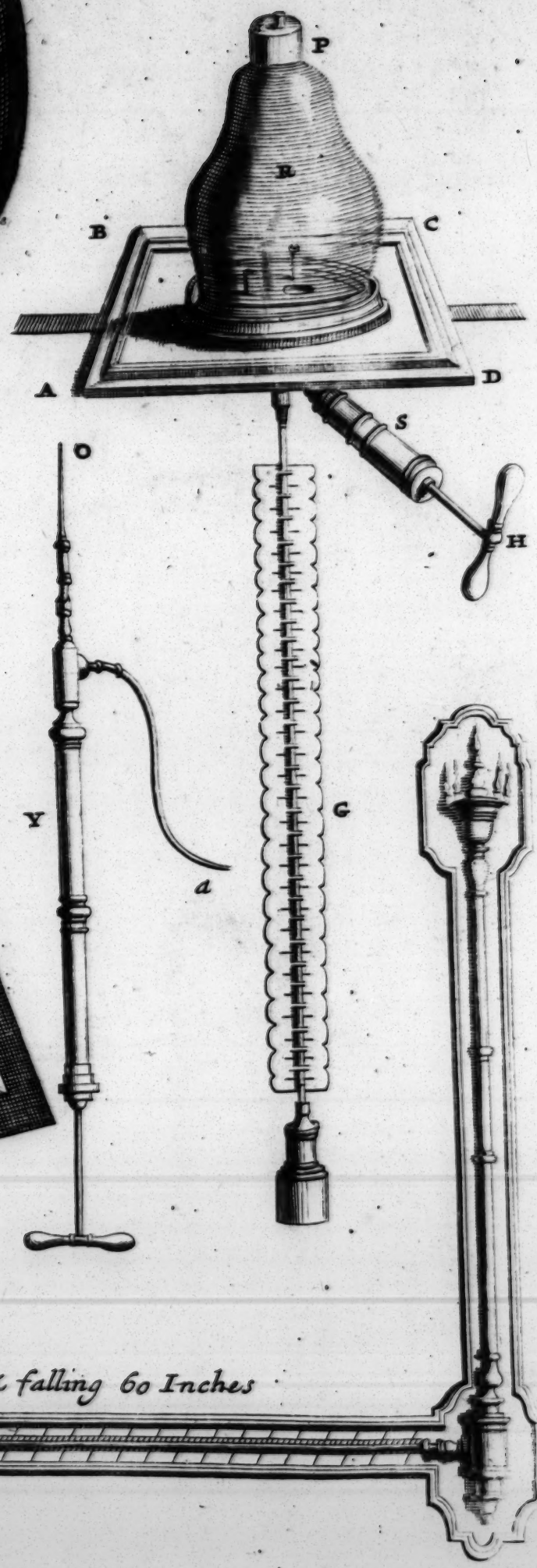


Fig. 1.





M.r Hawksbee's Barometer, rising & falling 60 Inches

an infinite Page which would not do in this Case; and therefore happily fell on thinking of the Counter-Balance of the Air's Weight, which *Torricellius* afterwards purſued and improved, with like Sagacity; inventing, as a farther Proof of the Notion of the Gravity of the Air, that which we call the *Torricellian Experiment*.

Mr. *Boyle* found a Lamb's Bladder containing about $\frac{3}{4}$ of a Pint, and blown up, and well dried to loſe about a Grain and $\frac{1}{4}$ when it was prick'd, and the Air let out.

Alſo, that a Lamb's Bladder being counterpoiſed in a nice Pair of Scales in the Reciever, on the Air's being drawn out, did manifeſtly preponderate; but when the External Air was let in again, the Scale's returned to their former Equilibrium.

An Æolopile well heated, and then having its little Hole ſtop'd, was cooled, and weighed; after which the Hole being opened, the Air was heard plainly to ruſh in with a whiſtling Noiſe, and then the Æolopile being weigh'd again, it was manifeſtly heavier than it was before.

The *Magdburgick* Engine being weighed when full of Air, and afterwards being again weighed when 'twas well exhauſted, was found to weigh an entire Ounce and $\frac{1}{10}$ leſs than it did before.

And Mr. *Boyle* found by accurate Experiments, that a ſmall Receiver weigh'd 35 Grains more when full of Air, than after it was exhauſted. He found alſo that

A Glaſs Bubble as big as a Hen's Egg, having as much Air as could be driven out by Heat, had then its Stem nimbly ſealed up, and then being left leiſurely to cool (for there is great Danger of its breaking) was put into a nice Balance, and then the Scales were equipoized: After, the ſealed End being warily broken off, the Air was heard to ruſh in with a whiſtling Noiſe, and then the Scale in which the Bubble was, did manifeſtly preponderate by near $\frac{1}{4}$ of a Grain. And after this, filling it with Water, it was found to hold 906 Grains of that Liquor; ſo that allowing for $\frac{1}{4}$ of the Cavity of the Bubble's being filled with Air, which perhaps might weigh about a Grain, the Proportion of Water to Air appears in Weight to be about 905 to one, and roundly it may be ſuppoſed as 1000 to one, becauſe 'tis not poſſible but that ſome Air muſt remain in the Bubble more than is now accounted for.

Mr. *Boyle* found by repeated Experiments, that the weight of Air to Water is as 1000 to 1.

Mr. *Halley*, *in Philoſ. Tranſ.* N°. 181. ſays, That the Specifick Gravity of Air, near the Earth's Surface to that of Water, at ſeveral Trials, was as 1 to 840, as 1 to 852, and as 1 to 860; the *Mercury* ſtanding at all thoſe times about $29\frac{3}{4}$; but becauſe 'twas Summer Weather, and conſequently the *Air* rarefied when all theſe were try'd, it may, without ſenſible Error in round Numbers, be ſaid, that the *Barometer* ſtanding at 30 Inches, and in a mean Eſtate of Heat and Cold, the Specifick Gravity of the *Air* to Water, is as 1 to 800: Wherefore, ſince Mercury to Water is as $13\frac{1}{2}$ to 1, Mercury will be to Air as 10800 to 1, and a Cylinder of Air of 10800 Inches, or 900 Feet, is equal to an Inch of Mercury; wherefore if the Air were throughout of an equal Definity, the Height of the Atmoſphere would be no more than 5 Miles, and one Tenth of a Mile, and in the Aſcent of every 900 Feet from the Earth's Surface, the Mercury in the Barometer would fall an Inch. But ſince the Expanſion of Air increaſes, as the Weight of the incumbent Atmoſphere decreaſes, or as the Mercury ſinks in the Barometer; the upper Parts of the Air muſt be much more rarefied than the lower, and conſequently the Height of the Atmoſphere much greater than 5 Miles. *See Vol.* 2.

AIR PUMP, an Inſtrument to exhauſt the Air out of proper Veſſels. Mr. *Boyle* owns he had the firſt hint of it from *Schottus*, who had publiſhed to the World, (but Mr. *Boyle* had not ſeen the Book) that one *Otto Gerick*, *Conſul* of *Magdeburgh*, had found out a way of evacuating Glaſs Veſſels, by ſucking out the Air at the Mouth of the Veſſel, plunged under Water. But this Engine was defective in two reſpects: 1. That in order to evacuate the Veſſel, there was required the continual Labour of two ſtrong Men for two Hours. 2. The Receiver and Engine being all of one Piece, there was no way to get things in and out of it, in order to try any Experiment upon them. To remedy which, and to ſupply thoſe Imperfections which Mr. *Boyle* had heard the *Otto Gerick Engine* laboured under, he directed one Mr. *G.* and Dr. *Hook* to contrive a newer and better *Air Pump*; which Dr. *Hook* effected in the following Form, which I will deſcribe, becauſe it was the firſt of the kind made here.

This *Air Pump* conſiſts of two Parts; a Glaſs Veſſel; and a Pump to draw the Air out of it.

The Glaſs is expreſſed by the Fig. 1. *A*. having a Hole at the Top with a Cover fitted to it, and alſo a ſtop Cock faſtened to the Extremity of its Neck below; its Cavity being large enough to contain about 60 lb. of Water. The Diameter (*B C*) of the Hole at the Top of the Veſſel (*A*) is about four Inches, the Orifice whereof is encompaſſed with a Lip of about an Inch in Height, whoſe uſe is for the Cover to reſt on; which Cover is deſcribed in the Second Figure, where (*D E*) denotes a Brazen Ring, which is to cover, and to be cloſely cemented on the Lip (*B C*) of the firſt Figure. To the internal tapering Orifice of this Ring, is fitted a Braſs Stopple (*F G*) ſo exact, as to prevent any conſiderable acceſs of External Air: In the midſt of this Cover there is a Hole (*H I*) of about half an Inch Diameter, encompaſs'd with a Ring or Socket of Braſs, to which is likewiſe fitted a Stopple (*K*) of the ſame Metal, ſo exquiſitely adapted to it, that it may be turned round, without admitting in the leaſt Air, and yet may be put in or taken out at pleaſure: Through the lower End of it there is a little Hole (8) made for Paſſage of a String, (8, 9, 10) which is likewiſe to paſs through a ſmall Brazen Ring (*L*) fixed to the Bottom of the Stopple (*F G*); the uſe of which String is to move what is contained in the exhauſted Veſſel, without unſtopping it. That the Stop Cock (*S*) (in the firſt Figure) might be better faſtened to the Neck of the Receiver, and cemented on with Pitch, Roſin and Wood-aſhes well incorporated together, and poured hot into the Cavity of the Plate; and to prevent the Cement from running into the Orifice (*Z*) of the Shank (*X*) it was ſtopp'd with a Cork, having a String fixed to it, that it might be drawn out at the upper Orifice of the Receiver, and then the Glaſs Neck of the Receiver being well warmed, and thruſt into the Cement, it filled the Interſtices betwixt the Tin Plate and the Receiver, as alſo between the internal Superficies of the Receiver, and the Shank of the Cock.

The

The lower Part is the *Sucking Pump* or *Air Pump*, ſupported by a Frame of Wood, with three Legs, (III) ſo contrived, for the freer Motion of the Hand, that one ſide of it may ſtand perpendicular; acroſs the Midſt of the Frame is nailed a Board (222) to which the *Pump* is faſtened.

The *Pump* is made up of four Parts, *viz.* An exact and ſtrong Cylinder of Braſs of about fourteen Inches in length, with a Cavity of about three Inchers Diameter; to which is fixed a Sucker made up of two Parts; the one (44) ſomewhat leſs in Diameter than the Cavity of the Cylinder, on which a thick Piece of tann'd Leather is nailed, whereby it cloſes ſo exactly to the Cylinder, that the Air cannot inſinuate it ſelf between them: The other Part being a thick and narrow Plate of Iron (55) is firmly joined to the Middle of the former Part (44) it is ſomewhat longer than the Cylinder; one Edge of it being ſmooth, but the other indented (as in the Figure) with a Row of Teeth; to the Interſtices of which are fitted the Teeth of a ſmall Iron Nut *(L B)* which is faſtened by two Staples (22) to the under ſide of the croſs Board (222) on which the Cylinder reſts, and is turned to and fro by the *Manubrium* or Handle (7).

The laſt part of the Pump is the Valve *(R)* being a Hole at the Top of the Cylinder, a little taper towards the Cavity; to this Hole is fitted a Braſs Pegg, to be put in or taken out upon Occaſion.

Having thus deſcribed the Engine, it will be requiſite for the better Excluſion of the outward Air, and the more eaſy moving of the Sucker, Stop-cock and Key *S*, as alſo the Valve, that they ſhould be well oyled with Sallad Oyl; but ſometimes Oyl and Water together prove more effectual: Alſo, that the Ingreſs of Air betwixt the Braſs Cover and the Ring may be likewiſe prevented, the Edges of both muſt with the former Cement, be carefully plaiſtered, and ſpread on with a hot Iron, that it may run the better, and fill the little Cavities.

Things being thus fitted, and the lower Shank (*O*) of the Stop-cock being put into the upper Orifice of the Cylinder, then the Handle being turned till the Sucker riſes to the Top of it, and ſhutting the Valve with the Plug, and turning the other way, the Sucker is drawn down to the Bottom; by which means the Air is driven out of the Cylinder, and a Succeſſion from without being prevented, the Cavity of the Cylinder muſt be emptied of Air; then if the Turn-cock be turned, ſo as to afford a Paſſage betwixt the Receiver and Cylinder, part of the Air contained in the Receiver, will deſcend into the Cylinder, and by turning back the Key, that may be prevented from flying back into the Receiver, and may alſo, by opening the Valve, and winding up the Sucker, be forced into the open Air; and ſo by reiterated Exſuctions of the Air out of the Receiver, and Expulſions of it again out of the Cylinder, it may be exhauſted, as the Nature of the Experiment requires.

When this Engine is ſet on work, theſe *Phænomenas* are obſerv'd (1) That the Sucker being wound up, and upon ſtopping the Valve, and turning the Key, drawn down again; the Air in both Veſſels will be brought to an equal Meaſure of Dilation; and upon returning the Key, and opening the Valve, near a Cylinder full of Air will be expelled; but the Receiver by reiterated Exſuctions, being more and more exhauſted, leſs proportionably is forced out; ſo that at laſt, before you need to open the Valve, the Sucker may be forced up almoſt to the Top of the Cylinder; and if, when it is ſo exhauſted, you let go the Pump, the Valve being ſtopped, the Sucker meerly by the Protruſion of the External Air, overpowering that more rarified Air within, will be forced up to the Top of the Cylinder; whereby 'tis obſerved, That as the Sucker is preſs'd higher by the external Air, it ſhews the Receiver to be more or leſs exhauſted; the Air in the Cylinder being accordingly more or leſs able to reſiſt the external, as it varies in Quantity. 'Tis alſo obſerved, That whilſt the Receiver retains any conſiderable Quantity of Air, there is a briſk Noiſe immediately produced upon the turning of the Key.

2. Alſo, that when the Receiver is well exhauſted, the Braſs Key (that is a Stopple to the Braſs Cover) cannot be lifted up without ſome Difficulty, for it feels as if ſome great Weight were faſtened to the Bottom of it: The Cauſe of this *Phænomenon* ſeems to be, That the Air in the Receiver being very much dilated, its Spring muſt be proportionably weakened, and conſequently the lower end of the Stopple is accordingly preſs'd up, whereas the Spring of the external Air is not at all weakened; ſo that a Strength to lift up the Stopple, muſt ſupport a Preſſure equal to the Diſproportion betwixt the Force of the internal expanded Air, and that of the *Atmoſphere* incumbent upon the upper part of the Stopple: But if the Air be let into the Receiver by Degrees, the Weight that is ſuppoſed to keep the Stopple down, may be felt to decreaſe more and more, the internal Air by this Recruit apporoaching more to an *Æquilibrium* with the external, till at laſt the Receiver being fill'd with Air again, the Stopple may be eaſily lifted up.

Mr. *Boyle*, after ſome Years Experience, found it convenient to alter a little the Form of his firſt *Air Pump* into that which the annexed Figures repreſent: And the advantagious Differences between this and the former Engine, are as followeth.

(Vid. Plate I.)

1. The Cylinder is contrived to be placed within a Frame of Wood which is filled with Water, ſo that the Cylinder is always kept quite covered with it; by which means the Sucker is always kept Turgid and Plump, and the Water alſo fills up all the little Intervals or Spaces between the Sucker and the Barrel, and by that means the Air is much more exactly excluded than in the former Engine. But here great Care muſt be taken in turning the Stop-cock, or elſe the Water will get into the Receiver, and ſpoil the Experiment.

2. Becauſe in this Engine the Sucker is to be always under Water. There is a Perforation *P Q* *(See Plate* II.*)* which paſſes perpendicularly thro' it, and together with the Stick *R S*, ſerves for a Valve, and is to be ſtop'd at the Bottom of the Cylinder *N O*, when it is full of Water; wherefore the Stick *R S* muſt be of a conſiderable Length, as of 2 or 3 Foot.

3. The chief thing in this reformed Engine is, that the Pipe *A B (Plate* II.*)* whoſe End *B* turns upwards, is made to lie in a Groove or Gutter hollowed purpoſely for it in the Board *C D E F*, on which the Receivers are to reſt. This Board was covered

covered with good Cement, and then on it was applied a ſtrong Plate of Iron of the bigneſs of the Board, having only a Hole in the Middle for the Mouth of the Pipe *B* to paſs through; and this Plate he added, becauſe he found that the Weight of the Atmoſphere would ſometimes force the Air to penetrate thro' a thick Board, tho' its Pores were alſo deſignedly filled with Oyl. The Edges of this Plate ſhould be a little turned upward, to hold a little Water, which now and then will be apt to get into the Receiver.

The Stop-cock, *GHIK*, tho' it may be ſodered into the Cylinder at *I*, yet had better go on with a Screw; for then it may be more eaſily mended if it ſhould not prove right or ſtanch, and alſo will not be ſo apt to break off. 'Tis convenient alſo to have a little Cover of Tin, *&c.* to put over the Noſe of the Pipe *B*, to hinder things from falling into it, or injuring it, and to keep the Cement out of it, when very ſmall Receivers are uſed.

There is this conſiderable Advantage in this flat Board on which the Receiver is placed; that the Receiver needs no Stop-cock of its own, but is uſually one entire piece of Glaſs in the form of a Bell, or Cucurbit, *&c.* which will much better keep out the Air than if it were perforated, tho' the Stop-cock ſhould be never ſo good.

Care muſt be taken to get a good Cement to faſten the Receivers to the Plate: That which the Honourable Mr. *Boyle* uſed was a well wrought mixture of equal parts of Bees-wax and Turpentine; tho' in the Winter he found it beſt to uſe a little more of the Turpentine, and in the Summer a greater portion of Bees-wax.

The Deſcription of Mr. *Papin*'s Engine for exhauſting the Air from Mr. *Boyle*'s continuation of the *Phyſico Mechantical Experiments*, Part 2. *Iconiſmus primus*, Figure 1, 2.

AA, are two Pumps made of Braſs.

BB, are two Pluggs hollow within and open below.

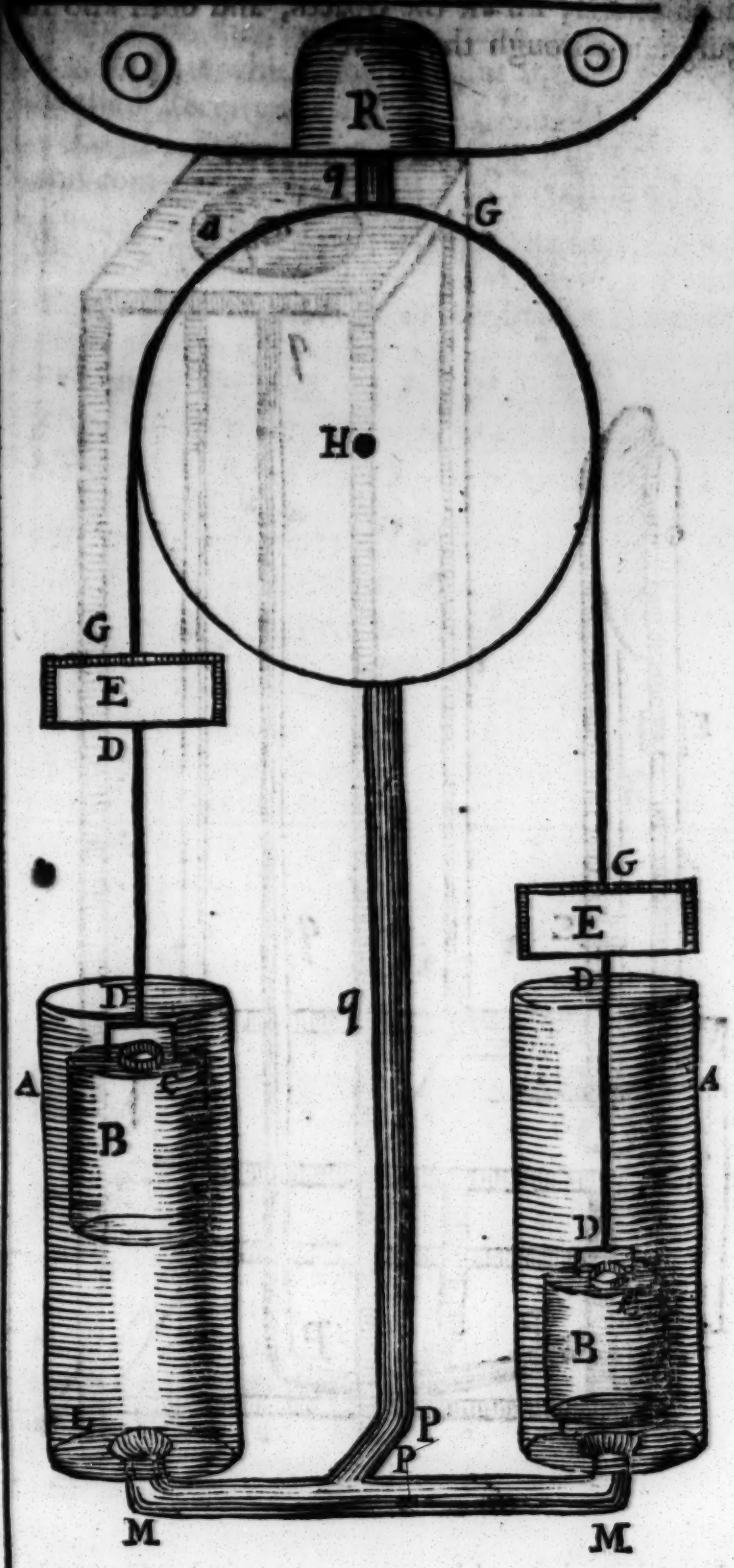
CC, are two Holes in the upper part of the Pluggs, with Valves opening inwardly, that they may afford paſſage to the Air to go out, and hinder it from coming in.

DDDD, are Iron Rods ſerving to move the Pluggs, and annexed to them, by means of the Gnomons *FF*.

EE, are two flat Iron Stirrups at the top of the Rods *DD*, on which the Operator muſt ſtand to ſet a-work the Engine.

GGG, is a Cord joyned to the two Stirrups, and compaſſing the Pulley *H*.

LL, are two Valves at the Bottom of the Pumps, opening inwardly, for the admiſſion of the Air out of the Tube *MM*.

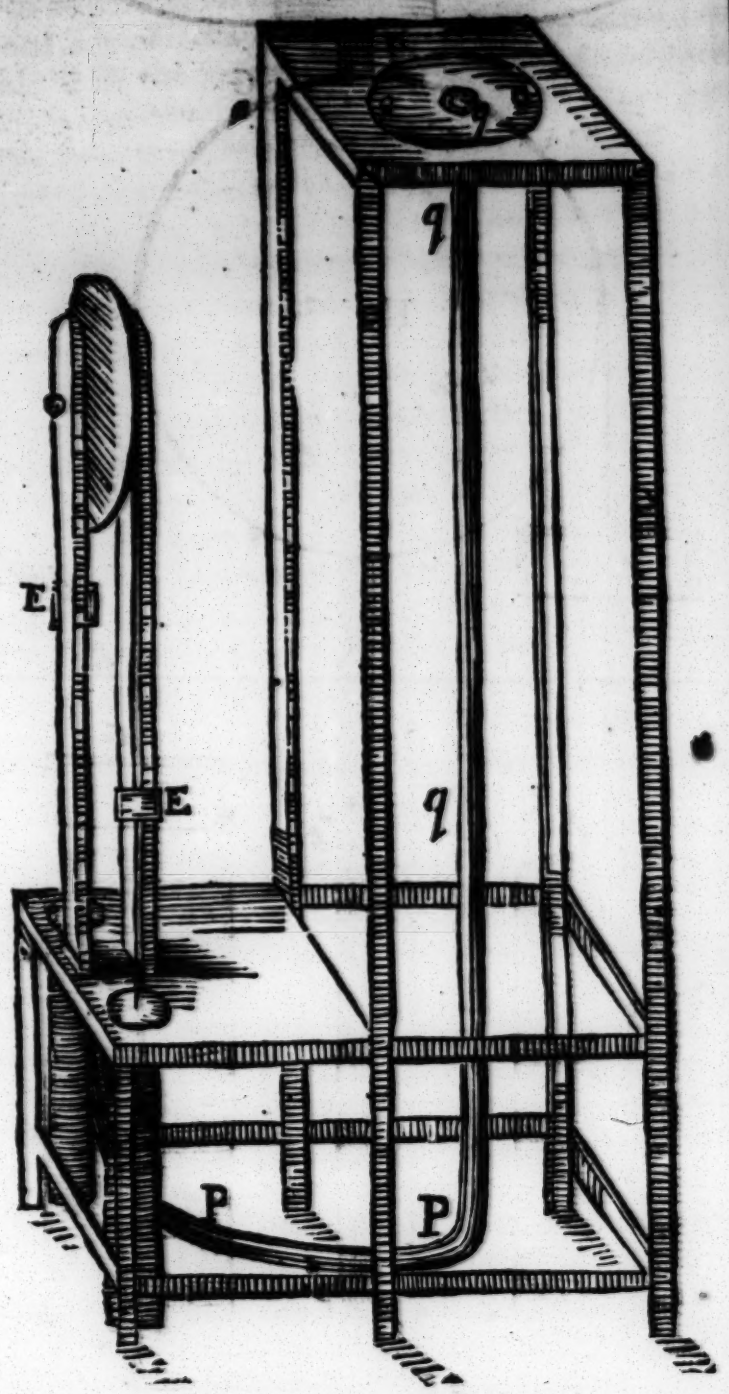


MM, is a Tube reaching from both Pumps to the *Plate OO*, by means of the Curvature *PP QQ*; which Curvature ought to be ſo long, that the Tube *PQQ* may not hinder the Exerciſer of the Pumps, but that he may conveniently ſtand on the Stirrups *EE*.

OO, is a Plate bored in the middle, on which the Receivers to be evacuated, are to be put; as *R* for Example.

This Engine is to be put into a Frame of Wood to ſupport it before it can be uſed, ſuch as is ſhewed in the ſecond Scheme. And as much Water is to be pour'd into the Pumps thro' the Hole *Q* in the *Plate OO*, as is ſufficient to fill the Cavities of the Pluggs, and a little more; and then ſome Body muſt ſtand on the two Iron Stirrups *EE*, and muſt alternately depreſs and elevate them: For by this means the Pluggs following the Motion of the Stirrups, in their aſcent will leave the Space in the Bottom of the Pump empty; and ſeeing all other Paſſage is intercluded from the Air, that Air alone which is contained in the Receiver *R*, is conveyed into the aforeſaid Pumps by the Tube *QQPPM*, and opens the Valve *L*, which being ſhut again, hinders the ſame Air from making a Regreſs; wherefore the Plugg afterwards deſcending, compreſſeth that Air, whence, of neceſſity, the Valve *C* muſt be open'd, and all the Air muſt paſs out of it,

becauſe the Water in the Bottom of the Pumps doth exactly fill all the Spaces, and doth alſo regurgitate through the Valve C.



Here 'tis obſervable, That this *double Engine* is upon many Occaſions to be preferr'd before a *ſingle one* (that's mov'd with the Foot) for it doth not only produce a double Effect, but performs it much more eaſily; for in theſe Engines, which are furniſhed but with one Tube, whilſt the Plugg is drawn out to evacuate the Pump, the whole Pillar of the Air, incumbent on the Plugg, is to be elevated by Force; and again, when the Plugg returns back, it is alſo by Force to be reſtrained, leſt it ſhould be too ſwiftly impell'd by the Air, and ſo break the Bottom of the Engine; but in theſe *double Engines*, the Plyer of them is in a manner wholly free from that Toil. For the Pluggs are eaſily lifted up, in the firſt Suction; becauſe the Air, immediately derived from the Receiver *R* into the Pumps, preſſes the Pluggs downwards, almoſt as ſtrongly as the external Air incumbent on the oppoſite Parts; and when the Quantity of the internal Air is diminiſh'd, it comes to paſs, that the Plugg to be depreſs'd, tends downward with ſo much the greater Force, and ſo by means of the Cord *GGG* compaſſing the Pulley, draws the other Plugg upwards, and at the ſame time hinders it from too much Velocity of Deſcent; ſo that by this means both Pluggs at one and the ſame time will be helpful to him that exerciſeth the Pumps.

This Engine is of great uſe in order to thoſe Experiments which cannot be very well made but with Velocity and Speed, ſeeing the Pluggs make but a ſmall Reſiſtance, a Man may eaſily judge, that the two Pumps of this Engine may be plyed with greater Eaſe and more Speed, than one Pump in a ſingle Engine can.

The Ingenious Mr. *Hawkesbee* now makes *Air-Pumps* of a much ſimpler and eaſier Form than theſe Engines, above deſcribed, and in which are many Conveniences which they had not: The Form of which is as follows.

1. There is a ſquare Board, as *ABCD*, which, by the Help of two Screws, is faſtened readily in any Window, or on any Table; in the middle of this Board is a Hollow, which contains a Braſs Plate, on which the Recipient *R* is placed, and faſtened to it without any Cement, by means of a thin Piece of wet Leather: In this Braſs Plate are two Holes, into one of which is an Elbow fitted, which hath the End of the *Air Pump* ſcrew'd on it, and on that Screw is a Valve made by a piece of Bladder, and anſwers alternately to another in the Sucker, opening when that ſhuts, and cloſing when that opens reciprocally: The other Hole hath faſtened into it a ſmall Braſs Pipe, on which is ſcrewed the upper Part of the Mercurial Gage, whoſe uſe is by the riſing of the Mercury from the Ciſtern below in the *Torricellian* Tube, to ſhew to what Degree the Recipient is exhauſted. This Gage is repreſented by the Letter *G*. *S* expreſſes the Body of the *Syphon* or *Air Pump*, which is work'd Horizontally by means of the Handle of the *Piſton b*: By which means the Recipient is very eaſily exhauſted, the Valves much better ſupplying the Uſe of the Stock-cock in other Engines of this Nature.

And when the Experiment is over, and you would let the external Air return again into the Receiver, in order to take it off the Engine, you need only unſcrew a little the Elbow above-mentioned, by turning the *Air Pump* about from the Left Hand towards the Right, as far as Liberty allows, and then the Air will eaſily inſinuate it ſelf between the Joints of the Screw: Or you may let the Air in alſo, by unſcrewing the Cap at *P*.

R. 2. is another Receiver, through whoſe Cap *P* (which contains a Box, in which are ſeveral Collars of Cork and Leather) paſſes a Braſs Wire as *W*, moveable up and down in the Cap, without letting in any Air into the Receiver, and on whoſe Hook *K*, may any thing be ſuſpended or faſtened in an Experiment.

F is a ſmall Air Pump applicable to a Cupping-Glaſs, by which 'tis eaſily affixed to any part of the Body, without Fire.

Y is a Syphon or Syringe for Injection in Anatomical Experiments; having ſeveral ſmall Pipes, as *C*, of differing Bores, to ſcrew on upon it; and receiving a conſtant Supply of the Liquor by means of the crooked Pipe *a*.

In the *Memoires de Mathematique & de Phyſique* for *December* 1693, you have this general Theorem (from Mr. *Varignon*) about the Proportion of the remaining Air in the (partly) exhauſted Receiver, to that which was in the Receiver before you began to pump, viz.

The Quantity of the Natural Air contained in the Receiver before you begin to pump any out, is always to the Quantity of what remains, after any Number of Pumps: As the Capacity of the Receiver, and the Cavity of the Pump together (which Cavity is made by the drawing up of the Sucker) *raiſed to a Power which ſhall have the Number of the Stroaks*

of

of the Pump for its Index; is to a like Power of the Capacity of the Receiver alone.

Demonstration.

Let a be the Natural Air, v that which remains after any number of Stroaks of the Pump, r the Capacity of the Receiver, s the Capacity of the Receiver, and the Cavity of the Pump together, n the number of the Stroaks of the Pump (here supposed all equal in force and effect to one another). Then says Mr. *Varignon*.

| $a.$ *is to* v :: *as* $s^n . r^n$. | which is the Theorem above delivered, *in species*. To shew the Truth of which, 'tis enough (saith he) to consider, That each time the *Piston* or Sucker of the Pump is drawn back, the Air in the Receiver must expand it self so as in some measure to fill up the Cavity of the Pump left vacant by the *Piston*, as well as the Receiver it self. (*N.B.* He seems to build on the *Cartesian* Notion of a *Plenum*, but it matters not, the Calculation is just) wherefore, as now, so after each Stroak of the Pump, the remaining Air in the Receiver and Pump, will be to what was in the Receiver just before, as the Capacity of the Receiver alone, is to that of the Receiver and Pump taken together; that is, as r to s.

Let us make then a, b, c, d, e, f, &c. and at last t and v to denote the different Quantities of Air found successively in the Receiver after each Stroak of the Pump: That is, let a be the Air in its Natural State when you begin first to Pump; b the Quantity of Air there after the first Stroak; c the Quantity of Air after the second Stroak, and so on till you come to the last Stroak, where v represents the Quantity of Air remaining in the Receiver and Cavity of the Pump after any Number of Stroaks; and that Number will be n.

Then will it ever be

$a. b :: s. r.$
$b. c :: s. r.$
$c. d :: s. r.$
$d. e :: s. r.$
$e. f :: s. r.$

and in one Word,

$t. v :: s. r.$

wherefore $a. v :: s^n . r^n$. *Q. E. D.*

From whence, by way of Corollary, he gives us this Rule.

Let $b. k. l. m.$ represent the Logarithms of the Quantities before-mentioned, a, v, s and r; then will $b. k :: ln. mn.$ that is, those four Terms will be Arithmetically Proportional: Wherefore $b + mn = k + ln$: or $b - k = ln - mn$. Which is the *Rule* to be used, as follows in the *Problems*.

Problem 1. *The Capacity of the Receiver, and of the Cavity of the Pump being given, or the Ratio between them; together with the Number of the Stroaks of the Pump in the Evacuation of the Receiver; To find the Ratio between the Natural Air, and that now in the Receiver.*

The *Rule* is, keeping to the last mentioned Notation, $b - k = ln - mn$.

Where $ln - mn$ is the Logarithm of the Ratio sought; that is, in Words, The Logarithm of the Ratio of the Natural Air to that in the (nearly suppose) exhausted Receiver is always equal to the Product of the Number of the Stroaks of the Pump, multiply'd by the Logarithm of the Ratio between the Capacity of the Pump and Receiver together, and the Receiver alone.

So that these things being given, as in the Supposition of the *Problem*, the *Ratio* of the Natural Air, to that which now remains in the nearly exhausted Receiver, is found. *Q. E. I.*

Let this *Ratio* be as p to q; then will $a. v :: p. q.$ and consequently $aq = pv$; and dividing all by q, the Natural Air will be thus expresst, $\frac{pv}{q} = a$, if you have the remaining Air in the Receiver; and that remaining Air will be expresst thus, $\frac{aq}{p}$ if you have the Natural Air. And supposing both Natural and Remaining Air to be each $= 1$, they will be thus expresst: The Natural Air $= \frac{p}{q}$ and the remaining rarify'd Air $= \frac{q}{p}$

As for *Example*, Suppose the Cavity of the Receiver to be 10 times as great as that of the Cavity of the Pump left by drawing up the *Piston*; and that the Number of the Stroaks of the Pump be 30: I demand what Proportion the Air in the (partly) exhausted Receiver bears to the common Air. The Answer is, That there is about the 18th part of the Air which was in the Receiver when you began to Pump.

For in this Case the Logarithm $l - m =$ to the Ratio between the Capacity of Receiver and Pump together, to Receiver alone, will be 4139275 which, multiply'd by $30 = n$, gives 12417810 for the Logarithm of $ln - mn$, the Ratio of the Natural Air to the remaining Air. Let the Natural Air in the Receiver, before the Pump was set on work, be $= 1$; then will -12417810 be the Logarithm of that small Quantity of Air which shall at last remain after the 30 Pumps, which will be the Logarithm of $\frac{1}{18}$ *fere*; that is, it may be expresst thus, $\frac{a}{18}$. And therefore, to find the Weight of all the Natural Air ($= a$) in the Receiver, we may say, that the re-entred Air at last let in is $= a - \frac{a}{18}$; and then taking a for its proper Weight, (as supposing the Weights of Bodies to be proportionable to their Bulks) let p be the Difference between the Weights of the Receiver when full and when exhausted; we shall find that $a - \frac{a}{18} - p$, which Æquation will produce $a - p + \frac{a}{17}$, for the Weight of all the Natural Air in the Receiver. In general, if g be put for the Number of which $ln - nm$ is the Logarithm, the remaining Air at last will always be precisely $= \frac{a}{g}$, its Weight $= \frac{p}{g - 1}$: And the Weight of the Natural Air $= \frac{gp}{g - 1}$.

Problem 2. *The Ratio between the Natural Remaining Air being given with the Number of Stroaks of the Pump, to find the Ratio of the Receiver, to the Cavity of the Pump.*

The Rule will be $b - k = ln - mn$, and consequently $\frac{b - k}{g} = l - m$; then will $\frac{b - k}{n}$ be the Logarithm of the Ratio of the Capacity of

the Receiver alone; which Ratio being alſo known, viz. as p to q, then will $s.r :: p.q$, and $s-r.r :: p-q.q$; that is, the Logarithm of the Ratio of the natural Air to the remaining Air, being divided by the Number of the Strokes of the Pump, will always give for the Quotient the Logarithm of a Ratio, whoſe Antecedent leſs the Conſequent, will be to the Conſequent, as the Pump is to the Receiver; and therefore this Quotient being known, the Ratio between the Pump and the Receiver will alſo be known. *Q.E.I.*

From hence, if the Capacity of the Receiver be known, the Capacity of the Pump will be found to be $\frac{rp-rq}{q}$; and if the Capacity of the Pump be known, viz. $s-r=e$, then that of the Receiver will be $\frac{eq}{p-q}$.

Problem 3. *The Ratio between the Pump and Receiver being given, together with that of the natural Air to the remaining Air; To find what Number of Strokes of the Pump, are neceſſary to bring the natural and remaining Air to the given Ratio: Or, in other Words, To rareſie the Air in a given Ratio, with an Engine whoſe Receiver and Pump are given in Capacity.*

The *Rule* being $b-k=ln-nm$, and conſequently $\frac{b-k}{l-m}=n$, it will be, as the Logarithm of the Ratio of Receiver and Pump together, to Receiver alone, is to the Logarithm of the Ratio between the natural and remaining Air: So is Unity to the Number of Stroakes of the Pump required: Or, in other Words, the Quotient of the Second of theſe Logarithms divided by the Firſt, is always equal to the Number of Stroakes ſought.

AIRY METEORS: See *Meteors.*

AISTETERIUM, the common Senſory, which *Cartes* would have placed in the *Glandula Pinealis*, but is now generally ſuppoſed to be about the beginning of the *Medulla Oblongata* in the *Corpus Striatum.*

AJUTAGE, is the Spout for a *Jets d'eau* in any Fountain: Mr. *Marriott* aſſerts, That an even poliſhed round Hole in the End of the Pipe, will give an higher *Jet* than either a Cylindrical or a Conick *Adjutage*; but of thoſe the latter is the beſt.

ALA, in *Botany*, ſignifies the Angle (which generally is acute, and never greater than a Right one on the *Foot Stalks* of Plants, and is always tending upwards) that either the Leaves or the Foot Stalks of Leaves make with the Stalk, or with any Branch of the Plant. Sometimes alſo 'tis taken for a little Branch, making an Angle after that manner with the Stalk.

ALABASTRA, in a Plant, are thoſe little green Leaves which compaſs in the Bottom of the Flower.

ALBA FIRMA, in Land, is an Annual Rent in Money, payable to the Chief or Lord of any Hundred; and *Spelman* ſaith, 'Tis called *Alba* becauſe it is not paid according to the Cuſtom of old Times in Corn (which was call'd *Blackmail*) but in Silver, or as they ſay now in ſome Parts of *England*, in *White Money.* There are Tenures of this Nature in *Weſtmorland*, 2 *Part Inſtitut. Fol.* 10.

ALBAPITUITA, the ſame with *Leuco-Phlegmatia.*

ALBUGINEA OCULI, is a very thin white Coat or Tunic of the Eye, adhering to the *Cornea*, extending it ſelf beyond the *Sclerotick*, even to the Circle of the *Iris*, but leaves a Hole forward for the opening of the Apple of the Eye. See *Tunica Adnata*: 'Tis by ſome Writers call'd *Tunica Conjunctiva.*

ALBUGINEA TESTIS, is the White Membrane immediately involving the *Teſtes* or *Teſticles.*

ALBUGO, the *Pin* and *Web*, is a white Speck in the Honey Tunicle of the Eye, which hinders the Sight, and uſually follows an Inflamation, Wound or Ulcer of that Part. Sometimes it's taken for the *Album Oculi*, or White of the Eye; being that part where the *Tunica Adnata* or *Albuginea* adheres to the *Sclerotica.*

ALBUM OCULI, ſometimes is taken for the ſame with *Albugo*: But by *Galen* and *Hippocrates* is uſed for that Tunick of the Eye which is uſually call'd, the *Tunica Adnata*; and by ſome Writers *Albuginea Oculi*: Which ſee under thoſe Words.

ALCHAICKS, are a ſort of Verſes conſiſting of two *Dactyls* and two *Trochees*, as ſome will have it; but *Fabricius* ſaith, they conſiſt of 5 Feet, of which the firſt is a *Spondee* or *Iambick*, the ſecond an *Iambick*, the third a long Syllable, the fourth a *Dactyle*, the fifth a *Dactyle* or *Amphimacer*; as theſe of *Horace.*

Vides ut alta ſtat nive candidum
Soracte, nec jam ſuſtineant onus.

ALCHYMIST, is one that ſtudies *Alchymy*; that is, that Sublimer Part of *Chymiſtry* which teaches the Tranſmutation of Metals and the Philoſoper's Stone; according to the Cant of the *Adeptiſts*, who amuſe the Ignorant and Unthinking with hard Words and Non-ſenſe: For were it not for the *Arabick* Particle *Al*, which they will needs have to be of wonderful vertue here, the Word would ſignifie no more than *Chymiſtry.* Whoſe Derivation ſee under that Word. This Study of *Alchymy* hath been rightly defined to be, *Ars ſine Arte, cujus principium eſt mentire, medium laborare, & finis mendicare*: That is, an Art without an Art, which begins with Lying, is continued with Toil and Labour, and at laſt end in Beggery. And ſo poor *Penotus* found it, who after he had ſpent his whole Life and Fortune in this vain Study, died at laſt in an Alms-Houſe at *Yverdon* in *Switzerland*; and uſed to ſay, he would recommend the Study of *Alchymy* to a mortal Enemy, whom he did not dare openly to attack.

ALCOHOL, a Term uſed by the *Chymiſts* both for a very fine or impalpable Powder; and alſo for a very pure Spirit well rectify'd or dephlegmated. Thus the higheſt rectify'd Spirit of Wine is called *Alcohol Vini.* Hence to *Alcoholize* any thing, with them ſignifies to ſubtilize; as when any thing is beaten to a very fine Powder, *&c.*

How to make a tolerable true Alcohol or pure Spirit of Wine, ſee in *Alcalizate Spirit of Wine.*

ALCOVE, in Architecture is a part of a Chamber ſeparated by an *Eſtrade* or Parition made by Columns and other correſponding Ornaments, in which is placed a Bed of State, or ſometimes Seats to entertain Company.

ALDEBARAN, an *Arabian* Name for a fix'd Star of the firſt Magnitude, ſituate in the Head of the Conſtellation called the *Bull*, and therefore is uſually named the *Bull's-Eye.*

ALE-

ALE-TASTER, is an Officer appointed and ſworn in every Court-Leet, to look that there be a due Size and Goodneſs of Bread, Ale and Beer ſold within the Juriſdiction of the Leet.

ALEMBICK, is a Chymical Inſtrument uſed in Diſtilling; it has the ſhape of an Helment Concave within, and Convex without; and towards the Bottom is placed a Beek or Noſe about a Foot and a half long, by which the Vapours deſcend; ſometimes they are made without a Noſe, but then they are rather Circulatory Veſſels, and the Head is called a *Blind-Head*: They are made uſually of Copper tinn'd within-ſide; and often of Glaſs.

ALEOPHANGINÆ *(Pillulæ)* are purging Pills compoſed of Aloes and ſeveral Spices.

ALERSANS JOUR, (a Law Term) ſignifying to be finally diſmiſs'd the Court, becauſe there is no further Day aſſign'd for Appearance.

ALEXIPHARMICK MEDICINES, are ſuch as are uſed as Antidotes againſt Poiſon, or any Infectious Diſeaſe; or to raiſe or ſtrengthen the decayed or drooping Spirits in malignant Diſtempers.

ALEXITERICAL, } the ſame with *Alexipharmick*.
ALEXITERICK, }

ALGAROT, In Chymiſtry, ſignifies a ſtrong Emetick and Cathartick Powder, the ſame as *Mercurius Vitæ*, being made of Butter of *Antimony* precipitated into a white Powder, by being waſhed or diluted in a large Quantity of warm Water.

ALGEBRA; the wonderful *Analytick Art*, or the Art of Equation. In *Arabick* is called *Al-giabr W'al-mokabala*, from the former of which Words we call it *Algebra*; and it may be render'd, either the *Art of Reſtitution and Compariſon*, or the *Art of Reſolution and Equation*. *Lucas de Burgo*, the moſt Ancient *European* Writer of *Algebra* we have, defines it *Reſtaurationis & Oppoſitionis Regula*.

The *Italians* gave it the Name of *Regula Rei & Cenſus*; that is, *the Rule of the Root and the Square*, becauſe they call the Root *Res*, and the Square *Cenſus*; and from *Coſa* in the *Italian* Language, for *Res* or the Root, comes the Word *Coſſick*: For ſome Writers call the *Powers* of Numbers, as the *Root*, the *Square*, *Cube*, &c. *Coſſick Numbers*.

Cardan calls it, and that very juſtly, *Ars magna*, *The great Art*; following therein *Lucas de Burgo*, who ſtiles it in *Italian*, *L'Arte Maggiore*.

It was certainly of Old in uſe amongſt the *Grecians*, but purpoſely concealed as a very great Secret. We have ſome Examples of it in *Euclide*, or at leaſt in *Theon* upon *Euclide*, who tells us, it was firſt communicated by *Plato*: There are alſo Inſtances of this Art in *Pappus*; and we find the Effects of it plainly in *Archimedes*, *Apollonius*, and ſome others, tho' ſtudiouſly covered and diſguiſed. The firſt Books among the *Greeks*, and, I believe, the only one that treats profeſſedly of *Algebra*, is that of *Diophantus*: Publiſhed at firſt in *Latin* by *Xylander*, afterwards in *Greek* and *Latin* by *Bachet*, with ſome things added of his own; and ſince him by Mr. *Fermat*, with ſome Additions of his likewiſe. But it certainly was in uſe among the *Arabs* more anciently than among the *Greeks*; and they are ſuppoſed to have had it from the *Perſians*, and the *Perſians* from the *Indians*. Thence, that is, from the *Arabs*, the *Moors* and *Saracens* brought it into *Spain*, from whence it came into *England*; and that before we knew any thing of *Diophantus*. The Uſe of the Numeral Figures, Mathematick Learning and all our old Aſtronomy, came to us likewiſe the ſame way from the ſame Original, and about the ſame time.

The firſt *European* Writer of *Algebra* (as was hinted above) is *Lucas Pacciolus* or *Lucas de Burgo* a Minorite Frier: His Book is in *Italian*, printed at *Venice* 1494. He makes mention of one *Leonardus Piſanus*, and ſeveral others, from whom he learn'd it, but we have none of their Writings. He ſays, this Art came Originally to us from the *Arabs*, and makes no mention of *Diophantus*, who therefore 'tis probable was not yet known here. His *Algebra* goes no farther than Quadratick Equations.

Next came out *Stiphelius*, a good Author, but he alſo went on beyond Quadraticks.

But *Scipio Ferreus*, *Cardan*, *Tartalea*, and ſome others, proceeded to give a Solution of ſome Cubick Equations.

After this *Bombelli* went a little farther, and ſhewed how to reſolve a Biquadratick Equation into two Quadratick ones, by the means of a Cubick.

Then, in the laſt Century, appear'd *Nonnius (Nunnez* in *Spaniſh) Ramus*, *Schonerus*, *Saliguacus*, *Clavius*, &c. who wrote on this Subject in various ways, but generally went no farther than Quadratick Equations.

About this time out came *Diophantus*, whoſe Method differs much from that of the *Arabs*, which others had hitherto followed.

All this while, the known Quantities in any Equation, were deſigned only by the Numerical Letters, and there were no Symbols nor Marks but for thoſe that were unknown or ſought.

But then came *Vieta*, *A. D.* 1590, and introduced what he called his *Specious Arithmetick*; which is a way of giving Marks or Symbols to all the Quantities, both known and unknown; whereby a very ſhort and conſpicuous way of *Notation* was gained, the whole Operation expoſed always to the Eye in a ſhort *Synopſis*, and many Diſcoveries were made in *Algebra*, not before taken notice of.

Vieta alſo introduced the *Numeral Exegeſis* of affected Equations, ſhewing how to extract their Roots in Numbers. And in the Denomination of the Powers of Numbers, he follows *Diophantus*, and not the *Arabian* manner uſed by others.

The Incomparable Mr. *Oughtred* followed, and mightily improved the Specious *Algebra* of *Vieta*, in his *Clavis Mathematica*, firſt publiſhed 1631: He alſo affecting Brevity, (which indeed he was a perfect Maſter of, being ſhort, but not obſcure) invented many *Compendious Characters* or *Ligatures* to note the *Sums*, *Differences*, *Rectangles*, *Squares*, *Cubes*, and their *Sum*, *Difference*, &c. by which means his little Book contains more excellent and uſeful Geometry, than many other large Volumes. *Oughtred* in his *Clavis* uſually contents himſelf with the Solution of Quadraticks, rarely proceeding to thoſe of higher Powers, becauſe he deſigned it as an *Introduction* to *Algebra* only.

The Famous Mr. *Harriott* was Contemporary with *Oughtred*, but died before him; he left many good things behind him, of which nothing is yet publiſhed but his *Analytice* or *Algebra*, which Mr. *Warner* printed *A. D.* 1631. From this great Man did *Des Cartes* borrow, not to ſay ſteal, all the famous things in his *Geometry*, which are purely Algebraical, as any one may ſee, that will compare their Methods together: For 'tis impoſſible but one muſt be Copied after the other: But the *Geometry* of *Des Cartes* was not publiſhed in *French* till the

the Year 1637, and not in *Latin* till the Year 1649: Therefore he muſt have ſeen and copied *Harriott*'s Book.

Mr. *Harriott* did wonderfully improve (in this Treatiſe) that which is purely *Algebra*, in the following Reſpects, and many others which I might mention.

1. He brought in ſmall Letters inſtead of the Capitals uſed by *Vieta* and *Oughtred*.

2. He waved the uncouth Terms of *Quadrato-Cube*, *Surſolid*, &c. explaining the Power plainly to the Eye, by only repeating the Root as often as the Index of the Power.

3. He ſhewed the true Original and Conſtitution of all Equations, by putting all the Equation over to one ſide; and thereby making the whole equal to nothing; whereby alſo he determined the Number of Roots, which he ſhews are in Number, ſuch as the Index of the higheſt Powers in the Equation.

4. He diſcovers the true Conſtruction of the abſolute Number (the *Homogeneum Comparationis*) in a Quadratick or Superior Equation; ſhewing it to be the Product of the continual Multiplication of all the Roots.

5. The ſame he doth alſo by the Co-efficients.

6 He ſhews the way to multiply the unknown Roots of an Equation according to any Proportion aſſigned, thereby freeing the Co-efficients from Fractions and Surds.

7. He ſhews how to reduce the adrected Quadraticks, to ſimple Equations, and all adfected Cubicks to a Form eaſily ſovable, by the means of deſtroying the ſecond Term in ſuch Equations.

8. He ſhews the Method (and a very good one 'tis) of ſolving all adfected Quadraticks by compleating the Square.

9. He mightily alſo improves the *Exegeſis Numeroſa*, invented by *Vieta*.

All theſe vaſt Improvements, and many more (which, to avoid Prolixity, I omit) did *Des Cartes* take from *Harriott*, without ever ſo much as naming him, and publiſh them as his own. 'Tis true, in his *Geometry* there are abundance of excellent Things about the Accomodation of *Algebra* to *Geometrical Propoſitions*, and many very fine *Geometrical Effections* and *Conſtructions*; but this was not *Harriott*'s Buſineſs, who kept himſelf up pure *Algebra* only. As to which *Des Cartes* hath added but one ſingle Rule (and even that is plainly deducible from *Harriott*'s Principles) over and above what is in *Harriott*; and that is, the Method of diſſolving a Biquadratick Equation, whoſe ſecond Term is wanting, into two Quadraticks, by means of a Cubick Equation of a plain Root; and this, after all, both *Bombell* and *Vieta* had done before him. And thus leaving the *French* Plagiary, I come next to another of *Our* Countrey Algebraiſts, Dr. *Pell*, who reviſed and altered a Piece of *Algebra* firſt publiſhed in *High Dutch*, *A. D.* 1659, at *Zurich*; and after tranſlated into *Engliſh* by Mr. *Thomas Francher*, and printed, *A. D.* 1688, and called, *An Introduction to Algebra*: In which Dr. *Pell* gives us a peculiar Method of his own for applying *Algebra* to *Problems* of divers Sorts; and introduces a way of keeping a *Regiſter* of the whole Proceſs in the Margin. He ſhews alſo there how to judge whether a *Problem* be fully determined or not; which is by this Rule (as Dr. *Wallis* interprets him). *If the Number of the* Data, *or Things given in any Queſtion, be (independent of each other) fewer than the things ſought, the Queſtion is not fully determined, but is capable of innumerable Anſwers or Solutions.*

But if the Number of both Data *and* Quæſita *be the ſame, the Queſtion is then determined to either to ſome one, or to ſome certain Number of Solutions.*

And when the *Data* are more in Number than the *Quæſita*, ſo many as exceed are always ſuperfluous, and ſometimes, it may be, are contrary to, or inconſiſtent with others, and conſequently render the thing impoſſible.

Dr. *Pell* alſo, beſides the former Characters, introduced this Mark & for *Involution*, and this *vv* for *Evolution*, as he calls it, *i. e.* for *Squaring*, *Cubing*, &c. of any Quantity, and for *Extracting the Square*, *Cube*, &c. Roots out of any Quantity. He makes alſo the Mark :- to ſtand for *Diviſion*, and Regiſters the ſeveral Steps of the whole Proceſs by Numeral Figures in their Order in the little Column in the middle; keeping an Account alſo in Symbols of the ſeveral Operations in the Column towards the Left Hand, that ſo you may ſee how any Quantity or Equation in the large Column towards the Right Hand is produced. In which very good Method he is follow'd by Mr. *Ward*, in his ſmall Treatiſe of *Algebra*.

Algebra is well enough divided into

1. *Numeral* or *Vulgar*; which was that of the Ancients, and ſerved only to find the Solution of Arithmetical Problems, without any Demonſtration; ſuch as thoſe given us by *Diophantus*, &c.

2. *Specious* or *New*, called ſometimes *Logiſtica Specioſa*, and often *Species* alone; which ſince *Vieta* hath been perform'd by Letters of the Alphabet. And this way of Notation is very pleaſing to the Mind, aſſiſting to the Imagination, and eaſy to the Memory. This alſo is no ways limited, like the former *Algebra* to any one certain kind of Problems, but ſerves equally for the Inveſtigation and Demonſtration of all Theorems; eſpecially if to thoſe two you add the new Methods of

3. *Fluxions*; a large Account of which you will have under that Word.

And the ſeveral Operations of *Algebra*, ſuch as *Addition*, *Subſtraction*, *Multiplication*, *Diviſion*, *Extraction of Roots*, *Fractions*, *Equations*, &c. you will find Directions how to perform under thoſe ſeveral Words.

ALGENEB, a fix'd Star of the ſecond Magnitude in the right ſide of *Perſeus*, whoſe *Longitude* is 57 *Deg.* 17 *Min.* *Latitude* 30. 5. Right Aſcenſion 44 *Deg.* 15. *Min.*

ALGOL, or *Meduſa's Head*, a fix'd Star of the third Magnitude, in the Conſtellation *Perſeus*, whoſe Longitude is 51. 27. Latitude 22. 22. and Declination 39. 39.

ALGORITHM, ſometimes call'd *Logiſtica Numeralis*, is the Sum of the principal Rules of Numeral Computation; of which they commonly reckon Five, *Numeration*, *Addition*, *Subſtraction*, *Multiplication* and *Diviſion*; to which may be added *Extraction of Roots*.

ALGORISM, is the Practical Operation in the ſeveral Parts of *Specious Arithmetick*, or *Algebra*; and ſometimes the Word is uſed for the Practice of Common Arithmetick by the ten Numeral Figures.

ALIDADA, the Label or Ruler which is moveable on the Centre of an Aſtrolabe, Quadrant, *&c.* which carries the Sight. It is ſo called by the *Arabian* Writers of Mathematicks, from whom we took and retain ſeveral *Arabick* Terms, as *Azimuth*, *Zenith*, *Nadir*, *Almacanter*, &c.

ALIEN,

ALIEN, a Subject born in a Foreign Countrey, who (by our Common Law) is not capable to inherit Lands in *England*, till Naturaliz'd by Act of Parliament.

ALIENATION, is (in Law) making a thing another Man's, or to alter or put the Poſſeſſion of Lands, or other things, from one Man to another; and in ſome Caſes a Man hath Power in himſelf to do ſo, without the Aſſent or Licence of any other, and in ſome not.

ALIFORMES MUSCULI, *Alares*, *Pterygoides*, are Muſcles ariſing from the Pterygoide Bones (the Proceſs of the *Os Cuneiforme*, partly with a Nervous Beginning, and partly Fleſhy; and ending in the Neck of the lower Jaw, and towards the internal Seat of the Head.

ALIFORMES PROCESSUS, are the Prominences of the *Os Cuneiforme*, from the fore Part; the ſame with the *Pterygoides*.

ALIMENT, is whatever ſerves to nouriſh, ſupply the Decays of, and to recruit an Animal or Vegetable Body.

ALIMONY, formerly ſignified Nouriſhment or Maintenance; but in a Modern Legal Senſe, it is that Portion or Allowance which a married Woman ſues for upon any Occaſional Separation from her Husband, wherein ſhe is not charged with *Elopement* or *Adultery*. This was recoverable in the Spiritual Court, but now only in Chancery.

ALIQUOT PART of a Number, is ſuch an one as will exactly meaſure it without any Remainder. But an

ALIQUANT PART, is that which cannot meaſure any Number exactly, but that ſome Remainder will be left. Thus 3 is an Aliquot Part of 12, becauſe being taken 4 times it will juſt meaſure it; but 5 is an Aliquant Part of 12, for being taken twice it falls ſhort, and when taken 3 times it exceeds 12.

ALKAHEST; one of the canting Terms of the *Alchymiſts*, by which they intend an Univerſal *Menſtruum* that will diſſolve all manner of Bodies; and by which they pretend to extract the Sulphur of Metals. Some Chymiſts have given this mighty Name to the *Tincture*, or *Liquor* of *Flints*,, which is a Solution of them made (after Calcination) by the means of Salt of Tartar; and others to the *Liquor of Fixt Nitre*, which is Nitre calcined and fixed, by burning powder'd Coals with it, and at laſt run into a *Deliquium*, by being ſet in a cool Cellar, as Oyl of *Tartar per Deliquium* is made. *Van Helmont* calls this Liquor ſometimes *Ignis Gehennæ*: He pretends to be Maſter of it himſelf, and Mr. *Boyle* is inclined to believe him. *Helmont* ſaith, it would diſſolve all Bodies, without leaving any *Caput Mortuum*, and was as fit for a new Operation after it had diſſolved one kind of Body as at firſt; it would diſſolve Metals, Marchaſites, Stones, and even Glaſs it ſelf when finely powdered.

'Tis found, that the common *Menſtruums*, ſuch as *Aqua Fortis*, *Spirit of Nitre*, &c. when they have once diſſolved any Metal, are render'd uncapable by it of any futher Service, having the Points or Edges of their *Acids* ſo broken, that they can hardly diſſolve any more of the ſame, or any other Metal. Therefore this immortal *Alkaeſt* had, in this reſpect, a wonderful Preheminence, if what they relate of it be true. And to ſhew that ſomething of this Nature is poſſible, Mr. *Boyle* ſays, That he diſtill'd a Spirit from Verdigreaſe, which would ſerve more than once as a *Menſtruum* to diſſolve Bodies. or to draw Tinctures, and being drawn off, was ready for the ſame Operation anew.

ALKALISATE SPIRIT OF WINE; So Mr. *Boyle* calls a Spirit of that Liquor diſtill'd from Salt of Tartar, or Tartar calcined to Whiteneſs: And by ſo drawing off Spirit of Wine from that Salt, you may get eaſily a pure and rich dephlegmated Spirit (*viz.* one that ſhall burn all away, and fire Gunpowder) after this manner;

Put about an Inch thick of Tartar calcined white, into a Glaſs as long and ſlender as you can procure, and then put upon it Spirit of Wine that hath been once rectified, to a Finger's Height above the Tartar; and fitting on a Head, draw the Spirit off in a very gentle Heat; or at leaſt, ſo much of it as you conclude, or find will come pure, and it will anſwer your Expectation at the firſt Diſtillation. The Tartar being dried and new calcined will ſerve again for a new Operation. If you cannot procure Tartar, Quick-lime, or the Salt of Pot-Aſhes will do tolerably well. *Eſſay of Unſucceſsfulneſs of Experiments.*

ALKALI, a Chymical Word ſignifying the *fixt Salt* of any Plant; and is ſo call'd, becauſe the Herb called *Kali* which is a kind of a *Sea-blite*, *Glaſs-wort*, or *Salt-wort*, yields ſuch a Salt in a great Quantity. This fix'd Salt of Plants (which is made by burning the Plant, making a *Lixivium* or Lee of its Aſhes; and after filtrating the Lee, evaporating the Moiſture over a gentle Heat, that the fix'd Salt may remain at the Bottom of the Veſſel) being render'd very Porous by the Fire's paſſing ſo often thro' it in its Calcination, and it may be fixing there ſome of its Eſſential Salt: And becauſe very many of the fiery Particles do alſo ſtick in thoſe Pores, it makes a very great Ebullition or Efferveſcenſe when any *Acid Liquor* is mingled with it, and from thence, all Bodies that do, or are ſuppoſed to ferment with *Acids*, are now always call'd *Alkalies*, or *Alkaliſate Bodies*; not becauſe they muſt always contain any *Hidden Alkali* in them; which ſome Chymiſts aſſert as neceſſary to the Cauſe of Fermentation; but becauſe they are of the Nature of *Alkalies* themſelves, and have their Pores naturally ſo form'd, in ſuch a Proportion, as that they are fitted to be penetrated and put into a violent Motion by the Points of the *Acid* poured upon them. Theſe fix'd Salts of Plants are called *Fix'd Alkalies*: but the Volatile Salts of Vegetables, becauſe they will ferment with *Acids*, are called *Volatile Alkalies*.

ALKERMES, in Pharmacy, is a Confection deſcribed in the *Diſpenſatory*, and ſold in the Shops, and ſo called from the *Arabick* Particle *Al* and *Kermes*, which are *Red* or *Scarlet Grains*, the chief Ingredient in the Confection.

ALLANTOIS *or* ALLANTOIDES, is the Urinary Tunic placed betwixt the *Amnion* and the *Chorion*, which by the Navel and *Urachus* (or Paſſage by which the Urine is convey'd from the Infant in the Womb) receives the Urine that comes out of the Bladder: It's called likewiſe *Farciminalis*, becauſe that in many Brutes it's of the Shape of a Gut-pudding, but in Man, and ſome other few Animals it is round, and like the thin ſoft Skin which wrappeth the Child in the Womb.

The Ingenious and Accurate Dr. *Richard Hale*, of *Trin. Coll.* in *Oxford*, *in Phil. Tranſact.* N. 271 hath obliged the World with a more perfect Diſcovery of the Human *Allantois*; and aſſign'd the Reaſons why thoſe who believed its Exiſtence had not before

fore fully found it out; giving alſo an Anſwer to the Objections of thoſe, who even ſtill, deny its Reality.

ALLEGATION, is the Citation or Quotation of any Authority, Book, &c. to make good any Point or Aſſertion.

ALLEGORY, is a Figure in Rhetorick, conſiſting of one continued Metaphor, carried on thro' the whole Diſcourſe.

ALLEGIANTIA, is the natural and ſworn Allegiance or Legal Obedience which every Subject bears to his Prince.

ALLEGIARE, is to juſtifie and clear himſelf by courſe of Law, of the Crime objected to him.

ALLEMANDE, is a kind of grave ſolemn Muſick, where the Meaſure is full and the Movement ſlow.

ALLIANCE, properly is a Connection of two Perſons or two Families together by Marriage; but it is often extended in a larger Senſe, ſignifie the Leagues, Unions and Treaties made between Princes, &c.

ALLIGATION, is a Rule in Arithmetick (ſo called from the Numbers being bound or connected together by Circular Lines) relating to the mixture of Merchandizes; as Corn, Wine, Metals, Medicines, &c. one with another; and to the Proportion of the Ingredients in any Quantity of, and the Price of ſuch a Mixture. 'Tis diſtinguiſh'd into two kinds, *viz.* *Alligation*, *Medial* and *Alternate*.

Alligation Medial teaches how to find a Mean in the Price, Quantity or Quality between the Extreams; and all Caſes in it may be ſolved by theſe Propoſitions and Rules.

1. Having the Quantity of the Ingredients, and the particular Prices, to find the Price or Value of ſome part of the Mixture.

Rule; Multiply the Ingredients ſeverally by their own Prices, and Divide the Sum of thoſe Products by the Sum of the Ingredients, and the Quotient anſwers the Queſtion.

2. Having the particular Prices of the Ingredients, and the Sum paid or received for a Mixture bought or ſold; to find what Quantity of each was bought or ſold.

Rule; Divide the Sum paid or received for the Mixture bought or ſold, by the Sum of the particular Prices, the Quotient gives what was required.

3. Knowing the Ingredients of a Mixture, to augment or diminiſh the Mixture proportionally.

Rule; Sum up the Ingredients; then ſay, As that Sum is to the Augmentation or Diminution, ſo is the Quantity of each Parcel of the Mixture to the Quantity of the Mixture deſired.

4. Knowing the Nature, Quality, or Fineneſs of the ſeveral Ingredients of a Mixture, to find the reſulting Temperament or Fineneſs of the whole.

Rule; Place the ſeveral Quantities of the Mixture in Rows, againſt which place orderly their ſeveral Qualities of Fineneſs, and multiply each Quantity by its own Quality or Degree of Fineneſs, then as the Sum of all the Quantities is to the Products of all the Quantities, ſo is Unity to the Quality or Fineneſs of Mixture.

Example; There are melted and mixed together two kinds of Silver, one worth 5 *s.* and the other worth 4 *s.* an Ounce, and there were 4 Ounces of the former, and 8 of the latter; what is the value of an Ounce of the Mixture?

	Oun.	*s.*		*s. d.*
Silver	4 + 5 = 20		12 : 52 :: 1 : $\frac{52}{12}$	(= 4. 4
	8 + 4 = 32			
	12	52		

5. Knowing the Quantities of a Mixture, to find the particular Qantities of any Ingredient in any part of the Mixture.

If the Mixture be compounded of but two things, then ſay, As the Total of the Ingredients in the Compoſition, is to the part of the Mixture propoſed: So is the Quantity of the Ingredient propoſed in the whole Compoſition, to the Quantity of the Ingredient in the Part deſired.

But if the Mixture be decompounded, then you muſt repeat your Work upon every Mixture.

6. Knowing the Total of a Mixture, with the Total Value, and the Values of the ſeveral Ingredients mixed, to find the ſeveral Quantities mixed, tho' unequally.

Rule. Multiply the Total of the Mixture by the leaſt Value; ſubſtract the Product from the Total Value, and the Remainder is the firſt Dividend: Then take the ſaid leaſt Value from the greateſt valued Ingredient, and the Remainder is the firſt Diviſor. The Quotient of this Diviſion ſhews the Quantity of the higheſt Priz'd Ingredient, the other is the Complement to the Whole: And when more Ingredients than two are in the Compoſition, the Diviſors are the ſeveral Remains of the leaſt Value taken from the other. The Dividends are the Remains left upon the Diviſions, till 0 remain there; which will be one ſort of the Number of Ingredients, and this defective Ingredient is to be ſupplied as a Complement; and in Diviſion no more muſt be taken in every Quotient, than that there may remain enough for the other Diviſors, and the laſt to leave nothing remaining.

II. *Alligation Alternate*, ſhews the due proportion of every Ingredient entring the Mixture, and counter-changes the Places of ſuch Exceſſes or Differences as fall out between the Mean Price and the Extreams, aſcribing it to the greater Extream which proceeds from the Leſſer, and the contrary.

Rule 1. Let every greater Extream be linked with one Leſſer.

2. When either of the Extreams be ſingle, and the other Extreams be plural, the ſingle Extream muſt be linked to all the reſt.

3. If both greater and leſſer Extreams are not ſingle, then they may be linked ſo diverſly, that ſundry Differences may be taken, and Diverſities of Anſwers to the Queſtion, yet all true: But if one of the Extreams be ſingle, there can be but one Anſwer.

4. The Numbers being linked, take the Difference of each Number from the Mean or common Price, and place this Difference againſt the Number it is linked to alternately.

5. Every Number linked with more than one, muſt have all the Differences of the Numbers it is linked to ſet againſt it.

6. Thoſe Differences reſolve the Queſtion, when the Price of every of the Ingredients is given without their Quantities, and the Demand be to mix them ſo as to ſell a certain Quantity at a mean rate.

7. But when the Quantity of one, with the Price of all the Ingredients is given, and the Demand

mand is to know the Quantities of the other Ingredients, then the *Rule of Three* is to be uſed.

8. And when the Price of every Ingredient is given, without any of their Quantities, and the Demand be to make up a certain Quantity to be ſold at a mean Rate, then all the Differences added together, ſhall be the firſt Number in the *Rule of Three*; the whole Quantity to be mixed ſhall be the ſecond Number; and each Difference apart the ſeveral third Numbers: And ſo many ſorts mix'd, ſo many Operations of the *Rule of Three*.

9. A Queſtion may be ſo propounded, as both Sorts of *Alligation* is needful to the Reſolution.

Example.

Suppoſe a Mixture of Wine of 119 *Quarts be required, that muſt be made up of theſe ſeveral Prices,* 7 d, 8 d, 14 d *and* 15 d, *ſo as the whole may be afforded at* 12 d. per *Quart.*

Having link'd 8 to 14, and 7 to 15, and counterchanged their Difference from the common Price 12 *d*, I find the Sum of their Differences to be 14, by which dividing 119, the Quotient is $8\frac{7}{14}$ or $8\frac{1}{2}$, or for conveniency in Operation $\overline{1}7\frac{7}{2}$.

		Quarts.
8 } 2	$17\frac{7}{2} + 2 = 19\frac{4}{2}$	$= 17$
14 } 3	$17\frac{7}{2} + 4 = 23\frac{8}{2}$	$= 34$
7 } 4	$17\frac{7}{2} + 3 = 20\frac{1}{2}$	$= 25\frac{1}{3}$
15 } 5	$17\frac{7}{2} + 5 = 24\frac{5}{2}$	$= 42\frac{1}{2}$
14		119

ALLIOTH, the Name of a Star in the Tail of the *great Bear*, whoſe Obſervation is much uſed at Sea. The *Elevation of the Pole* or the *Latitude* may thus be eaſily found by this Star.

Obſerve when *Allioth* comes to the *Meridian* under the *Pole*, then take the Height of the *Pole-Star* with a Quadrant, and out of that ſubſtract 2°. 25. the Diſtance of the *Pole-Star* from the *Pole*, the Remainder is the *Pole*'s Height, or the Latitude.

ALLITERATION, (a Figure in Rhetorick) is a repeating and playing on the ſame Letter.

ALLOCATIONE FACIENDA, is a Writ directed to the Lord Treaſurer and Barons of the *Exchequer*, upon complaint of ſome Accountant, commanding them to allow him ſuch Sums as he hath by vertue of his Office lawfully and reaſonably expended.

ALLOCATION, in Law, is an Allowance made upon an Accompt.

ALLODIAL *Lands* are thoſe, for which no Rents, Fines, nor Services are due. Such as *Free-Land*.

ALLODIUM, a Law-term, ſignifying, every Man's own Land, *&c.* which he poſſeſſeth meerly in his own Right, without acknowledgment of any Services, or payment of any Rent to another, which is a property in the higheſt degree.

ALLOETICKS, are Medicines conſiſting chiefly of *Aloes*.

ALLOGOTROPHY, with ſome Writers, is a Diſproportionate Nutrition of the Body; when one part (as in the Rickets) is nouriſhed more than the other.

ALLOY, is the Proportion of a Baſer Metal mingled with a Finer or Purer; as the Quantity of Copper that is mingled with Gold to make it of a due hardneſs to be Coined into Money, is called its *Alloy*: And Gold that hath more of this than it ought to have, is ſaid to be of a Courſer or Greater *Alloy*. The Proportion of *Alloy* for Gold uſed in our Mints is about a 12th part.

ALMACANTERS, an *Arabick* Word ſignifying the ſame with *Parallels of Altitude on the Globe*: Which ſee. Some write it *Almicanterahs*, and others *Almacanterahs*.

ALMACANTERS STAFF, is an Inſtrument uſually made of *Pear-Tree* or *Box*, with an Arch only of 15 degrees, to take Obſervations of the Sun, about the times of its Riſing and Setting, in order to find the *Amplitude*, and conſequently the Variation of the Compaſs.

ALMONDS *of the Throat* or the *Tonſillæ*; a Glandulous Subſtance repreſenting two Kernels placed on each ſide of the *Uvula*, at the Root of the Tongue. They are covered with the common Tunick of the Mouth, and have Veins and Arteries from the *Carotides* and *Jugulars*: They are of a lax and ſpongy Subſtance, having ſeveral *Sinus*'s within them, in which they contain the Liquor of the *Saliva*, which they receive from the Brain, and by diſperſing it to the *Larynx*, *Jaws*, *Tongue*, and *Oeſopagus*, do moiſten and lubricate thoſe Parts. When theſe are ſwelled and inflamed by a Cold, *&c.* they very much ſtraiten the Paſſage of the Throat, and render Swallowing painful and difficult, and help to make what we call a *ſore Throat*, and as the Country People ſay, the coming down of the Almonds of the Ears.

ALMUCANTERHS, the ſame with *Almacanters*: Which ſee.

ALOPECY, is a ſhedding of the Hair, occaſioned by the Pox, or otherwiſe: So called from a Fox ἀλώπηξ, whoſe, Urine is ſaid to make places bald, and barren for a Year, as the Scholiaſt on *Callimachus* obſerves; or from a Diſeaſe peculiar to a Fox. It is called likewiſe ὀφίασις, from the Figure, becauſe that the parts ſmooth and deſtitute of Hair, look winding like a Serpent, in Greek ὄφις. It's common to both theſe Diſtempers that the Hair fall of *Areatim*, *i. e.* by ſhedding, whence in general this Diſeaſe is called *Area*. *Blanchard*.

ALPHETA, the Name of a Star: See *Lucina Corona*.

ALPHUS, is a Cuteaneous Diſtemper, in which the Skin is rough, and looks here and there as if there were Drops of a white Colour upon it: Some call it *Morphew*; it differs from the *Leuce*, in that it penetrates not ſo deep as the *Leuce* doth.

ALRAMECH, a Star's *Arabick* Name, which is the ſame with *Arcturus*.

ALTERAGE, or ALTARAGIUM, is a Word which includes not only the Offerings made upon the Altar, but alſo the Profit that ariſes to the Prieſt by reaſon of the Altar.

ALTERATION, is, in a Phyſical Senſe, that Motion by which a Body is varied or changed in ſome Circumſtances from what it really was before, tho' as to Senſe, its Nature and Bulk appear to continue ſtill the ſame; ſo that it conſiſts in the Body's acquiring or loſing ſuch Qualities, as whether preſent or abſent, do not *eſſentially* change the Subject: And herein it differs from *Generation* and *Corruption*, which Terms expreſs the Acquiſition or Loſs of the Eſſential Qualities of any Body. Or otherwiſe.

ALTERATION, is an *Accidental* and *Partial Change* made in any Body, without proceeding ſo far as to make the Subject be quite unknown, or to take a new Name or Denomination upon it: Or it may be called the *Acquiſition* or *Loſs* of ſuch Qualities as are not Eſſential to the Form of any Body.

ALTERING REMEDIES; ſuch Medicines as ſerve to purifie and reſtore the due Mixture of Blood, and other circulating Humours.

ALTERNATE PROPORTION: See the Word *Proportion*, N°. 8.

ALTERNATE ALLIGATION: See *Alligation Alternate.*

ALTERNATE ANGLES: See *Angles.*

ALTERN BASE, a Term in *Trigonometry*, diſtinguiſhed from the *True Baſe*, thus; In Oblique Triangles the *True Baſe* is always either the Sum of the Sides, (and then the Difference of the Sides is called the *Altern Baſe*) or the *True Baſe* is the Difference, and then the Sum of the Sides is called the *Altern Baſe.*

ALTERNATION, is a Word uſed by Dr. *Wallis*, and others for the different Changes or Alterations of Order in any Number of things propoſed. Of this that learned Mathematician hath a peculiar Diſcourſe at the end of his *Algebra.* This Alternation is eaſily found, by only continual Multiplication of all the Numbers beginning at Unity. Thus, if it were required to know how many Changes can be rung on ſix Bells, you need only write down 1, 2, 3, 4, 5, 6, and then multiply all thoſe Numbers continually one into another, and the laſt Product gives the Number of Changes, which is 720 Changes.

ALTIMETRY, the Art of taking and meaſuring of *Heights*, whether *Acceſſible* or *Inacceſſible*: See *Altitudes* or *Heights.*

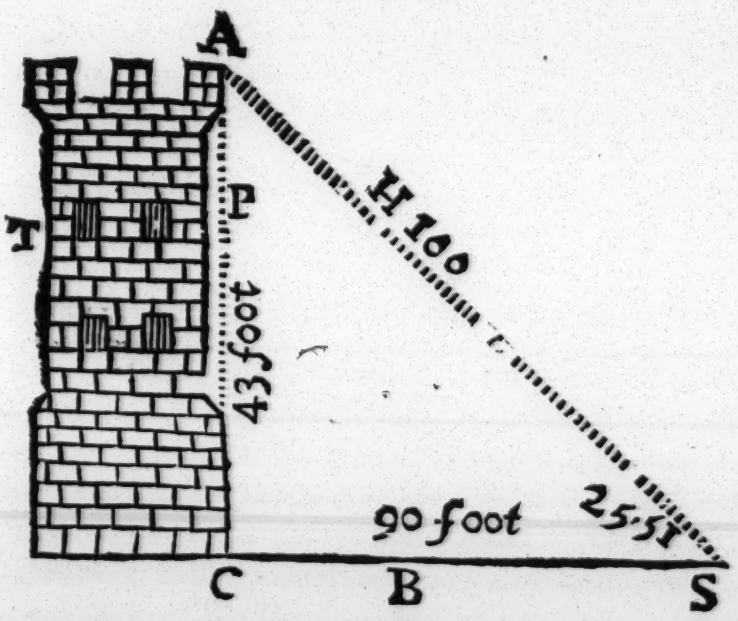
ALTITUDE *of the Pole*: See *Elevation of the Pole.*

ALTITUDE of MOTION, is a Term uſed by Dr. *Wallis* in his Mechanicks, for the Meaſure of any Motion, eſtimated according to the Line of Direction of the moving Force.

ALTITUDES, or *Heights of Places* perpendicularly above the *Horizon*, are thus found, whether *Acceſſible* or *Inacceſſible*, *i. e.* whether they are ſuch whoſe Foot or Bottom you can have acceſs to, or ſuch as you cannot come near.

1. *To take an Acceſſive Altitude at one Station.*

Let *T* be a Tower ſtanding upon a level Ground, whoſe Height is required, your Station being at *S*, 90 Foot diſtant from the Baſis of the Tower.



Firſt, with a *Quadrant*, *Theodolite*, or ſome other graduated Inſtrument for that purpoſe, from your Station *S*, take the *Angle of Altitude ASC*, 25 *Deg.* 1 *Min.* Now, you ſee that the Perpendicular Height of the Tower *AC*, the Baſe *CS*, and the *Viſual Line SA*, do conſtitute a Right Angled Triangle, wherein there is given the Baſe *B* 90 Foot, the Angle at *C* a Right one, and the *Angle of Altitude* taken by Obſervation 25°. 51′. and therefore the Angle *SAC*, its Complement to 90 *Deg.* = 64°. 60′. and the Altitude *P* is required.

Wherefore, by *Caſe* 1. of *Right Angled Plain Triangles*, the Proportion is,

As the Radius, is to the Baſe; ſo is the Tangent of the Angle of Altitude, to the Height of the Tower. That is, *R* : *B* :: *T*, *S* : *P.*

And the Operation is performed thus:

To the Logarithm of *B*, 90 *F.*	1,954242
Add the *Tang.* of the Angle *S*, 25°. 51′.	9,685290
The *Sum* will be	11,639532
From which Subſtract the Radius,	10,000000
The *Remainder* is the Log. of 43 Feet,	1,639532

Which is the Perpendicular Height of the Tower.

N. B. Here, and in all ſuch Caſes of this kind, Allowance muſt be made for the Height of the Eye, or Inſtrument above the Ground.

You may alſo, having the former Requiſites, *viz.* the Baſe and Angles, eaſily find the Hypothenuſe *H*, or how far it is from the Top of the Tower to the Station, by the ſecond Caſe of Rectangle Triangles; and this will be uſeful in many Caſes.

On the *Common Quadrant* you have a Line called the *Quadrat*, which hath two Sides, divided each into 100 equal Parts, and that on the Left-hand is called *Right Shadow*, and that on the Right-hand *Contrary Shadow.*

By which means 'tis very eaſie to take any Acceſſible Altitude at one Station by the Quadrant; for, if the Angle *S* be juſt 45, the Diſtance to the Foot of the Tower from the Station is always equal to the Altitude: But if the Angle be leſs than that, the String will fall on *Right Shadow* in the *Quadrat.* Then ſay, as 100: Is to the Number of Parts of the *Right Shadow*, cut by the String :: So is the Diſtance: To the Altitude. So that if the String cut 25, 75, or 50, *&c.* the Height is accordingly $\frac{1}{4}$, $\frac{3}{4}$, or half the Diſtance.

But when the String falls towards the Right-hand, and the Angle *S* be above 45°. then ſay, As the Parts cut by the Thread in the Quadrant: Are to 100 :: So is the Diſtance: To the Height. Wherefore, if the Thread cut 50 here, the Height is double to the Diſtance; if it cut 25, 'tis 4 times as great as the Diſtance, *&c.*

N. B. By applying what is here ſaid of Diſtances to the Shadow of any Objects; the taking their Height by the Length of their Shadows, will be eaſily underſtood.

2. *How to take an Inacceſſible Altitude at two Stations.*

Let *AB* (*ſee the following Figure*) be a *Church*, *Steeple*, &c. whoſe Height is required; your Station being at *D*, between which and the Baſis of the *Steeple*, there is a River, ſo that it is inacceſſible, that is, you cannot come to the Foot at *B.*

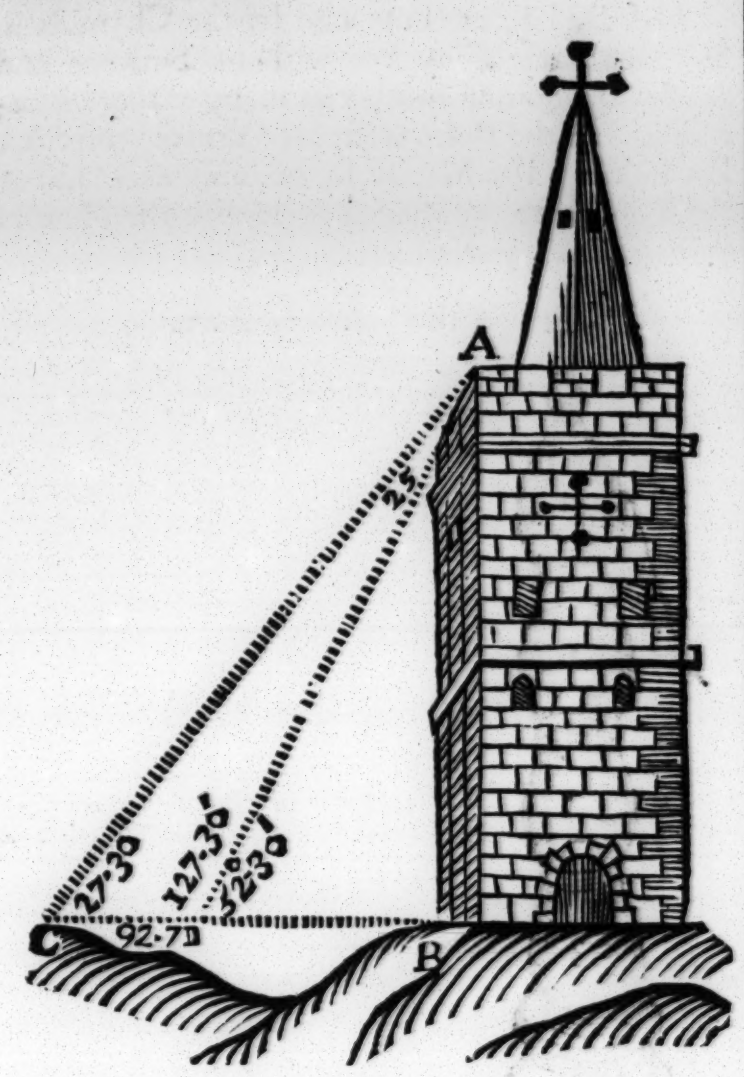
Firſt, from *D* with your Quadrant (or the like Inſtrument) take the *Angle of Altitude ADB*, which ſuppoſe 52 *Deg.* 30 *Min.*

2. Remove your Inſtrument to another *Station*, as to *C*; where take alſo the Angle of Altitude *ACB*, 27 *Deg.* 30 *Min.*

3. Meaſure the Diſtance between the two Stations *D*, *C*, which let be 92,7 Foot.

Now, the two viſual Lines *DA*, *CA*, together with the Diſtance *DC*, do make the *Oblique Angled*

gled *Triangled A D C*, wherein there is given the Angle *A C B*, 27°. 30′; and by the Angle *A D B*, 52 *Deg.* 30 *Min.* you have the *Angle A D C*, 127 *Deg.* 30 *Min.* its Complement to 180; and conſequently you have the *Angle C A D* 25 *Degrees*, alſo the Side *D C* 92,7 Feet.



So that having the three Angles and one Side given, the Side *A D* may be found, by *Caſe* 3d of *Oblique Angled Triangles*; for the *Analogy* is,

As { *S*, *DAC* : *D C* :: *S*, *ACD* : *AD*
{ *S*, 25,00 : 92,7 :: *S*, 27, 30 : 101. 3

By which means you gain *A D*, they Hypothenuſe of the right angled Triangle *ADB*; then in the *Right angled Triangle A D B*, there being given *A D*, the Hypothenuſe, 101, 3, and the Angle *A D B* 52°. 30′, 'tis eaſy to find the Perpendicular *A B*.

By *Caſe* 6. of *Right angled plain Triangles*, for the *Proportion* or *Canon* is,

As { *Rad.* : *AD* :: *S*, *ADB* : *AA*
{ *S*, 90, : 101,3 :: *S*, 52°. 30′ : 80,3 Feet.

3, *To take the Altitude of a Tower Steeple*, &c. *or the like, which ſtandeth upon a Hill.*

Let *H K* (*ſee the following Figure*) be a *Tower* ſtanding upon a Hill, and you ſtanding at *L*, deſire to know the Height thereof above the Hill.

Firſt, take the Angle *H L M* 40 *Degrees*; as alſo, the Angle *K L M* 22 *Degrees*, 3 *Minutes*.

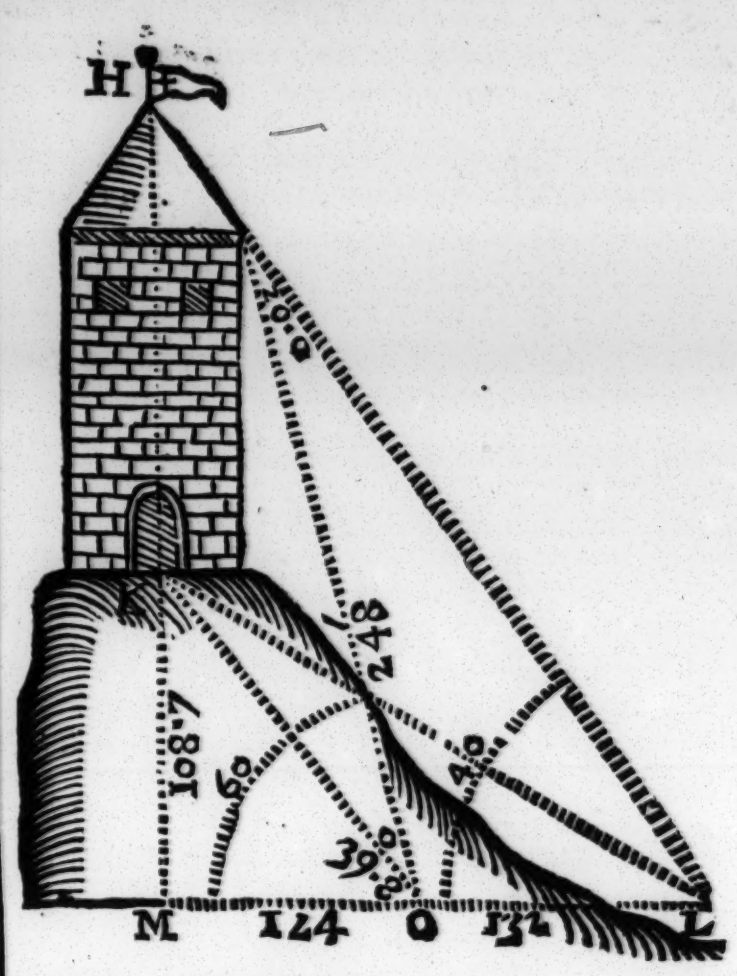
Secondly, remove your Inſtrument to *O*, and take the Angle *H O M* 60 *Degrees*; as alſo the Angle *K O M* 39 *Deg.* 54 *Min.*

Thirdly, meaſure the Diſtance *O L* = 132 Feet.

Now, in the Triangle *H O L*, you have given the Angle *H L O* 40 *Deg.* the Angle *H O L* 120 *Deg.* and the Diſtance *L O* 132 Foot. Then, by *Caſe* 3. of *Oblique angled Triangles*,

As { *S*, *L HO* : *O L* :: *S*, *H L O* : *HO*
{ *S*, 20°. : 132 :: *S*, 40°. : 218.

Then, by *Caſe* 1. of *Right angled Triangles*, *HM* is found to be 214 Foot.



Now, in the Triangle *H M O*, you have given the Angle *H O M* 60 *Degrees*, and *H O* 248, or the Perpendicular *H M* 214 Foot, required, the Baſe *M O*; 'twill be, As *Rad* : *H O* : : *S*, *H O M* : *M O* 124 Foot.

Alſo in the Triangle *K M O*, there is given *MO* 124, and the Angle *K O M* 39 *Deg.* 54 *Min.* required *K M*, which, by *Axiom* 2. *Plain Triangles*, is found to be 108,7 Foot, which being ſubducted from *H M* 214, leaves 1053 Foot for the Height of the Tower.

ALTITUDE, in *Aſtronomy*, is of the *Sun*, *Stars*, or any Planet or Point of the Heavens, an Arch of an *Azimuth Circle*, contained between the *Horizon* and any *Parallel* of *Altitude*, or between the *Star*, *Planet*, or aſſigned Point in the *Heavens* and the *Horizon*.

To find the *Sun's Altitude* at any time by the *Globe*, *rectify* your *Globe*, and fit the *Quadrant of the Altitude*; then turn the *Globe* about till the Hour Index ſhew the Time of the Day, and ſtay it there; after which bring the *Quadrant* to cut the Sun's Place in the Ecliptick, and then that Place ſhall ſhew the *Altitude* on the *Quadrant*.

To find the Sun's *Altitude* and *Hour of the Day*, when he is due, *Eaſt* or *Weſt*, and above our *Horizon*, by the *Globe*.

Having *rectified* the Globe, and fitted the Quadrant, bring it to cut the true Eaſt Point, and then turn the Globe till the Sun's Place in the Ecliptick cut the graduated Edge of the Quadrant, for then that Place will ſhew the *Altitude*, and the Index the *Hour*.

To find the Sun's *Altitude* on any *Azimuth* by the Globe.

Set the Quadrant to the *Azimuth* given, and then turn the Globe till his Place in the Ecliptick touch the Graduated Edge of the Quadrant, ſo ſhall that Place give the Altitude on the Quadrant.

By *Trigonometrical Calculation*.

1. To find the Sun's *Altitude* when it is due *Eaſt* or *Weſt*.

Having the Latitude of the Place, and the Sun's Declination given,

Say, *As the Sine of the Latitude : Is to the Radius :: So is the Sine of the Sun's Declination : To the Sine of the Sun's Altitude required.*

Example, Suppoſe the Latitude be	51°. 30′.	
And the Sun's Declination	11 31	
Then to the Ar.co. of the Sine of	51°.30′.	0,106455
Add the Sine of	11 31	9,300275
Sum the Sine of	14, 49.	9,406730

Which is the *Sun's Altitude* that Day when due *Eaſt* or *Weſt*.

2. To find the *Sun's Altitude* on any Hour in the *Equinoctial*.

Say, *As the Radius is the Co-ſine of the Latitude, ſo is the Co-Sine of the Sun's Diſtance from the Meridian (or Hour from Noon) to the Sine of the Altitude required.*

3. To find the *Sun's Altitude* at Six.

Say, *As the Radius is to the Sine of the Latitude, ſo is the Sine of the Declination to the Sine of the Altitude at Six.*

4. To find the *Sun's Altitude* on any *Azimuth*.

Say, *As the Radius is the Co-Sine of the* Azimuth, *ſo is the Co-Tangent of the Latitude to the Tangent of the* Altitude.

To find the *Sun's Altitude* at any time, having the Latitude and Declination given;

Say, *As the Radius is to the Sine of the Sun's Diſtance from Six, ſo is the Co-Tangent of the Latitude to the Tangent of the fourth Ark.*

Which 4th Ark, for Hours between 6 and 6 muſt be ſubſtracted from, or for Hours, before or after Six, muſt be added to the Sun's Diſtance from the Pole, and the *Sum* or *Difference* ſhall be a Fifth Ark.

Then as the Co-Sine of the 4th Ark, is to the Sine of the Latitude, ſo is the Co-Sine of the 5th Ark to the Sine of the *Sun's Altitude*.

Sir *Jonas Moore* gives an eaſier Method for theſe *Problems*; of which this is his *Example* for the Hour of the Day.

There is given the Complement of the Sun's Height, his Complement of the Declination, and the Complement of the Latitude of the Place: Required the Angle of the Sun's Diſtance from the Meridian, or the Hour from Noon.

Write all theſe down thus;

Complement of the Latitude	38°.30′.	*Sine Comp. Arith.*	0.205850
Complement of Declination	76. 53.	*Sine Comp. Arith.*	0.011481
Their Difference is	38. 23		
To which add Comp. of the *Al.*	60. 00		
The Sum is	98 23		
And their Difference is	21. 37		
Then take the ½ Sum which is	49. 11	*Sine* =	9.878984
And the half difference, which is	10. 48	*Sine* =	9.272726
Then add the two Arith. Compl. and theſe two Sines all into one Sum, and it will make			19.369041
The Half of which will be			9.684520

Which laſt Quantity is the Sine of 28°. 56′. Double thoſe Degrees and they make 57°. 12′. which Sum converted into Time make 3 Hours 51 Minutes; which is the Time that the *Sun* wants of being at the *Meridian*, or it is the Hour of 8 a Clock 9 Minutes before Noon; or 3 a Clock and 51 Minutes after Noon.

ALTO & BASSO, (or *in Alto, & in Baſſo*) in Law ſignifies the abſolute Submiſſion of all Differences, ſmall and great, high and low, to a Judge or Arbitrator.

ALUDELS, are Pots uſed by the Chymiſts in Sublimations: They are without Bottoms and are fitted into one another as many as there is occaſion: At the Bottom (in the Furnace) there is a Pot holding the Matter to be ſublimed; and at the Top there is a Head to receive the Flowers that ſublime up thither.

This is the Figure of them.

a The Head

1, 2, 3, Three *Aludels*.

e The Pot holding the Matter to be ſublimed.

f The Fire-place.

b The Stopple of the Fire-place.

ALVEARIUM, is the Cavity of the inward Ear, near the Paſſage which conveys the Sound, where that yellow and bitter excrementitious Stuff is bred, call'd *Ear-Wax*.

AMAIN; a Word uſed at Sea when a Man of War giveth Defiance to another Ship, or biddeth her *ſtrike* her Topſails or yield; for to bid a Ship *Strike Amain*, is to order her to let fall her Topſails.

AMALGAMATE, a Chymical Term ſignifying the mixing Quickſilver with ſome melted Metal: The Deſign of which is either to render the Metal fit to be extended on ſome Works, as in Gilding, *&c.* or elſe to reduce the Metal into a very ſubtile Powder.

The *Amalgama* of Gold is thus made; Take a Dram of the Regule of Gold, beat it into very thin little Plates, which heat in a Crucible Red hot in a ſtrong Fire, then pour on it an Ounce of pure Quickſilver; ſtir the Matter with an Iron Rod, and when you find it beginning to raiſe a Fume, which will ſoon happen, caſt it into an Earthen Pan filled with Water; it will co-agulate and become tractable. Waſh it often to take away its Blackneſs, and preſſing from it with your Fingers and in a Linen Cloth, that *Mercury* that remains ununited with the Gold. The Gold will retain about thrice its weight of the *Mercury*. If you would reduce the Gold into Powder, put this *Amalgam* into a Crucible over a gentle Fire, and the *Mercu-*

ry

ry will evaporate into the Air, and leave the Gold at the bottom in an inpalpable Powder, which you may melt into its Form again; and if it ſhould retain any Blackneſs from the *Mercury*, *Oil of Tartar per Deliquium* will fetch it off.

For Experiment ſake, you may make a *Luminous Amalgama* after this manner.

Put into a long Vial 10 Grains of the *Phoſphorus* made from Urine, and pour on it two Drachms of Oyl of *Aſpike*: The Glaſs muſt be large enough for two Thirds at leaſt to remain empty. Heat it a little with a Candle, and the *Phoſphorus* will diſſolve with an Ebullition: Whilſt this Diſſolution is making, pour into it half a Drachm of pure Quickſilver, ſhaking the Glaſs that the Matter may be ſtir'd and mix'd. You will have an *Amalgama* which will appear all of a Fire in the Dark; but it muſt, like the *Phoſphorus*, be kept cloſe ſtop'd from Air, elſe it will ſoon be ſpoiled.

If the *Amalgam* of Gold be deſign'd to be ſo hard, as to be fit to be powder'd, you muſt uſe 3 parts of the Metal, and 2 of *Mercury*; but if you would have it ſo ſoft as to ſpread, you muſt uſe 3 parts of *Mercury* to one of the other Metal.

AMANSES, a barbarous factitious Word which ſome of the canting Chymiſts uſe for counterfeit Gems, and precious Stones.

AMAUROSIS, is a dimneſs of Sight, whether the Object be placed near or at diſtance; but ſo that no external Fault appear in the Eye, if you inſpect it never ſo narrowly; the Defect conſiſts in the Obſtruction of the Optic Nerve: It is called alſo *Gutta Serena*. *Blanchard*.

AMBAGES, an idle Circumlocution, or vain connecting together of far fetch'd Words or Sayings, remote from the true purpoſe of the Speaker.

AMBE, is a ſuperficial jutting out of the Bones: Alſo a Chyrurgeon's Inſtrument, with which diſjointed Bones are ſet again.

AMBIDEXTER (in Law) ſignifies that Juror or Embraceor that takes Moneys of both Parties for giving of his Verdict, for which he forfeits ten times as much as he taketh.

And ordinarily, *Ambidexter* denotes that Man that can equally uſe both his Hands.

AMBIENT, encompaſſing round about: Thus the Bodies which happen to be placed round any other Body are called the *Ambient*, and often the *Circum-Ambient* Bodies; and the whole Body of the Air, becauſe it encompaſſes all things on the Face of the Earth, is often by Phyſical Writers called, by way of Eminence, *The Ambient*.

AMBIT, of any Figure in Geometry, is the Perimeter, Circumference or Sum of all the Bounding or Encompaſſing Lines that include it.

AMBLIGONIAL, in Geometry, ſignifies *Obtuſangular*, or that the Sides of any Plane Figure make an Obtuſe Angle one with another. Thus an *Ambligonial Triangle* is that which hath one Obtuſe Angle.

AMBLIOPIA, is a dulneſs or dimneſs of Sight when the Object is not clearly diſcern'd at what diſtance ſoever placed, and proceeds from an imperfect Obſtruction of the Obtick Nerves, a light Suffuſion, want of Spirits, or groſsneſs of the ſame, *&c.* Some reckon 4 kinds of *Ambliopia*, viz. *Myopia*, *Presbytia*, *Nyctalopia*, and *Amauroſis*: Which ſee under thoſe Words. *Blanchard*.

AMBLOTICK *Medicines*, are ſuch as Cauſe Abortion.

AMBUSCADE, a Place where Soldiers hide themſelves to ſurpriſe the Enemy.

AMENDMENT (a Common-Law Term) ſignifying the Correction of an Error committed in a Proceſs, and eſpied before Judgment, but may be amended by the Juſtices after Judgment; and if there be Error in giving Judgment, they may not amend it, but the Party is to put in his Writ of Error.

AMERCEMENT, (a Term in Law) is a Penalty aſſeſs'd by the Peers, or Equals of the Party amerced, for an Offence done.

AMERCEMENT ROYAL, is when a Sheriff, Coroner, or other ſuch Officer of the King is amerced by the Juſtices for Abuſe in his Office.

Blunt makes this Difference between *Amercements* and *Fines*; that the *latter*, as taken for Puniſhments, are Puniſhments certain, which grow expreſly from ſome Statute; and *Amercements* are arbitrarily, impoſed by *Aſſeerors*.

AMETHIST, in *Heraldry*, is the Term for the Purple Colour in the Coat of a Nobleman; which in all Gentlemen's Eſcutcheons below that Degree is called *Purpure*, and in thoſe of Sovereign Princes *Mercury*.

AMITERE LEGEM TERRÆ, a Law Term, ſignifying to loſe the Liberty of ſwearing in any Court, to become Infamous; the Puniſhment of a Champion overcome or yielding in a Fight, or in Battel, and the Jurors found Guilty in a Writ of *Ataint*, and of a Perſon outlawed.

AMNESTY, is an Act of Oblivion; ſuch as was granted at King *Charles*'s Reſtauration.

AMNION or AMNIOS, is the innermoſt Membrane with which the *Fœtus* in the Womb is moſt immediately covered, and with which the reſt of the *Secundines*, the *Chorion*, and *Allantois* is ejected after the Birth; it is whiter and thinner than the *Chorion*. It contains not only the *Fœtus*, but the Nutritious Humour, whence the *Fœtus* by the Mouth and Throat ſucks its Nouriſhment. It is outwardly cloathed with the Urinary Membrane and the *Chorion*, which ſometimes ſtick ſo cloſe to one another, that they can ſcarce be ſeparated: Tho' it is not knit to the *Chorion* in any Place, ſave where the Umbilical Veſſels paſs thro' them both into the *Placenta*. It hath Veſſels from the ſame Origin as the *Chorion*.

Before the *Ovum* is impregnated, this Membrane contains a Limpid Liquor, out of which, after Impregnation, the Embryo is formed. In it (ſays *Gibſon*) reſides the Plaſtick Power, and the Matters alſo out of which the firſt Lineaments of the *Embryo* are drawn; but becauſe its Liquor is ſo very little, there Tranſudes thro' this Membrane the *Amnion*, a part of the Nutritious Albugineous Humour which is contained in the *Chorion*, which it had imbibed out of the *Uterus*, and by the *Juxta*-Poſition or Addition of its Humour to undiſcernible Rudiments of the *Embryo*, it receives its Encreaſe. But tho' the *Amnion* have its additional Nutritious Liquor at firſt only by Tranſudation, yet when the *Umbilical Veſſels* and the *Placenta* are formed, it receives it after another manner; for then its Liquor at firſt being ſeparated from the Mother's Arteries by the *Placenta*, and imbibed by the Umbilical Vein of the *Fœtus*, it paſſes directly to its Heart, from whence, being driven out by the *Aorta*, it is ſent forth again, in good part, by the Umbilical Arteries, out of whoſe Cavities, being plentifully diſperſed thro' the *Amnion*, it iſſues

ſues into its Cavity: juſt as the Juices, which are far more groſs and viſcid than this, do ſometimes critically, and often on taking a Purge, ouze into the Inteſtines out of the ſmall Mouths of the Arteries: Indeed, here the Intervention of the Glands aſſiſt this Matter; but 'tis hoped, ſome curious Perſon one time or other will diſcover, that there are ſuch alſo in the *Amnion*.

AMORTISE (a Term in Law) is to alien Land or Tenements to any Corporation, Guild or Fraternity, and their Succeſſors, which cannot be done without Licence of the King, and the Lord of the Mannor.

AMOUSES, counterfeit Gems, or Precious Stones.

AMPELITE (in Agiculture) is a kind of Black or Bituminous Earth, uſed about Vines, to make them thrive the better.

AMPHIBOLOGY, a Grammatical Figure, when our Expreſſions ſeem to look one way, and are intended another.

AMPHIBLESTROIDES, or the *Tunica Retina* or *Retiformis* of the Eye, is a ſoft, white and ſlimy Subſtance; which is ſo named, becauſe that being thrown in the Water it reſembles a Net; it ſhoots from the very Centre of the Optick Nerve, and conſiſts of the Medullar Subſtance of it, and expanding it ſelf over the *Vitreous Humour*, is extended as far as the *Ligamentum Ciliare*, or the Ligaments of the Eye-lids: This Tunic, in that it is whitiſh and of a marrowy Subſtance, ſeems to proceed from the very marrowy and fibrous Subſtance of the Optick Nerve; ſo that it is, as it were, an Expanſion of Nervous Fibres, which are there gathered into one Bundle, into a Contexture made like a Net; and indeed if the whole Eye were taken for a Flower, growing, as it were, to the Brain by the Stalk of the Optick Nerve, the *Tunica Retina* would be the very Flower it ſelf, and the two other Tunicles, the *Sclerotica* and *Choroides*, be only in the Nature of a Stem. This Tunic ſeems to be the principal Organ of Sight, and receives the viſible Species within the Bed of the Eye much after the ſame manner as a whited Wall, or a piece of a white Paper in a darkned Chamber, receives and repreſents the viſible Species which are intromitted thro' a little Hole: See *Camera Obſcura*.

AMPHIBRACHYS, is the Foot of a Latin Verſe conſiſting of three Syllables, where the two Extreams are ſhort, and the Middle long, as *Amare*.

AMPHIBRANCHIA, are Places about the *Glandules* in the Jaws, which moiſten the *Aſpera Arteria* and *Stomach*.

AMPHIBIOUS, is uſed for an Animal that lives both on Land and in the Water, as an *Otter*, *Beaver*, &c.

AMPHIMACER, is the Foot of a Latin Verſe, conſiſting of three Syllables; the two Extreams long, and the Middle ſhort; as *Caſtitas*.

AMPHIDÆUM, with ſome Writers is the Summit or Top of the Mouth of the Womb. *Blanchard*.

AMPHIPROSTYLE, a Term in Architecture for a kind of Temple of the Ancients, which had four Columns in the Front, and as many in the Face behind.

AMPHISCII; ſo the Inhabitants of the *Torid Zone* are called in reſpect of their Shadows; becauſe their Shadows fall both ways, *viz.* to the South (as ours always do to the Northward) when the Sun is beyond them in Northern Signs, and to the North when the Sun is to the Southward of them in Southern Signs.

AMPHISMELA, is an Anatomical Inſtrument uſed in the Diſſection of Bones.

AMPHITHEATRE, is a Place built for Acting and ſeeing of Publick Spectacles and Stage-Plays: The common Theatre was but ſemicircular, but this was built entirely round, or in a Form of a perfect Circle.

AMPLIATION (in Law) ſignifies a deffering of Judgment till the Cauſe be further examined.

AMPLITUDE of the *Sun* and *Stars*, is an Ark of the *Horizon* intercepted between the true *Eaſt* and *Weſt* Point of it, and the Center of the *Sun* or *Stars* at their Riſing or Setting; and ſo is either *North* and *South*, or *Ortive* and *Occaſive*.

To find the *Sun*'s *Amplitude*, either Riſing or Setting by the Globe, bring the *Sun*'s Place to the *Horizon* either on the *Eaſt* or *Weſt* ſide, and the Degrees from the *Eaſt* Point either *North* or *South*, are the *Amplitude* required.

To find the *Sun*'s *Amplitude* Trigonometrically: having the Latitude and *Sun*'s Declination given.

Say, *As the Co-ſine of the Latitude is to the Radius, ſo is the Sine of the preſent Declination to the Sine of the Amplitude.*

Example, Suppoſe the Latitude to be 51 *deg.* 30 *min.* and the Declination of the ſame 11 *deg.* 50 *min.*

Then, to the Ar. co. of the Co-ſine of	50°. 30'. 0,	2058503
Add the Sine of -----	9,	3118926
Sum is the Sine of -------	9,	5177429

Which is the *Amplitude* required.

AMPLITUDE MAGNETICAL: See *Magnetical Amplitude*.

AMPLIFICATION (in Rhetorick) is a Figurative Speech aggravating a Crime, enlarging in Praiſe of another, inſiſting upon a Relation, *&c.*

AMPUTATION, is the Surgeon's Term for the cutting off any Member of the Body.

AMULET, any thing that is hung about the Neck or any Part of the Body, ſuppoſed to be good againſt Witchcraft or Diſeaſes. Theſe were called anciently *Præbia*, *Apotropæa*, *Phylacteria*, *Amynteria*, *Alexiteria*, and *Alexipharmaca*.

AMUNITION, in the general, is all Sorts of Warlike Stores and Proviſions; eſpecially Powder and Ball.

AMMUNITION-BREAD, in an Army, is that which is provided for and diſtributed to the Soldiers.

AMY (is a Law Term) ſignifying the next to be truſted for an Orphan or Infant.

AMYGDALATE, in Pharmacy, is an Artificial Milk, or Emulſion made of blanch'd Almonds, *&c.*

AMYGDALÆ: See *Tonſillæ*.

ANA, a kind of barbarous Word uſed amongſt the Writers of Pharmacy, and ſignifies that an equal Quantity of thoſe Ingredients with which it is connected, is taken for the Compoſition of any Medicine.

ANABIBAZON, the *Dragon's Head*, or the Northern Node of the *Moon*, where ſhe paſſes the Ecliptick from *South* to *North Latitude*., is ſometimes ſo called.

ANABROCHISMUS, is a way of drawing out the inverted pricking Hairs of the Eye-lids, by means of a Thred of a fine Silk in the Eye of a Needle

Needle, which when you have doubled, you put the Hair thro', and ſo draw it out.

ANABROSIS, is a conſuming or waſting of any Part of the Body by ſharp Humours.

ANACAMPTICK, ſignifies Reflecting; 'tis frequently uſed in reference to Ecchoes, which are Sounds produced *Anacamptically*, or by Reflection: And therefore *Anacampticks* is by ſome taken for *Catoptricks*.

ANACATHARSIS, is a Medicine that diſcharges Nature by ſome of the upper Parts; as a thing that provokes to Vomit, to Sneezing, to Salivation, *&c.* in which laſt Senſe *Hippocrates* uſed the Word, as *Galen* ſaith.

ANACATHARTICK MEDICINES, are ſuch as cauſe Vomiting.

ANACEPHALEOSIS, is a brief Summary or Recapitulation of the Heads of any Matter ſpoken or delivered in Writing.

ANACHRONISM, an Error in *Chronology*, an undue Connexion of Time, or a falſe Chronicling.

ANACLATICKS, a part of *Opticks* which treats of all ſorts of *Refractions*, and is the ſame with *Dioptricks*.

ANACOLLEMA, is a kind of Linement or dry Medicine, to be apply'd to the Forehead or Noſe, in Diſeaſes of the Eyes, or to ſtop Bleeding; alſo a Medicine which will breed Fleſh and conglutinate the Parts.

ANACREONTICK VERSE, is a kind of Verſe conſiſting of ſeven Syllables, without being tied to any certain Law of Quantity; ſo call'd from its Author *Anacreon*, a *Lyrick* Poet.

ANADIPLOSIS (a Figure in *Rhetorick*) when one Verſe begins with the ſame Word the laſt ended with. 'Tis alſo ſometimes uſed in Medicine, for the Redublication of the Paroxyſms or Fits of Feavers; and in this Senſe 'tis call'd by ſome Writers *Epanadiploſis*.

ANADOSIS, is ſometimes uſed for whatever tends upwards in the Body, as a Vomit, *&c.* but moſt uſually for the Diſtribution of the *Chyle* thro' the proper Veſſels.

ANAGLYPHICK ART, is the Art of Carving, Engraving, or Emboſſing.

ANAGOGICAL, the ſame with Myſterious, or which hath an elevated, raiſed, uncommon Signification, or which raiſes the Mind up to Divine Contemplations.

ANAGRAM, is the Tranſpoſition of the Letters of any one's Name, Title, &c. in order to make out from thence ſomething to the Honour of the Perſon. Thus *Galen* by Tranſpoſition is *Angel*, &c.

ANA LEMMA, is a Projection of the Sphere on the Plane of the *Meridian*, *Orthographically* made by ſtrait Lines and *Ellipſes*, the Eye being ſuppoſed to be at an infinite Diſtance, and in the *Eaſt* or *Weſt* Points of the *Horizon*.

To deſcribe the Annalemma.

With 60 Degrees of —— the Line of Chords, deſcribe the *Meridian* $ZHNb$, which is the Primitive Circle.

Then draw the Diameters ZN and Hh at Right Angles one to another: Then will

Hh be the *Horizon*;

P the *North Pole*, elevated above the *Horizon* 51°. 30'.

p The *South Pole*.

Pp The *Axis* of the World.

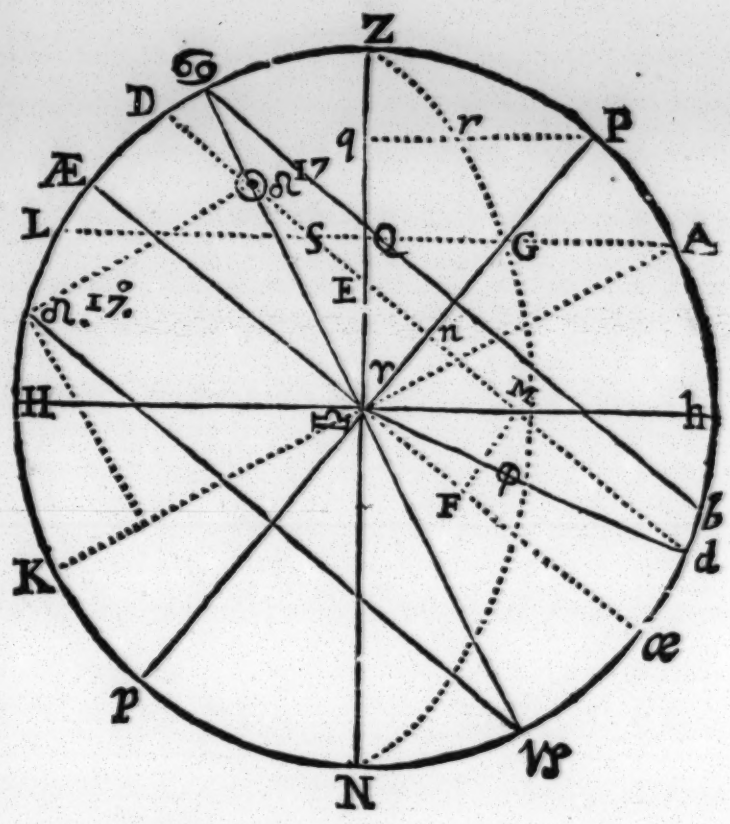
$Æ\ æ$ The *Equinoctial* at Right Angles with Pp.

Z The *Zenith*.

N The *Nadir*.

ZN The *Axis* of the *Horizon*, the *Prime Vertical Circle*, or *Eaſt* and *Weſt Azimuth*.

The *Analemma* for the *Lat.* 50°. 30'. *North*.



At the Diſtance of 23 *Deg.* 30 *Min.* (on the Limb) each way from $Æ$ and $æ$ draw,

$69\ b$ The *Tropick* of *Cancer*.

$♑\ o$ The *Tropick* of *Capricorn*; draw alſo

$69\ ♑$ The *Ecliptick*, and at Right Angles to it

$A\ K$ The *Axis* of the *Ecliptick*.

Let $D\ d$ drawn any where parallel to the *Æquator*, and repreſenting a Parallel of the *Sun*'s *Declination*, or the *Sun*'s *Diurnal Ark* for that Day.

M } the Point of { Riſing or Setting.
D } the *Sun*'s { *Culminating*, or being on the *Meridian*.

Then will $\gamma\ M$ repreſent the *Sun*'s *Amplitude*, and the parts of the Parallel.

$D\ M$ } the *Sun*'s *Semi-* { *Diurnal* / *Nocturnal* } *Ark*.
$d\ M$ }

$n\ ☉$ The like Sine of the *Sun*'s Right Aſcenſion.

$M\ n$ The like *Ark* of his *Aſcentional Difference*.

$H\ D$ The *Sun*'s *Meridian Altitude*.

$L\ A$ A Parallel of Altitude or *Almacanter*.

$\gamma\ Q$ or $\gamma\ q$, the Sine of the *Sun*'s *Meridian Altitude* when he is at L and at D.

To find the Arches of Leſſer Circles, which Mr. *Oughtred* calls *Like Arks*; Say,

As the *Semi-Diameter* of any Parallel is to the like Diſtance in that Parallel, ſo is the Radius of the Primitive Circle to the Sine of the *true Diſtance* from the Center.

So that if by this Method, you will find $n\ M$, the like Sine of the Aſcentional Difference.

To the end of the Parallel $D\ d$, draw the Radius $\gamma\ d$, and from the Point M, draw $E\ \varphi$ parallel to Pp; that Parallel will cut the Legs of the Triangle $\gamma\ d\ n$ proportionably; ſo that

$n\ d : n\ M :: \gamma\ d : \gamma\ \varphi\ (= \gamma\ F)$ the Sine of the Aſcenſional Difference.

If the Sum be in the 17th *deg.* of *Leo*; then he muſt be 47 *deg.* diſtant from the firſt *degree* of *Cancer*.

Wherefore

Wherefore ſet 47 *deg.* on the Limb, from ♋ to ♌ 17, and from thence take the neareſt Diſtance to *k* ♈, the Axis of the Ecliptick, and ſet it from ♈ to ☉ on the Ecliptick, ſo ſhall it be the Sine of the Ark ♌ 17 *k*, 43 *Deg.* or the Sine of the *Sun*'s Diſtance from the next Equinoctial Point.

To deſcribe the *Azimuths*, *Meridians* or *Hour Circles*, which in the *Analemma* are *Ellipſes*.

As ſuppoſe, to draw an *Azimuth* through the Points *Z M N*.

Draw as many Parallels as you will to the *Horizon*, 'twill always be, as

♈ *b* : ♈ *M* : : ♌ λ : ♌ *G* : : *P q* : *q r*, &c.

By this means you may find as many Points as you pleaſe, as *r*, *G*, to deſcribe the *Ellipſes*.

To bring which to practice, ſet the Sector to the Radius of the Parallel, and then from it take the Sine of the *Azimuth*'s Meridian or *Hour Circle*'s Diſtance from the Prime Verticle *Z N*, and ſet it from ♌ to *G*, or from *q* to *r*, &c. which will find you as many Points as you pleaſe, through which the *Ellipſis* muſt paſs.

ANALEPTICKS, are Medicines which cheriſh and renew the Strength; it ſignifies alſo a part of *Hygieina*, or the Art of preſerving Health, whereby weak Perſons are recovered.

ANALOGY, in Mathematicks, is the Compariſon of ſeveral *Ratio's* together, much the ſame with *Proportion*, which ſee. And 'tis frequently uſed in common Diſcourſe for the Word *Proportion*.

ANALOGISM (in Logick) a forcible Argument from the Cauſe to the Effect, implying an unanſwerable Neceſſity.

ANALYSIS, a Reſolution of any thing into its component Principles: Thus a Chymiſt is ſaid to *Analyze* Bodies, when he diſſolves them by the Fire, and endeavours to find out their Conſtituent Parts: And *Algebra* is ſometimes called the *Analytick Art*, becauſe it teaches us to ſolve Queſtions, and to demonſtrate Theorems, by enquiring into the Bottom, into the Fundamental Conſtitution and Nature of the Thing, which is, as it were, reſolved into its Parts taken all to Pieces, and then put together again, that ſo we may ſee into the Reaſon and Nature of it. And in this Senſe *Analytical* Demonſtrations are oppoſed to *Synthetical* ones, which ſee. The Ancients had ſome Knowledge of this Art, but kept it concealed; whoſe Invention *Theo* aſcribes to *Plato*, and he defined it (according as *Vieta* renders it) *Aſſumpti Quæſiti tanquam conceſſi, per conſequentia ad verum conceſſum*; a taking of that as granted, or confeſſed which is enquired after, and thence going back by Conſequences to what is confeſſedly true.

ANALYTICK, in Logick, is a part of that Science teaching to decline and conſtrue Reaſon, as Grammar doth Words. Our famous *Butler* makes his Impertinent Heroe and Scholar *Hudibras*, to be *profoundly skill'd in* Analytick.

ANAPÆST, is a Latin Verſe, whoſe Feet conſiſt of three Syllables, the laſt long and the two firſt ſhort. Such Verſes are called.

ANAPÆSTICK VERSES; they are commonly uſed in *Tragedies*, where are three Feet which are uſed in all Parts of the Verſe indifferently; as,

Caſtos ſequitur mala paupertas,
Titioque potens regnat Adulter.

ANAPHORA, (a Figure in Rhetorick) is the Repetition of the ſame ſound in the beginning of ſeveral Sentences or Verſes.

ANAPLEROTICK MEDICINES, are ſuch as help to fill Ulcers with Fleſh.

ANARCHY, want of all Government in a Nation where there is no Supreme Authority lodged in either Prince or Rulers; but the People live without any Rule or Government at all, and all things are in the utmoſt Confuſion.

ANASARCHA, is a white, ſoft, yielding Tumour of the whole outward Body, or of ſome of its Parts, which dents in by compreſſing the Fleſh; it is cauſed by the Blood upon a double account; firſt, when it doth not rightly ſanguifie or aſſimilate the Chyle; and again, when it is not rightly accended in the Lungs; the Blood thus perverted, pours forth the *Serum* at the Extremities of the Arteries in greater Quantities than it can receive and reduce by the Veins and Lympheducts, or expel by the Veins and Pores, and other Paſſages that ſend it forth. If the Humours be too viſcous, it is called *Leucophlegmatia*. *Blanchard*.

ANASTOMATIQUE, *(Medicines)* are ſuch as open and dilate the Orifices of the Veſſels, and by that means help to make the Blood circulate freely, and paſs eaſily out of the Arteries into the Veins.

ANASTOMOSIS, is an Effluxion of the Blood, the Lympha or Chyle, at the meeting of Veſſels that cloſe not narrowly: It is alſo taken for the mutual opening of Veins and Arteries into one another.

ANATOCISM, is the annual Increaſe or *Intereſt* of Money, whether *Simple* or *Compound*. And under it, they alſo comprehend the Valuation of Annuities. See *Intereſt*.

ANATOMY, is an artificial Diſſection of an Animal, eſpecially Man, whereby the Parts are ſeverally diſcovered and explained, for the uſe of Phyſick and Natural Philoſophy; and he that is skilful in this Art, is called an *Anatomiſt*.

ANCHILE, is the back part of the Knee; alſo the Contraction of a Joint, eſpecially of the *Ham*.

ANCHOR of a Ship, is a thing as well known as the Ship it ſelf, and alſo its uſe; but the Terms of Art uſed at Sea about its ſeveral *Parts*, *Kinds* and *Uſes*, are as followeth.

The Parts of an Anchor are, (1.) The *Ring*, into which the *Cable* is faſtened. (2.) The *Beam* or *Shank*, which is the longeſt Part of the Anchor. (3.) The *Arm*, which is that which runs down into the Ground; at the End of which is, (4.) The *Flouk* or *Fluke*, by ſome called the *Palm*, being that broad and pecked Part, with its Barbs like an Arrow-head, which faſtens into the Ground. (5.) The *Stock*, a Piece of Wood faſtened unto the Beam near the Ring, ſerving to guide the *Fluke*, ſo that it may fall right, and fix in the Ground. There are three kinds of Anchors, the *Kedger*, the *Grapnel*, and the *Stream Anchor*, *(which ſee under thoſe Words)*. The Anchors aboard a Man of War, are, the *Firſt*, *Second* and *Third Anchors*; and two of which being always carried at the *Bow* of the Ship, are therefore called the *Firſt* and *Second Bowyer*: The other, which is the largeſt of all, is called the *Sheet Anchor*, and is their utmoſt Refuge when in a great Streſs of Weather they are forced to ride on a *Lee-Shore*.

When

When the Cable is perpendicular between the *Hawſe* and the *Anchor*, the Anchor is then ſaid to be *a-peek*. When the Anchor hangs right up and down by the Ship's Side, it's ſaid to be a *Cock-Bell* upon the Ship's coming to an Anchor. To put an Anchor down into the Sea, in order to make the Ship *ride*, is called *letting fall or dropping* the Anchor. They ſay an Anchor is *foul*, when by the turning about of the Ship, the Cable is hitched about the *Fluke*. An Anchor is ſaid to *come home*, when it cannot hold the Ship, but that ſhe drives away by the Violence of the Wind or Tide. To *Shooe an Anchor*, is, to put Boards fitted and formed for that purpoſe on upon the *Flukes*, that the Anchor may the better hold in ſoft Ground.

The Shank of an Anchor is to be 3 times the Length of one of its *Flukes*; and a Ship of 500 Tun hath her Sheet Anchor of 2000 Weight; and ſo proportionably for others ſmaller or greater.

ANCHORING, or *Anchorage*, is Ground fitting to hold a Ship's Anchor, that ſo ſhe may ride it out ſafely: The beſt Anchoring Ground is ſtiff Clay or hard Sand; and the beſt riding at an Anchor, is when a Ship is *Landlockt*, and out of the Tide.

ANCHORAGE, (in Law) is a Duty taken of Ships for the *Pool* of the *Haven* where they caſt Anchor; for no Man can let any Anchor fall on the King's Ground in any Port, without paying for it to the King's Officer appointed by Patent.

ANCHYLOPS, the ſame with *Ægylops*: Which ſee.

ANCIENT, is the Flag or Streamer in the Stern of a Ship.

ANCON, is the Top or Point of the Elbow, and is taken alſo ſometimes for the backward and larger ſhooting forth of the *Ulna*.

ANCONÆUS, a Muſcle of the *Cubit*, called ſo by *Riolanus* from its Scituation. It ariſeth Fleſhy from the inferior and back Part of the *Os Humeri*, growing larger as it marcheth between the ſuperior Ends of the *Ulna* and *Radius*, and is inſerted Fleſhy to the lateral Part of the *Brachiæus Externus*, a Thumb's length below the *Olecranum*: It helps to extend the Cubit.

ANCYLOBLEPHARUM, is the growing of the Eye-lids to the *Tunica Cornea*, or to the *Albuginea*, ſo that ſometimes both the Eye-lids grow together.

ANCYLOGLOSSUM, is when the little String under the Tongue is too ſtraitly tied, ſo that there is a Difficulty of uttering the Words.

ANCYROIDES, the ſhooting forth of the Shoulder-Bones in the form of a Beak; which is called *Coracoides*, *Anchoralis* and *Cornicularis*.

ANDRATOMY, is a Diſſection of Human Bodies, as *Zootomy* is of thoſe of Beaſts.

ANDROMEDA, a Northern Conſtellation conſiſting of 27 Stars.

ANDROGYNE, an Hermophradite, which is of both Sexes, or both Male and Female: The ſame with.

ANDROGYNUS, an Hermophradite, or one who is Caſtrate and Effeminate.

ANGLICISM, is the *Engliſh* Idiom, or form of Expreſſion, or manner of Speech which is peculiar to *England*.

ANEMOSCOPE, a Machine invented to foreſhew the Change of the Air or Wind: I have obſerved, that Hygroſcopes made of Cat's-gut (according to the Directions which you will find under that Word) are very nice *Anemoſcopes*, and never fail hardly by their turning the Index about to foretel the ſhifting Wind. But, as *Vitruvius* deſcribes an *Anemoſcope*, it ſhews, that the Ancients rather deſigned it to ſhew which way the Wind blew, than to foretel to what Quarter it would ſhift or change.

AN-JOUR and WAST, is a Forfeiture when a Man has committed petit Treaſon or Felony, and has Lands held of ſome common Perſon, which ſhall be ſeized for the King, and remain in his Hands a Year and a Day next after the Attaindure; and then the Trees ſhall be pulled up, the Houſes razed and pulled down, and the Paſtorage and Meadows plowed up; unleſs he to whom the Lands ſhould come by Eſcheat or Forfeiture, redeem it of the King.

ANEURISM, is a Diſeaſe which is a kind of Dilatation or burſting of the Arteries, always beating, and ſwelling ſometimes to the bigneſs of an Egg, which yields if you compreſs it, but recoils preſently.

The moſt Accurate and Learned Dr. *Tyſon* found in his *Anatomy of the Tajacu* or *Aper Mexicanus*, ſeveral *Aneuriſmata* in the *Aorta* or great Artery, which it ſeems were natural, and which he never ſaw before in the Arteries of any other Animal: Tho' *Malpighius*, as he obſerves, took notice of ſuch in the *Aorta* of Silk-worms.

ANGARIA, a Term in Law, ſignifying any troubleſome or vexatious Duty or Service paid by the Tenant to the Lord.

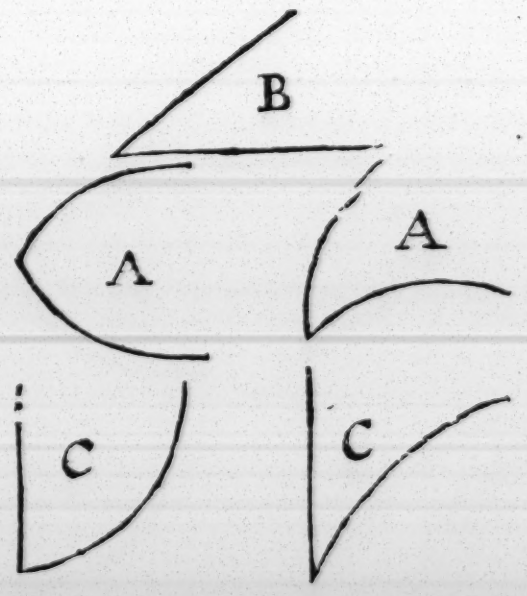
ANGLID, the bare ſingle Valuation or Compenſation of a Man or Thing, according to the legal Eſtimate, from the *Saxon*, *An* one, and *gild* Payment, Mulct, or Fine; ſo *Twigild* was the double Fine, *Trigild* the treble Fine, according to the rated Ability of the Perſon.

ANGIGLOSSUS, one that ſtuttereth, or hath a Difficulty in his Speech of pronouncing *L*, *R*, or *K*.

ANGINA, a *Quinſy* or *Squinancy*, is an Inflammation of the *Jaws* or *Throat*, attended with a continual Fever and Difficulty of Reſpiration and Swallowing; and it is two-fold, either *Spuria* or *Exquiſita*, a baſtard or a true *Squinſie*: The latter is again four-fold, *Synanche*, *Paraſynanche*, *Chynanche* and *Parachynanche*, of all which in their proper Places. *Blanchard*.

ANGLE, in *Geometry*, is either *Plane* or *Solid*.

A *Plane Angle* is the Inclination, Aperture or Diſtance between two Lines meeting in a Point,

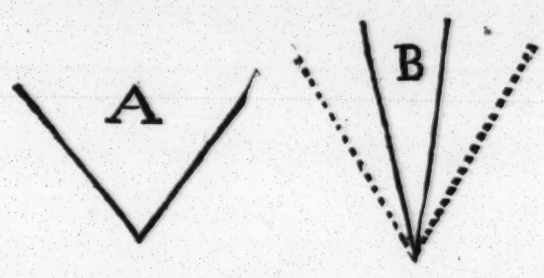


and which, when the Lines forming it (which are

called its *Legs)* are *Right* or *Strait ones*, is called a *Right Lined* or *Rectilineal Angle*, as *B*; but when the Legs are crooked Lines, 'tis called a *Curvilineal Angle*, as *A*; and when one Leg is ſtrait and the other crooked, 'tis called a *Mixt Angle*, as *C*.

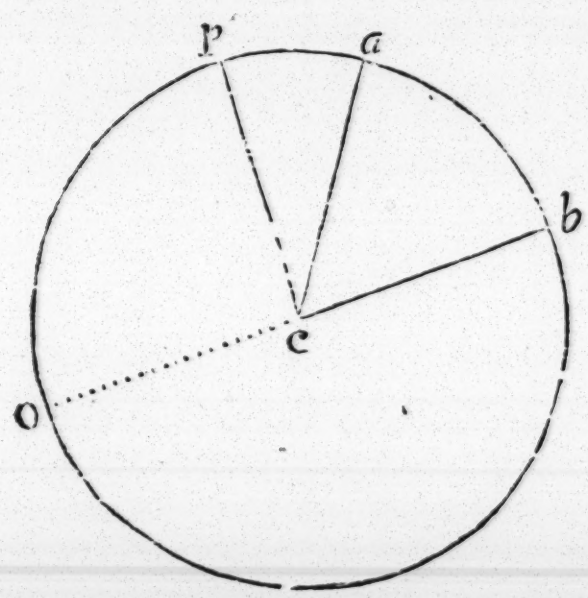
An *Angle* is uſually marked with 3 Letters (eſpecially if there be more *Angles* than one at the ſame Point) wherefore the middle Letter, which is always placed at the Angular Point where the Lines meet, denotes the Angle.

The *Quantity*, *i.e.* the *Greatneſs* or *Smallneſs* of an *Angle*, is by no means meaſured by the Length of its Legs, but by their Diſtance from, or Inclination to each other. Thus the Angle *B* is leſs than *A*, tho' the Legs of *B* are much longer than thoſe of *A*, but then thoſe of *B* are more inclined to each other, than the Legs of the Angle *A*. Which, to conceive the better, imagine



the Angle *A* to be laid upon *B*, as the prick'd Lines about *B* do repreſent; then 'tis plain, the Angle *B* will eaſily be contained within *A*; and therefore is *leſs* than *A*, becauſe its Legs come nearer, or are more inclined towards each other, than thoſe of *A*; and conſequently *A* will be a *greater* Angle than *B*, becauſe its Legs are farther diſtant from each other than the Legs of *B*. If you imagine the Legs to open and ſhut like thoſe of a Joint Rule, or a Pair of Compaſſes, the thing will be very plain.

The Quantity of any Angle is meaſured by the Number of Degrees of the Ark of a Circle intercepted between the Legs of the Angle, whoſe



Center is the Angular Point. Thus the Ark *a b* is the Meaſure of the Angle *a c b*; and if that Ark contain 30 Degrees, the Angle is ſaid to be an Angle of 30 Degrees.

A RECTILINEAL ANGLE is of 3 ſorts.

1. *Right*, when one Leg of the Angle ſtands exactly upright, or perpendicularly on the other, as *p c* doth on *c b*; and inclines no more one way than it doth another. And ſuch a *Right Angle* is ſaid to be an Angle of 90 Degrees, becauſe 'tis meaſured by an Ark that is the 4th part of a Circle (as you ſee in the laſt Figure) and every Circle being ſuppoſed to have its whole Circumference divided into 360 Parts (which are called *Degrees*) the 4th Part of that is 90 Degr. and therefore a Right Angle contains 90 Degr.

2. An *Obtuſe Angle*, as *a c o*, which exceeds or is bigger than a Right one, and is called *Obtuſe*, becauſe its Angular Point is blunt.

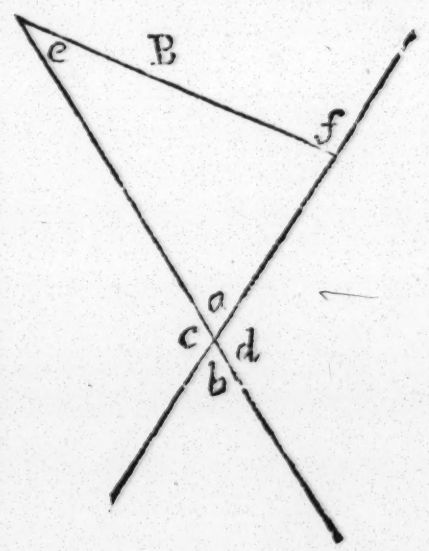
3. An *Acute Angle*, as *a c b*, which is leſs than a *Right one*, and is called *Acute*, becauſe its Angular Point is ſharp. No Angle can contain fully 180 Degrees, for then one Leg falls into the ſame Right Line with the other, and they make the *Diameter* of the Circle *o b*.

Angles alſo receive ſeveral other Denominations according to their ſeveral Poſitions, their Relation to the ſeveral Figures they are in, and the Lines that form them. Some are called

1. *Contiguous*, or *Adjacent Angles*, as *a* and *c*, *c* and *b*, *a* and *d*, &c. which have one Leg common to both Angles, and are both taken together, always equal to two Right ones; for if they are equal, the Obtuſe one will be as much bigger than a Right one, as the Acute one is leſs; and therefore in the whole muſt make juſt two Right. 13 *e* 1 *Euclid.*

Cor. And from hence 'tis plain, that all the Angles that can be made about any Point, are equal but to four Right ones.

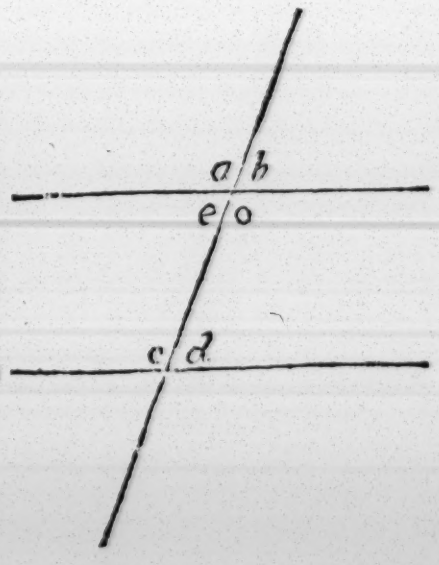
2. *Oppoſite* or *vertical Angles*, as, 1. Thoſe that are made by two Right Lines croſſing each other, and which touch only in their Angular Point. Thus the Angles *a* and *b*, or *c* and *d*, are called *Oppoſite* or *Vertical Angles*, becauſe they are oppoſed *ad Verticem*, or at the Head; and therefore in ſome Books are called *Head Angles*. Theſe are always equal one to another, becauſe each, with the *Contiguous one*, makes two Right Angles.



An Angle alſo in any Triangle is ſaid to be *Oppoſite* to the Side that *ſubtends* it; as the Angle *a* is to the Side *B*. *(Fig. preced.)*

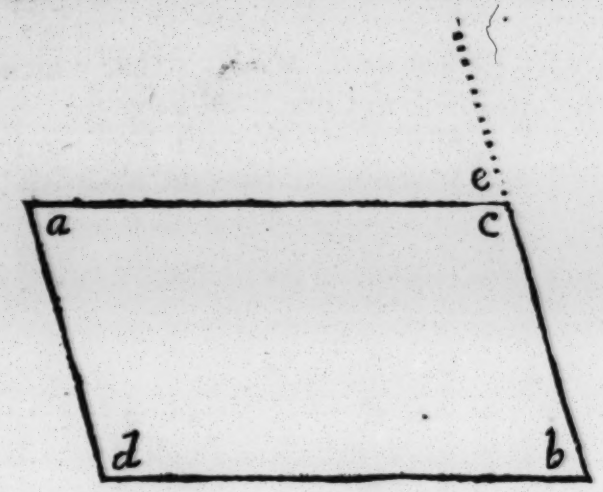
4. In any Triangle, as *a e f* *(ſee the ſame Figure)* the Angle *e* and *a* are called *Internal* and *Oppoſite*, in reſpect of the *External Angle f*, which is equal to them both.

5. If a Line cut two others that are Parallel, the Angles *c* and *d* are called *Internal* and *Oppoſite* alſo in reference to the External one *a* and *b*, to which they are ſeverally equal.



6. The

6. The *Angles a* and *b*, as alſo *c* and *d* in every *Rectangle* or *Parallelogram*, are called the *Oppoſite Angles*; and are always equal to one another,



for the Angle *a* is equal to the Alternate one *e*, and *e* is equal to the Internal and Oppoſite one on the ſame Side *b*, wherefore *a* is equal to *b*; and after the ſame manner may *d* and *c* be proved equal to each other.

ANGLE *of Right Aſcenſion*, is the Angle which the Circle of the Star's *Right Aſcenſion* maketh with the Meridian at the Pole of the World.

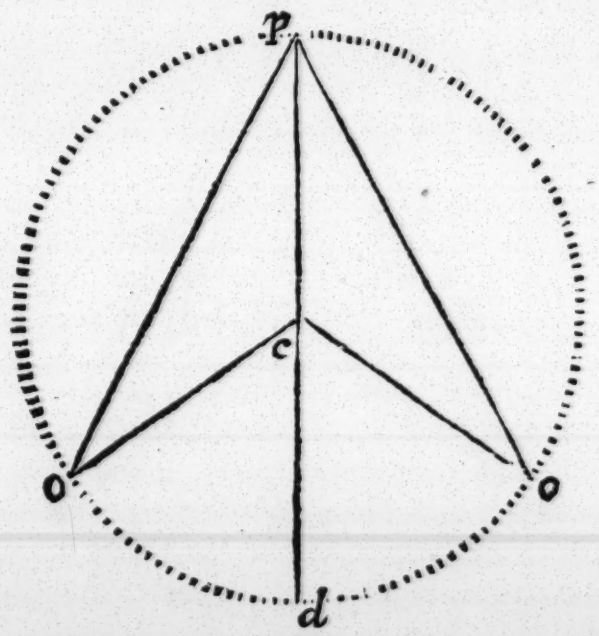
ANGLE *at the Centre of a Circle*, is an Angle made there by two *Radius*'s which meet in the Centre.

Propoſition.

If ſtanding or inſiſting on the ſame Chord, or being in the ſame Segment, two Angles are formed, as *o c d*, *o p d*, one at the Center, and the other at the Circumference: The Angle at the Center is always double of that at the Circumference. Of this there are three Varieties.

1. When one Leg of the Angle is the Diameter of the Circle, then 'tis plain the Angle at the Center *o c d* being external to the Triangle *o c p*, will be equal to *o* + *p* (by 16 *e* 1. *Eucl.*) but *o* = *p*, becauſe the Triangle is an *Iſoſceles* (5 *e.* 1.) wherefore *c* = 2*p*. *Q. E. D.*

Caſe 2.

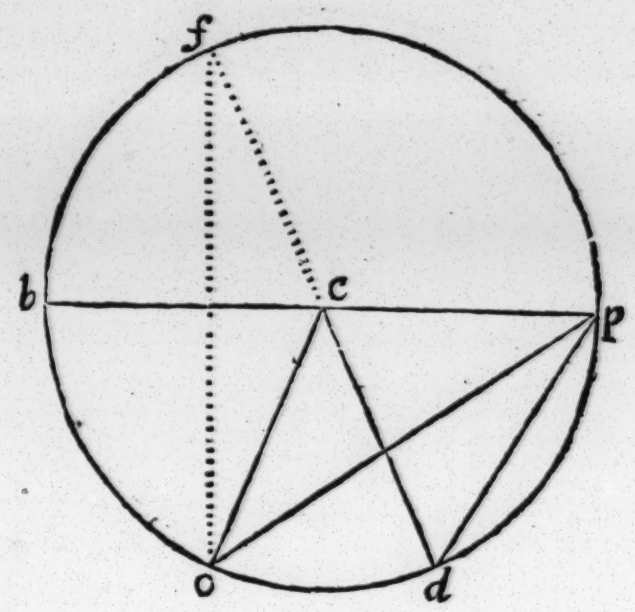


2. When the Diameter divides the two Angles, then 'tis plain, the whole Angle at the Center *o c o* muſt be double to the whole Angle *o p o* at the Circumference, becauſe its Parts are ſeverally double of the Parts of *P* (by the 1*ſt Caſe.*)

Caſe 3. When the Angles fall both on the ſame Side of the Diameter, then 'tis plain the whole External Angle *b c d* is = 2 *c p d*, and the Part *b c o* = 2 *c p o*; wherefore the remaining part *o c d*, the Angle at the Center, muſt be double to *o p d*, the Angle at the Circumference. *Q. E. D.*

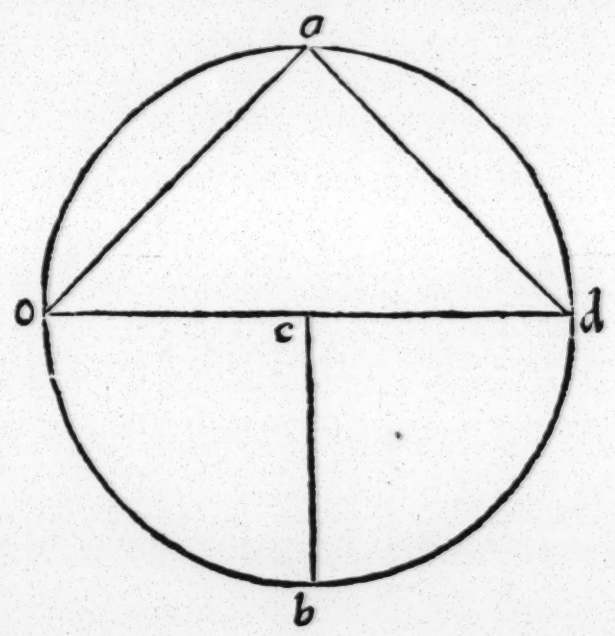
And hence are deducible the following *Corollaries.*

1. All Angles *o f d* and *o p d* ſtanding on the ſame Ark, or being in the ſame Segment, are e-



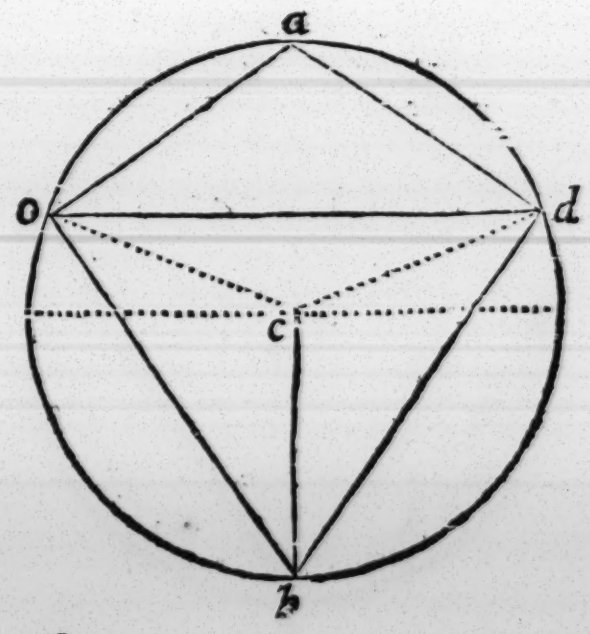
qual, becauſe they are juſt the Halves of the Angle *o c d* at the Center.

2. Hence any Angle at the Center *c* ſtanding on half the Ark *o b* muſt be equal to one at the Circumference *a*, which ſhall ſtand on *o d* the whole Ark, or on the double of the former Ark.



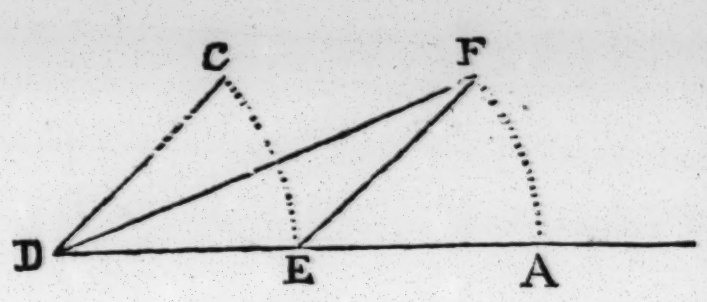
3. And from hence 'tis plain, that every Angle in a Semi-circle, as *a*, muſt be a Right one, becauſe 'tis equal to *c* at the Center, which ſtands on a Quadrant, and is a Right Angle.

4. Wherefore an Angle, as *a*, made in a Segment leſs than a Semi-circle, muſt be *Obtuſe*, becauſe 'tis equal to *o c b*, which is bigger than a Right one.



5. And consequently the Angle *b* made in the Segment *o b d*, which is greater than a Semi-circle, is *Acute*; for the Angle *a* of the Quadrilateral Figure *o a d b* inscribed in a Circle, being *Obtuse*, *b* must needs be an *Acute* one, since the Sum of both is but 2∟s, (by 22 *e* 3 *Euclid.*)

Hence may be drawn this *Problem* for the Bisfection of any Angle or Ark of a *Circle*; as suppose the Angle *CDE*, or the Ark *CE*.



Taking *EA* = *DE*, on the Center *E*, make the Ark *FA* = *CE*, and the Angle *FEA* = *CDE*, then draw *DF*, and that shall bisfect the Ark *CE*, or the Angle *CDE*: For the Angle *FEA* (= *CDE*) is double (because an Angle at the Center) to *FDA* an Angle at the Circumference.

ANGLE *of or at the Center*, in Fortification, is that which is made by the Concourse of two Lines drawn from the Angles of the Figure.

ANGLE *at the Circumference of a Circle*, is an Angle made by any two Chords which meet there in a Point.

ANGLE *of the Circumference*, in *Fortification*, is the mix'd Angle made by the Arch which is drawn from one Gorge to another.

ANGLE *of the Counterscarp*, is made by the two Sides of the Counterscarp meeting before the Middle of the Curtain.

ANGLE *of the Curtain*, or *Angle of the Flank*, is that which is made by or contained between the Curtain and the Flank in any Piece of Fortification.

ANGLE *of the Compliment of the Line of Defence*, is the *Angle* proceeding from the Intersection of the two Complements one with another.

ANGLE DIMINISHED, in Fortification, is that which is made by the meeting of the outermost Sides of the *Polygon*, and the *Face* of the *Bastion*.

ANGLE *of the Ecliptick with the Vertical Circle*, or, as some call it, *Parallactick Angle*, is thus found; As the Tangent of ☉'s distance from *Aries*: Is to *Rad* :: So is the Tangent of his Declination: To the Co-sine of the *Parallactick Angle*.

ANGLE *of Evection*: See *Evection*.

ANGLE *of the Exterior Figure*, or *The Angle of the Polygon*, is that which is formed at the Point of the *Bastion*, by the meeting of the two outermost Sides or Bases of the *Polygon*.

ANGLE *of the Interior Figure*, in Fortification, is that which is made in the Center of the *Bastion* by the meeting of the innermost Sides of the Figure.

ANGLE FLANKING, is that which is made by the meeting of the two *Rasant* Lines of Defence, *viz.* the two Faces of the *Bastion* prolonged.

ANGLE *flanking inward*, is the Angle made by the Flanking-Line and the Curtain.

ANGLE FLANK'D, by some called the *Angle of the Bastion*, in Fortification, is that which is made by the two *Faces*, being the utmost part of the *Bastion* most exposed to the Enemy's Batteries, and therefore by some is called *the Point of the Bastion*.

ANGLE *forming the Flank*, is that which consists of one *Flank* and one *Demi-Gorge*.

ANGLE *forming the Face*, in Fortification, is that which is composed by one *Flank* and one *Face*.

ANGLE *of Incidence*: See *Incidence*.

ANGLE *of Inclination in Opticks*: See *Inclination*.

ANGLE *of Inclination* of the *Axis* of the Earth to the *Axis* of the Ecliptick is 23°. 30, and remains inviolably the same in all Points of the Earth's Annual Orbit.

Mr. *Keil* in his Examination of *Burnet's Theory of the Earth*, hath shewn the great Wisdom of God in thus placing the *Axis* of the Earth Obliquely to the Plane of the Ecliptick; for by that means all those who live beyond 45°. of Latitude, have more of the *Sun's* Heat, take all the Year round; and those who live within 45°. have less than if the Earth moved always in the Equinoctial, *P.* 69, *&c.* And besides, 'tis the Oblique Position that causes all our Diversities of Seasons, and different Degrees of Heat and Cold.

ANGLE *of Longitude*, is the Angle which the Circle of a Star's *Longitude* maketh with the Meridian at the Pole of the Ecliptick.

ANGLE *of the Meridian and Ecliptick*, is found thus; As *Rad*: *T*, of the *Sun's* greatest Declination :: So is the Co-sine of his Longitude or Distance from *Aries*: To the Co-Tangent of the Angle sought.

ANGLE *of the Meridian with the Horizon*, is thus found; As the Co-sine of ☉'s Declination is to *Rad* :: So is the Co-sine of the Elevation of the Equinoctial: To the Sine of the Angle required.

ANGLE *of the Moat*, in Fortification, is that which is made before the *Curtain*, where it is intersected.

ANGLE *of the Parallax*: See *Parallax*.

ANGLE *of the Interval of two Places*, is the *Angle* made by the Lines directed from the Eye to those Places.

ANGLE *of the Sun's Position*, is the *Angle* made by the Intersection of the Ark of the Meridian Line, with an Ark of an *Azimuth*, or any other great Circle cutting thro' the Body of the *Sun*.

ANGLE *of Reflection*: See *Reflection*.

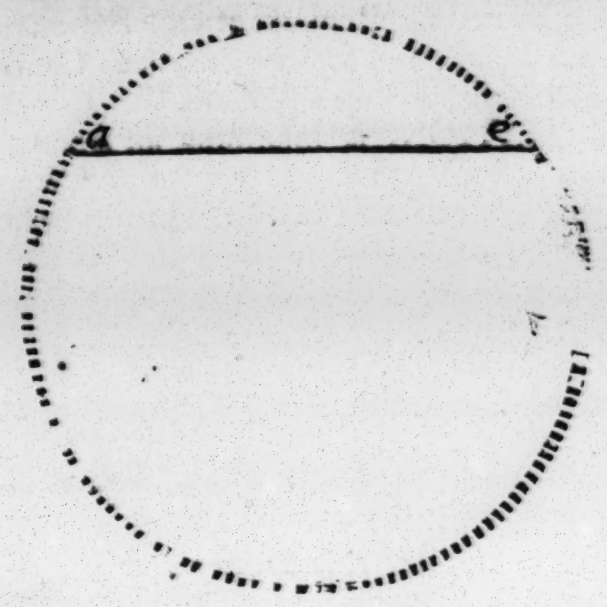
ANGLE *of Reflection*: See also *Incidence*.

ANGLE *of Refraction*: See *Refraction*.

ANGLE *Refracted*, in *Opticks*, is the *Angle* between the Refracted Ray and the Perpendicular.

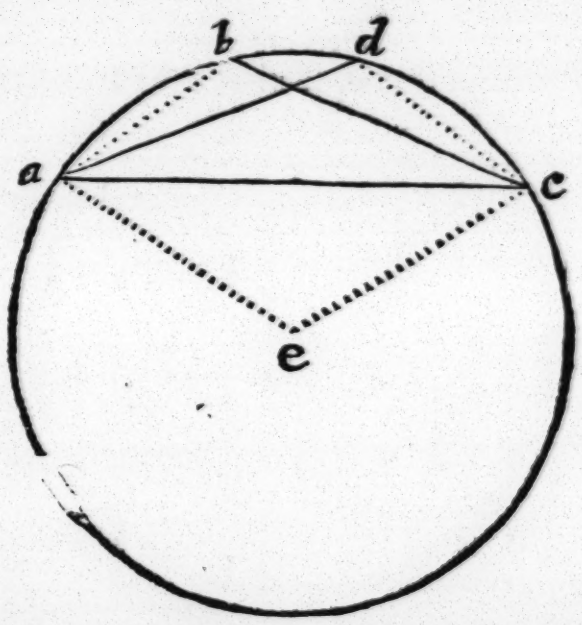
ANGLE RE-ENTRING, or *Re-entrant Angle*, in Fortification, is that which retires inward toward the Place.

ANGLE *of a Segment*, is an Angle made by the Circumference, and a Right Line cutting it:



Thus here the two mix'd Angles, *a* and *e*, made by the Chord, and the Ark, are called *Angles of a Segment*.

ANGLE *in a Segment*, is an Angle made by two Right Lines riſing from the Angles of the *Segment*, and meeting in the Circumference: Thus



the Angle *a b c inſiſting* or ſtanding on the Chord *a e*, and having its Vertex in the Circumference of the Circle, is called *an Angle in the Segment a b c*.

Propoſition.

All Angles in the ſame Segment, or ſtanding on the ſame or equal Arches or Chords, are equal, becauſe they are juſt the Halves of the Angles at the Center ſtanding on the ſame Ark. See *Angles of the Center*.

ANGLE SAILANT, is that which advances its Point towards the *Field*. This is called *Sortant* or *Viff*.

ANGLE *of the Sun's apparent Semi-Diameter in his neareſt Diſtance to the Earth*; *Bullialdus* found it by two Obſervations to be 16 *min.* 45 *ſec.* And the Semi-diameter of the *Moon* he found to be 16 *min.* 54 *ſec.* And the Semi-diameter of the *Earth's Shadow* he found in an Eclipſe of the *Moon* to be 44 *min.* 9 *ſec.*

ANGLE SPHERICAL, is made on the Surface of the Globe or Sphere by the Interſection of two Arks of *great Circles*.

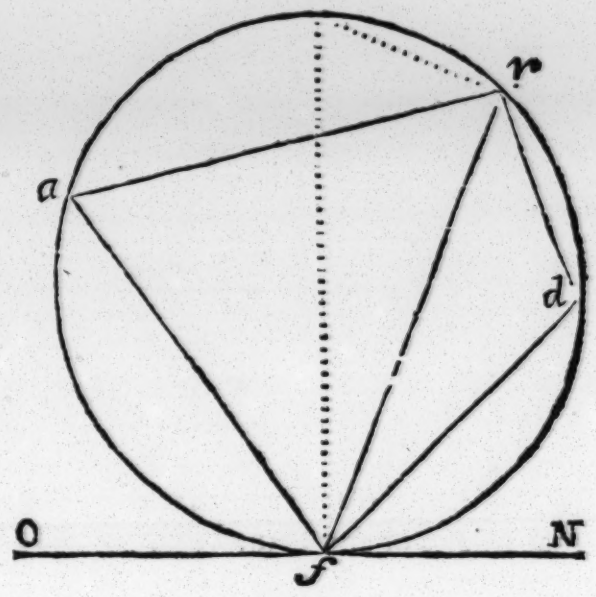
ANGLE *of the Shoulder*, in Fortification, is that which is conſtituted by the Lines of the *Face* and *Flank*.

ANGLE SOLID: See *Solid Angle*.

ANGLE made by a Tangent to a Circle and any Chord drawn from the ſame Point of Contract, is equal to any Angle that can be made in the oppoſite Segment, 32. *e.* 3. *Euclid.*

I ſay, ∟ *r f n* = ∟ *a*.

Draw the Diameter *b f*, and alſo the Line *b r*.



Demonſtration.

Becauſe *f b* is a Diameter, the Angle *b r f* is a Right Angle; wherefore the Angles *b* and *b f r* together muſt be equal to a Right Angle.

Alſo, *b f r* and *r f n* = ∟, becauſe *f n* is a Tangent; therefore take away *b f r* which is common to both, and ⌟ *b* = *r f n*.

But the ⌟ *b* = ⌟ *a*, becauſe in the ſame Segment, wherefore ∟ *a* = ∟ *r f n*. *Q. E. D.*

Alſo, I ſay, ⌟ *o f r* = ⌟ *d*.

Demonſtration.

The ⌟ *o f r* + *r f n* = 2 ∟

And ⌟ *d* + ⌟ *r f d* + ⌟ *f r d* = 2 □

But ⌟ *r f n* = *r f d* + *f r d*.

Therefore taking away *r f n* from both, the ⌟ *d*, will remain equal to the ⌟ *o f r*. *Q. E. D.*

Corollary.

Hence 'tis plain, That the oppoſite Angels (*d* and *a*) of any Quadrilateral Figure inſcribed in a Circle, are equal to two Right Angles.

For *d* + *a* = *o f r* + *r f n* = 2 ∟s.

ANGLE *of the Tenaille*, or the outward *Flanking Angle*, called alſo *Angle Mort* or the *Dead Angle*, *Angle Rentrant* or *Angle Inwards*; is made by the two Lines *Fiſchant*, in the Faces of the two Baſtions extended till they meet in an Angle towards the Curtain; and is that which always carries its Point in towards the Work.

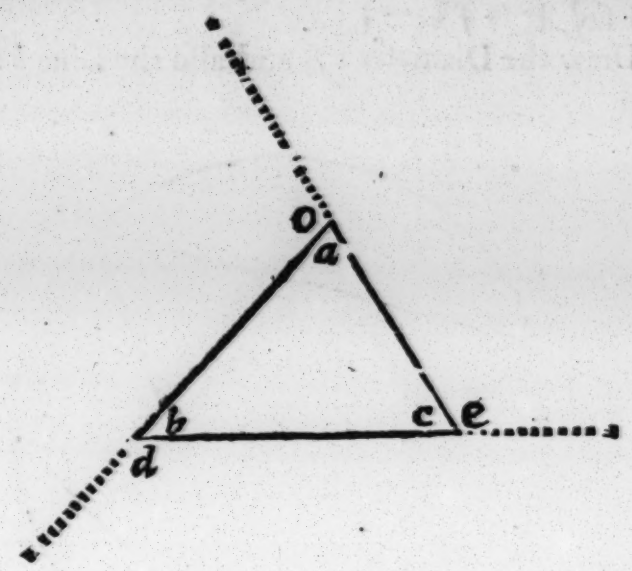
ANGLE *of the Triangle*, in Fortification, is half of the *Angle of a Polygon*.

ANGLES ALTERNATE, are *o* and *c*, as alſo *e* and *d* in Figure, *N.* 5. and are always equal to one another. *See* 3 *Pages back.*

ANGLES *of a Battalion*, are made by the laſt Men at the ends of the Ranks and Files: And two laſt Men of the Front and Rear Ranks, are called { *Front* and *Rear* } *Angles*.

ANGLES EXTERNAL, are the Angles of any Right Lined Figure without it, when all the Sides are ſeverally produced; and they are all taken together, equal to 4 Right Angles: And, in particular, of a Triangle the External Angle *e* is equal

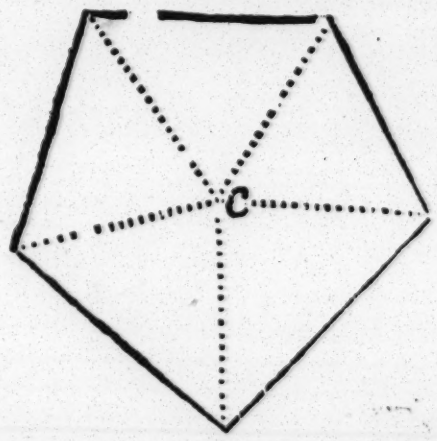
equal to both the Internal and Oppoſite ones *a* and *b*. *See the Demonſtration of which under* Triangle.



And as to the former part, that the Sum of the External Angles of any Plane Figure is = to 4∟s, is plain from hence; that the Sum of all the Angles of any Right-lined Figure both Internal and External, muſt be = to twice as many ∟s as the Figure hath Sides, (by 13. *e.* 1. *Euclid.*) But the *Internal ones* are = to twice as many ∟s as the Figure hath Sides, except 4. (by *Theor.* 1. *Prop.* 32. *e.* 1. *Barrow's Euclid.*) wherefore the External Angles all together muſt be equal to thoſe 4 Right ones.

ANGLES INTERNAL, in general, are all Angles made by the Sides of any Right-lined Figure within. Alſo the two Angles between the Parallel Lines on each Side the croſſing Line, as *o* and *d*, *e* and *c* (in *Fig.* 5.) are called the two *Internal Angles*; and are always equal to two *Right ones*. The *Angles c* and *d* (ſee *Fig.* 5.) are alſo called *Internal* and *Oppoſite Angles* in reſpect of *a* and *b*, as hath been lately ſaid.

The Sum of all the *Internal Angles* of any Right-lined Figure, is equal to twice as many Right Angles as the Figure hath Sides, except 4. For ſince every ſuch Figure from a Point taken within it, can be divided into as many Triangles as it hath Sides, and ſince the Sum of the Angles of each Triangle is equal to 2∟s (32. *e.* 1. *Eucl.*) That will make twice as many ∟s as the Figure hath Sides; from which Sum you muſt take away all thoſe Angles which are about the Point *c*, which (by 13. *e* 1. *Euclid.*) are equal to 4∟s; wherefore the remaining Sum of all the *Internal Angles* is equal to twice as many *Right Angles* as the Figure hath Sides, except 4. *Q. E. D.*



ANGLES OBLIQUE, are ſuch as are either *Obtuſe* or *Acute*, in oppoſition to *Right Angles*.

ANGULAR, is that which relates to or hath *Angles*.

ANHELATION, a Difficulty in fetching one's Breath.

ANHELOTE, a Term in Law, ſignifying that every one ſhould pay according to the Cuſtom of the Country, his reſpective Part and Share.

ANIENTE, a Law Term, ſignifies fruſtrated or made void.

ANIMADVERSION, ſometimes ſignifies Correction, ſometimes Remarks or Obſervations made on a Book, *&c.* and ſometimes ſerious Conſideration and Reflection on any Point.

ANIMATION, is informing an Animal Body with a Soul; thus the *Fœtus* in the Womb is ſaid to come to its *Animation*, when it begins to act like a true Animal; or after the Female that bears it is *Quick*, as the common way of Expreſſion is.

ANIMA HEPATIS, is *Vitriolum* or *Sal Martis*, Vitriol or Salt of Steel, according to ſome Chymiſts.

ANIMA SATURNI, ſignifies (with ſome Chymiſts) the Extract of Lead.

ANIMALS, are ſuch Beings, which, beſides the Power of growing, encreaſing and producing their Like, as Plants and Vegetables have, are endowed alſo with Senſation and Spontaneous Motion.

For the more eaſie and clear Comprehenſion and Diſtinction of the ſeveral kinds of *Animals*, Mr. *Ray* gives two *Schemes* or *Tables* of them: The firſt a general one of all *Animals*; the ſecond a particular one of *Quadrupeds*.

Animals are either
- *Sanguineous*, that is, ſuch as have Blood, which breath either by
  - *Lungs*, having either
    - *Two Ventricles in their Heart*, and thoſe either
      - *Viviparous*.
        - *Aquatick*, as the Whale-kind.
        - *Terreſtrial*, as Quadrupeds.
      - *Oviparous*, as Birds.
    - *But one Ventricli in the Heart*, as Frogs, Tortoiſes and Serpents.
  - *Gills*, as all Sanguineous Fiſhes except the Whale-kind.
- *Exanguineous*, or without Blood, which may be divided into
  - *Greater*, and thoſe either,
    - *Naked*
      - *Terreſtrial*, as naked Snails,
      - *Aquatick*, as the Poulp, Cuttle-Fiſh, *&c.*
    - *Covered* with a Tegument, either,
      - *Cruſtaceous*, as Lobſters and Crab-fiſh.
      - *Teſtaceous*, either,
        - *Univalve*, as Limpets.
        - *Bivalve*, as Oyſters, Muſcles, Cockles.
        - *Turbinate*, as Periwinkles, Snails, *&c.*
  - *Leſſer*, as Inſects of all ſorts.

Viviparous Hairy Animals or *Quadrupeds*, are either
- *Hoof'd*, which are either,
  - *Whole-footed* or Hoof'd, as the Horſe and Aſs.
  - *Cloven-footed*, having the Hoof divided into
    - *Two principal Parts*, called *Biſcula*, either
      - *Such as chew not the Cud*, as Swine.
      - *Ruminant*, or *ſuch as chew the Cud*, divided into
        - *Such as have perpetual and hollow Horns*,
          - *Beef-kind*,
          - *Sheep-kind*,
          - *Goat-kind*,
        - *Such as have ſolid, branched, and deciduous Horns*, as the *Deer-kind*.
    - *Four parts*, or *Quadriſulca*, as the *Rhinoceros* and *Hippopotamus*.
- *Claw'd* or *Digitate*, having the Foot divided into

- *Two Parts* or Toes, having two Nails, as the *Camel-kind.*
- *Many Toes* or *Claws*; either
  - *Undivided*, as the *Elephant.*
  - *Divided*, which have either
    - *Broad Nails*, and an *Human Shape*, as *Apes.*
    - *Narrower, and more pointed Nails*, which in reſpect of their Teeth, are divided into ſuch as have
      - *many Fore-teeth or Cutters in each Jaw*;
        - The *Greater*, which have
          - *A ſhorter Snout and rounder Head*, as the *Cat-kind*;
          - *A longer Snout and Head*, as the *Dog-kind.*
        - The *Leſſer*, the *Vermin* or *Weazle-kind.*
      - *Only two large and remarkable Fore-teeth*, all which are *Phytivorous*, and are called the *Hare-kind.*

ANIMALCULA, are very ſmall Animals, ſuch as by the Microſcope have been diſcovered in moſt Fluids, of which there are prodigious Numbers in Black-Pepper Water, and as I have often ſeen alſo in Water wherein Barley, Oats, and eſpeciall Wheat, hath been ſteeped for about 4 or 5 Days.

ANIMATED MERCURY; ſo Mr. *Boyle* calls a Mercury, which by being impregnated with ſome Subtile, Agile and Spirituous Particles, is rendered capable of growing hot when mingled with Gold; and ſuch alſo he calls *Incaleſcent Mercuries.*

ANIMATED NEEDLE, is one touch'd with a Load-ſtone.

ANI SCALPTORIS MUSCULIPAR, is the Muſcle called alſo *Latiſſimus Dorſi*, from its largeneſs; its Uſe is to draw the Arm backward and downward, and therefore is called *Ani Scalptor*, becauſe it helps to *ſcratch the Breech.*

ANKRED, ſo the Heralds call one of their Croſſes in a Coat of Arms, whoſe Figure is this.

ANNALS, are a Chronological Account of the Remarkable Events of a State, yearly, as the Annals of *Tacitus:* they differ from *Hiſtory*, becauſe this deſcants upon thoſe Events, and on the Cauſes that produced them. The Writer of ſuch an Hiſtory is called an *Annaliſt.*

ANNATES, (a Law Term) ſignifying the ſame with *Firſt-Fruits:* The Reaſon of the Name is, becauſe the Rate of *Firſt-Fruits* paid to Spiritual Livings, is after the Value of *one Year*'s Profit.

ANNIENTED, a Term in Law, ſignifying as much as fruſtrated or brought to nought.

ANNIHILATION, is the deſtroying utterly, or turning of any created Being into nothing.

ANNUA PENSIONE, is a Writ whereby the King having due unto him an Annual Penſion from an Abbot or Prior, for any of his Chaplains (whom he ſhould think for to nominate, being as yet unprovided of ſufficient Liberty) did demand the ſame of the Abbot or Prior; and alſo willed him, for his Chaplain's better Aſſurance, to give him his Letters Patent for the ſame.

ANNUAL EQUATION, or mean Motion of the Luminaries: See *Equation.*

ANNUALIA, formerly a Yearly Stipend aſſign'd to a Prieſt, for keeping the Anniverſary, or otherwiſe for ſaying continued *Maſſes* one Year, for the Soul of the deceaſed Perſon.

ANNUATES MUSCULI, a pair of Muſcles at the Root of the Tranſverſe Vertebra of the Back, deſcribed by Mr. *Cowper*, and called by him *Recti Interni Minores*, becauſe they lie under the *Recti Majores*; and he thinks they may very properly have this Name of *Annuates*, becauſe they ſerve to nod the Head directly forward.

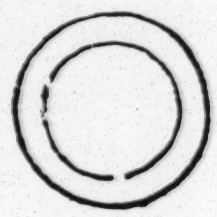
ANNUITY, is a Yearly Rent to be paid for Term of Life, or Years, or in Fee: In Common-Law, the Difference between a Rent and an Annuity is this, That Rent is payable out of Land, Annuity charges only the Perſon of the Grantor. For the Valuation of *Annuities*: See *Intereſt.*

An Annuity cannot be taken for *Aſſets*, becauſe 'tis no Freehold in Law; nor can it be put in Execution on a Statute Merchant, Statute Staple, or Elegit, as a Rent may.

ANNULAR CARTILAGE, the ſecond Griſtle of the *Larynx*, which is encompaſſed by it, as it were with a Ring.

ANNULARIS PROCESSUS, is a Protuberance made by the meeting of the Proceſſes of the *Medulla Oblongata*, under the Side thereof.

ANNULET, a little Ring, which in Heraldry is the Mark of Diſtinction which the Fifth Brother of any Family ought to bear in his Coat of Arms. *Anulets* are alſo part of the Coat-Armour of ſeveral good Families.

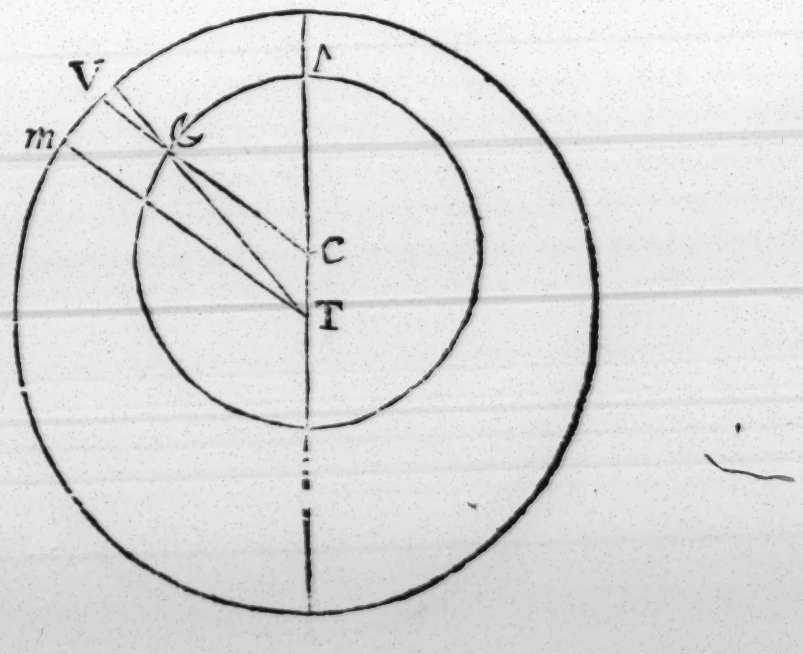


ANNULETS, in Architecture, are ſmall ſquare Parts turned about in the *Corinthian Capital*, under the *Echinus* or Quarter-round.

ANNULAR PROTUBERANCE, is with the Anatomiſts a certain part of an Human Brain lying between the *Cerebellum* and the two backward *Prominences.* The ſame with the *Annularis Proceſſus.*

ANODYNES, (in Medicine) are ſuch Remedies as alleviate or quite take away Pain. They are ſometimes alſo called *Paragoricks*, from the Comfort and Quiet that they procure to the Patient: If they are of ſuch a Nature as to produce Sleep, they are called *Hypnoticks*; if they ſtupify and take away the Senſe of Pain, they are called *Narcoticks.*

ANOMALY, is an Inequality or Irregularity in the Motion of the Planets. In *Phil. Tranſ.* N. 57. you have a way to find it Geometrically



by

by Mr. *Caſſini*. The Word *Anomaly* is ſometimes uſed to ſignify the *Argument* of the Irregularity, and the *Equation* which ſhould adjuſt it. This Irregularity is moſt conſiderable in the *Moon*'s Motion, and it muſt be adjuſted before the exact time of her Conjunction with the Sun can be found, and conſequently an Eclipſe truly calculated.

The *Angle A C ☾*, or its equal *A T M*, is the *Argument* or the *Mean Anomaly* of the *Moon*; and the *Angle A T ☾* is the *True* or *Co-adequated Anomaly*: See *Mercator*'s *Aſtronomy*, P. 69.

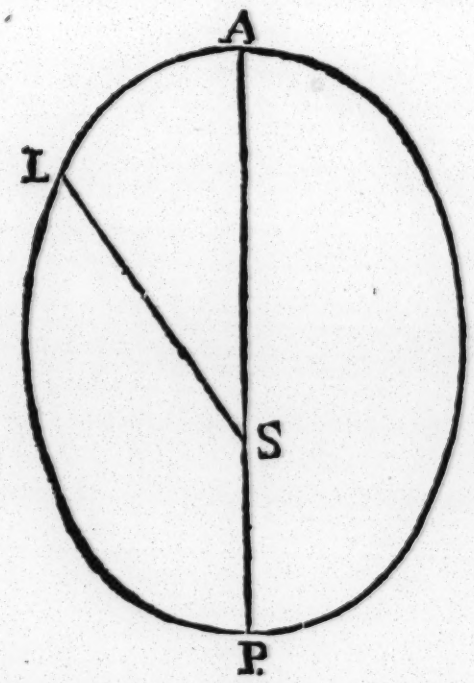
ANOMALY *of the Orbit*, is the Arch or Diſtance of a Planet from its *Aphelion*. The *Mean*

ANOMALY *of the Center*, in the *Ptolemaick Theory* of the Planets, is an Ark of the *Zodiack* of the *Primum Mobile* terminated by the *Linea Apſidum*, and by the Line of the *Mean Motion of the Center*. The *True*

ANOMALY *of the Center*, is the ſame Ark of the *Zodiack* terminated by the Lines of the *Apſes*, and by the Line of the *True Motion of the Center*.

ANOMALY *(true or equal)* of a Planet, is an Ark of the Eccentrick comprehended between the true Place and the *Apogee*.

ANOMALY, *Mean* or *Equable* of a Planet in the *New* or *Elliptical Aſtronomy*, is the *Area* contained under the Line *S L* drawn from the *Sun* to the *Planet*, under *S A* and *L A*, computed from *S A*, in *Conſequentia*, or according to the Natural Order of the Signs. They call it the *Equable*, *Mean* or *Middle Anomaly*, becauſe this *Area* increaſes equably, or in Proportion to the Time of the Planets Revolution round the *Sun* in the *Focus S*.



The *Angle A S L* under the Line of the *Apſes A P*, and the Line *L S*, which is that of the Planets Motion, is called the *Anomaly Co-æquated*, or *True*, in this *Aſtronomy*.

ANOMALY, *(Mean)* of the *Sun* or other Planet, in the old *Aſtronomy*, is an Ark of the Ecliptick between its mean Place and Apogee. This is call'd the *Argument*.

ANOMALY, is alſo uſed by the Grammarians, and is apply'd to ſuch Words as do not in their Formation or Variation, agree with a common Rule; as *do*, *dedi*, *datum*, where the *Imperfect Tenſe* and the *Participle* are both *Anomalous*, that is, *Irregular*.

They reckon 4 kinds of *Anomalous Nouns*, *Hetrogeneous*, *Heteroclites*, *Deficients*, and *Redundants* or *Abundants*, which ſee.

ANOMALOUS, is the ſame with *Irregular*, and is ſpoken of a Motion in the Planets that is Unequal or Irregular.

ANONYMOUS, *Nameleſs*, to which no Name is affixed. Mr. *Boyle* finding by Experiment, that a Spirit was ſeparable from *Tartar*, and ſeveral *Woods*, which in many Qualities differed both from the *Vinous*, *Acids*, and *Urinous ones*, and having not fully diſcovered its Nature, he called it by this Name *Anonymous*, and ſometimes the *Neutral* or *Adiaphorous* Spirit of *Tartar*, *Wood*, &c.

ANOPSY, is want of Sight, or Blindneſs.

ANOREXY, is a loathing of Meat, ariſing from an ill Diſpoſition of the Stomach.

ANOYSANCE, the ſame with *Nuſance*.

ANSES or ANSÆ, the ſame with the *Ring of Saturn*; ſo called, becauſe they ſometimes appear like Handles to the Body of the Planet. See *Ring*.

Anno 1668, *Auguſt* 17*th*, 11 *h*. 13*m*. *P. M.* Mr. *Hugens* and Mr. *Picart*, by the Help of a 21 Foot *Teleſcope*, found the Inclination of the great *Diameter* of the *Ring of Saturn*, with the *Equator*, to be about 9 *Degrees*; whence they inferred, the *Angle* of the Plane of the Ring, with that of the *Ecliptick*, muſt be about 31 *Deg*. See *Saturn*.

ANTAGONIST, he that in Diſputation, or Arguing oppoſes another.

ANTAGONISTA, is a Muſcle placed oppoſitely to another; as may be ſeen betwixt the *Adductor* and *Abductor*, that which contracts, and that which expands the Arm.

ANTANACLASIS, a Figure in Rhetorick, where the ſame Word in appearance is repeated in a various Signification.

ANTAPHRODITICK MEDICINES, are ſuch as are uſed for the *French Pox*.

ANTARES, the *Scorpion's Heart*, a fix'd Star of the firſt Magnitude in the Conſtellation *Scorpio*; its Longitude is 245. 13′. Latitude 4°. 27.

ANTARTICK POLE, is the *Southern Pole*, or End of the Earth's *Axis*; 'tis ſo called becauſe oppoſite to the *Arctick* or *North Pole*.

ANTARTICK CIRCLES: See *Polar Circles*.

ANTARTHRITICK MEDICINES, are ſuch as are uſed againſt the Gout.

ANTASTHMATICK MEDICINES, are ſuch as are uſed againſt the *Aſthma*.

ANTECEDENCE IN, or *in Antecedentia*: The Aſtronomers ſay, a Planet is in *Antecedence*, when it appears to move contrary to the uſual Courſe or Order of the Signs of the *Zodiack*, as when it moves from *Taurus* towards *Aries*, &c. but if it go from *Aries* to *Taurus*, and thence to *Gemini*, &c. they ſay, it goes *in Conſequentia*, or *in Conſequence*.

ANTECEDENT, (in Logick) is the firſt of the two Propoſitions in an *Enthymema*, as the latter is called the *Conſequent*.

ANTECEDENT, in Mathematicks, is the former of two Terms in Proportion, or that which is compared with the other; thus, if the Proportion were of *A* to *B*, *A* is ſaid to be the *Antecedent*.

ANTEMETICKS, are Medicines given againſt Vomiting.

ANTES, in Architecture, are ſquare Pilaſters which the Ancients uſed to place at the Corners of the Walls of their Temples.

ANTESTATURE, is a ſmall Retrenchment made of *Palliſadoes*, or Sacks of Earth ſet up in haſte to diſpute with the Enemy the remainder of a

Piece

piece of Ground, part whereof hath been already gained.

ANTHELIX, is the Protuberance of the Ear, or the inward Brink of the outward Ear, being a Semicircle within the *Helix*, and almoſt parallel to it.

ANTHELMINTICKS, are ſuch Medicines as deſtroy Worms.

ANTHERÆ, are thoſe little Tops or Knobs which grow on the Tops of the *Stamina* of Flowers, and are oftner called *Apices*: which ſee. Mr. *Ray* Engliſhes them *Chives*.

ANTHOLOGY, is a Diſcourſe or a Treatiſe of Flowers, or the Art of a true Floriſt.

ANTHRACOSIS OCULI, is a corroſive ſcaly Ulcer in the Eye, attended with a general Tumour, eſpecially of the Parts about the Eye.

ANTHRAX, *Carbo*, *Pruna*, or *Carbunculus*, is defined to be a Tumour that ariſes in ſeveral places ſurrounded with hot, fiery, and moſt ſharp Pimples, accompanied with acute Pains, but without ever being ſeparated; and when it ſpreads it ſelf farther, it burns the Fleſh, throws off Lobes when it is rotten, and leaves an Ulcer behind it, as if it had been burnt in with an Iron. *Blanchard*.

ANTIAS, in the plural *Antiades*, are the Glands called the *Tonſills* or the Almonds of the Ears.

ANTIAPHRODITICKS, are Medicines that lay Luſt.

ANTIARTHRITICKS, are Medicines againſt the Gout.

ANTIASMATICKS, Remedies againſt ſhortneſs of Breath.

ANTIBACHIUS, is a Latin Verſe whoſe Feet conſiſts of three Syllables, the two firſt long, and the laſt ſhort.

ANTICARDIUM, the ſame with *Scrobiculus Cordis*.

ANTICTHONES, the ſame with *Antipodes*.

ANTICKS, in Architecture, are certain carved Works repreſenting divers odd Shapes of Men, Beaſts, Birds, Fiſhes, Flowers, *&c.* which being rudely determin'd and form'd one out of another, ſerve as an Ornament to the whole Fabrick, and afford a grateful Variety to the Eye of the Beholder.

ANTIDILUVIAN, is whatever was before *Noah*'s Flood: Thus thoſe Generations from *Adam* which were before the Flood, are called the *Antidiluvians*, as thoſe ſince deſcended from *Noah* are called the *Poſt Diluvians*. The Earth that then was before it was deſtroyed by the Flood, and which the ingenious and learned Dr. *Tho. Burnet* conceives to have been very different from ours in Form, Conſtitution, Figure and Situation, is called the *Antidiluvian Earth*.

But Dr. *Woodward* in his *Natural Hiſtory of the Earth*, undertakes to prove from a Series of Obſervations carefully made,

1. That the Face of the Earth before the Deluge was not as the Theoriſt imagines, *Smooth*, *Even*, and *Uniform*, but as it is now, Unequal, diſtinguiſhed into Mountains, Valleys and Plains, as alſo having a Sea, Lakes and Rivers.

2. That this Sea was *Salt* as ours is, *agitated by Tides repleniſhed* with *Fiſhes* of all kinds, and that the Ocean then was nearly of the ſame Extent, and poſſeſs'd an equal ſhare of the Globe with the preſent one.

3. That the *Antidiluvian Earth* was ſtock'd with Vegetables and Animals on all ſides and in all Parts of it quite round the Globe; had both Metals and Minerals in it; had the ſame Poſition in reſpect of the *Sun* which ours now hath, its *Axis* being not parallel, but inclin'd as at preſent, to the Plane of the Ecliptick; and conſequently there were then the ſame Succeſſion of Heat and Cold, Wet and Dry, and the ſame Viciſſitudes of Seaſons, *Spring*, *Summer*, *Autumn* and *Winter*, as there are now.

ANTIDOTE, a Medicine againſt deadly Poiſon.

ANTIEPILEPTICKS, are Remedies againſt the Falling ſickneſs.

ANTIEMETICKS, Remedies that ſtop Vomiting.

ANTI-HECTICUM POTERII, or *Jupiter*'s *Diaphoretick*, is a *Chymical* Medicine made by the Mixture of *Tin*, the Martial Regulus of *Antimony*, and fixed by *Salt-Petre*. See the Operation in *Lemmery*'s *Chymiſtry*, laſt Edit. p. 117.

ANTIHYPNOTICKS, Medicines that drive away Sleep.

ANTI-HYPOCHONDRIACKS, are Medicines uſed againſt the *Hypochondriack Melancholly*.

ANTI-LOGARITHM, the Complement of the Logarithm of any *Sine*, *Tangent*, or *Secunt* to 90. *De*.

ANTI-LOGY, is a Contradiction between any Words or Paſſages in any Author.

ANTI-METRICAL, is whatever is contrary to the Nature and Order of Metre or Verſe.

ANTIMONIUM DIAPHORETICUM, is made of one part of *Antimony* and 3 of *Salt-Petre*, powdered and mixed together, and thrown Spoonful by Spoonful into a red hot Crucible, a Detonation will follow each Spoonful; when all is put in, continue a great Fire about the Crucible for about two Hours; then throw the white Matter into an Earthen Veſſel of fair Water, and leave it ſteeping warm for about two Hours, that all the *Salt-Petre* may be diſſolved; then pour off the Liquor gently, and waſh ſeveral time the white Powder at the Bottom; which is the *Calx of Antimony*, or *Antimonium Diaphoreticum*. Some uſe it as a *Diaphoretick*; but *Lemmery* ſaith, he could never find it would raiſe a Sweat.

ANTIMONIUM MEDICAMENTOSUM, is a Preparation conſiſting of 5 Ounces of *Antimony*, 1 Ounce of *Salt of Tartar*, and 4 Ounces of *Salt-Petre* fluxed together into a *Regulus*, which is aftewards powdered and waſh'd.

ANTIMONIUM RESUSCITATUM, is made of equal parts of *Antimony* and *Sal Armoniack* ſublimed together three times; then the Sublimate is waſh'd with diſtill'd Vienegar warm to get out the Salts.

ANTINEPHRITICK, is a Medicine good againſt the Stone.

ANTINOMASY, is a Figure in Grammar, or rather Rhetorick, whereby an Appellative is uſed inſtead of a proper Name; as the *Philoſopher* inſtead of *Ariſtotle*, &c. and whatever is thus delivered or ſpoken, is ſaid to be ſo delivered or ſpoken *Antonomaſtically*.

ANTINOMY, is a Contradiction between two Laws.

ANTIÆCI, are ſuch Inhabitants of the Earth as dwell one againſt another in the ſame Semicircle of the ſame Meridian, and in the ſame De-

gree of Latitude, but one *North*, the other *South*. These have Noon and Midnight at the ſame time, but the Seaſons of the Year are contrary; as when the *Northern Antiæci* have their *Summer*, the *Southern* have *Winter*, &c. In one Word, they live under the ſame Meridian, but oppoſite Parallels.

ANTIPAGMENTS, (in *Architecture*) are the Garniſhing of Poſts or Pillars.

ANTIPASIS, the ſame with the *Revulſion* of a Diſeaſe, when the Humours flowing into ſome one Part, are turned back again, and forced to take ſome other Courſe.

ANTIPERISTASIS, according to the Peripateticks, is a certain Invigoration of the Internal Heat of any Body, by its being invironed all round with Cold. They inſtance in Lime growing hot on the Effuſion of cold Water, *&c.*

ANTIPERISTALTICK, is a Motion by which the Excrements of the Guts are carried upwards inſtead of downwards, which is the uſual and natural *Periſtaltick Motion*. See that Word.

ANTIPHARMACUM, the ſame with *Antidote*, is a Medicine that expels Poiſon.

ANTIPHRASIS, a figurative Speech, having a contrary Meaning to what it carries in Appearence.

ANTIPILEPTICKS, are Medicines againſt the Falling-Sickneſs.

ANTIPODES, are ſuch Inhabitants of the Earth as live diametrically oppoſite to one another, that is, in Parallels of Latitude equally diſtant from the Equator, but one *North*, the other *South*; and under the ſame Meridian, though 180°. or juſt half of that Meridian diſtant from one another.

ANTIPRÆDICAMENTS, in Logick, are ſuch Notions as are previouſly neceſſary to underſtand the Doctrine of the Prœdicaments; ſuch as the Definitions of Univocal, Equivocal, and Denominative Terms, *&c.*

ANTIPTOSIS, a Figure in Grammar, wherein in one Caſe is put for another.

ANTISCII, is a Term in Geography, ſignifying ſuch Inhabitants of the Earth as live in two Places oppoſite to one another, one on the *North*, the other on the *South* Side of the *Æquator*; ſo that their Shadows at Noon fall different ways, one directly oppoſite to the other.

ANTISCORBUTICK, are Medicines againſt the *Scurvy*.

ANTISTROPHE, is a Figure in Grammar, whereby two Terms of Things which are mutually independant one upon another, or reciprocally converted; as if one ſhould ſay, the Maſter of the Servant, and the Servant of the Maſter.

ANTISPASMODICKS, are Remedies againſt Convulſions.

ANTITHENAR, one of the Muſcles that extends the Thumb.

ANTITHESIS, in Rhetorick, is a ſetting two things by way of Oppoſition one againſt anothet, that ſo the Excellence of one, and the Evil and the Folly of the other may the better appear.

ANTITRAGUS, a little Prominence at the lower end of the *Antihelix*, ſeated oppoſite to the *Tragus*, whence it has its Name.

ANTÆCI, the ſame with *Antiæci*, which ſee.

ANTONOMASIA, (a Trope in Rhetorick) is when the proper Name of one thing is applied to ſeveral others; or on the contrary, the Name of ſeveral things to one.

By this *Trope* we call any voluptuous Perſon a *Sardanapalus*, and any cruel Perſon a *Nero*, for the one was a voluptuous King, and the other a cruel Emperor,: Or when we ſay, the *Philoſopher* has prov'd it in his *Metaphyſicks*; The *Orator* gives this Precept in his *Rhetorick*; we mean *Ariſtotle* and *Cicero*.

ANUS, is the Extrimity of the *Inteſtinum Rectum*; it conſiſts of three Muſcles, two called the *Levatores*, which diſtend and open the *Anus* in order to diſcharge the Excrements; and one called the *Sphincter*, which ſhuts it and keeps it ſo. There is alſo a Cavity in the Brain called *Anus*, which ariſes from the four Trunks of the *Spinal Marrow*; and by ſome the Skin which goes over the Navel, in aged Perſons becoming wrinkled, is called *Anus*.

AORTA, or *great Artery*, ſo called becauſe it is the greateſt Artery in the whole Body, from which all others (except the *Pulmonary*) are deriv'd: It riſes immediately out of the left Ventricle of the Heart, and at its riſe hath three *Valves*, which have the ſame Uſe and Figure as the *Semilunares* in the *Arteria Pulmonaria*. As ſoon as the *Aorta* comes out of the Heart, it aſcends a little upwards, and then turns downwards to form the deſcending Trunk, becauſe the Blood might offend the Brain, if it ran with that impetuoſity with which it's thrown out of the Heart; and from the upper ſide of this turning, the *Cervical* and *Auxillary* Veſſels do ariſe: By this Artifice, as the Blood collides againſt the ſides of the *Aorta*, its force is broken, part of it is taken in by the Mouth of the aſcending Branches, but its greateſt part is directed downwards. At the riſe of the *Coronariæ* out of the *Aorta*, there is a *Valve* placed that permits the Blood to flow out of the great Artery into them, but hinders its reflux. When it has pierced the *Pericardium* and bended a little Arch-ways backwards, it is divided into two Trunks, whereof the one is called *Truncus Aſcendens*, the other *Deſcendens*.

The *Aorta* hath four *Tunicks*, a *Nervous*, a *Glandulous*, a *Muſcular*, and a *Membranous* one, which is the *Internal*. See *Arteries*.

APAGOGICAL DEMONSTRATIONS, are ſuch as do not prove the thing directly; but ſhew the impoſſibility and abſurdity which ariſes from denying it; and therefore 'tis uſually called *Reductio ad impoſſibile, vel ad Abſurdum*.

APATHY, is an utter want of Paſſion.

APEPSIE, bad Digeſtion or rawneſs of Stomach, when there is no good Concoction of the Aliments.

APERIENS PALPEBRAM RECTUS, is a Muſcle ſo called from its ſtreight Progreſs and Uſe. It ariſes ſharp and fleſhy from the profoundeſt Part of the *Orbit*, near the Place where the Optick Nerve is tranſmitted, paſſing directly over the *Muſculus Attollens*, it becomes Tendinous as it marches over the Bulb of the Eye, whence growing ſtill broader and thinner, till it is inſerted to the whole ſuperiour part of the upper Eyelid.

APERITIVE MEDICINES, or ſuch as open the obſtructed Paſſages in the ſmall Veſſels, *Glands* or *Pores*, and by that means promote a due Circulation of the contained Juices.

APERTURA FEUDI, a Term in the Civil-Law, ſignifying the loſs of a *Feudal Tenure* by Default

Default of Iſſue of him to whom the *Feud* was firſt granted or given.

APERTURE, in ſome Writers of Geometry is the Inclination of one Right Line to another, which meet in a Point and form an Angle. And 'tis ſo called, becauſe the Angle is the *opening* of the Legs of the Angle, like thoſe of a Joint Rule.

APERTURE, in Opticks, is the Hole next to the Object Glaſs of a Teleſcope or Microſcope, thro' which the Light and Image of the Object comes into the Tube, and thence is carried to the Eye. Mr. *Auzout* ſaith, he found that the *Apertures* of Teleſcopes, ought to be nearly in a Subduplicate Proportion of their Lengths.

The viſible *Area* of an Object, is not encreaſed or diminiſhed by the greater or leſſer *Aperture* of the Object Glaſs; all that is effected thereby, is the admittance of more or leſs Rays, and conſequently the more bright or obſcure appearance of the Object. When you look at *Venus* thro' a Teleſcope, you muſt uſe a much leſs *Aperture* than for the *Moon*, *Jupiter* or *Saturn*, becauſe her Light is ſo vivid and glaring.

APETALOUS *Flowers* or *Plants*, are by the Botaniſts accounted ſuch as want the fine coloured Leaves of Flowers which they call *Petala*: Theſe Flowers are otherwiſe called *Stamineous*, and are juſtly reckoned *Imperfect*.

APEX, is the top, point, uppermoſt or ſharpeſt part of any thing.

APHÆRESIS, in Grammar, is that Figure which takes away a Letter or a Syllable from the beginning of a Word.

In Surgery, is that part which teaches to take away Superfluities.

APHELIUM, or *Aphelion*, or *Auge* in the *Copernican Hypotheſis*, is that point of the Earth's or any other Planet's Orbit, in which it is the fartheſt diſtant from the *Sun* that it can ever be; and when 'tis at its neareſt diſtance, it is ſaid to be in its *Perihelion*.

Sir *Iſaac Newton* proves the *Aphelia* of the Planets as well as the Nodes to be at reſt, *Prop.* 14. *Book* 3.

In Philoſ. Tranſ. N. 128. is a ſtrict Geometrical Method for finding the *Aphelia* of the Planets by Mr. *Halley*.

APHORISM, is in a general Rule, or eminent but ſhort Obſervation, experienced for a Truth in any Art, or relating to Practice.

APHTHÆ, are Wheals, Ulcers or Pimples about the Internal Parts of the Mouth; as alſo about the Ventricle and Guts, which when they come to be ripe, fall off by piece-meal, and are often accompanied with a Fever in thoſe of riper Years. Infants are often ſubject to the *Aphthæ*, they begin in the Gums, and by degrees ſpread over the whole Palate and Mouth; if they ſeize the Epiglottis and the upper parts of the Throat, the Child ſeldom recovers. Theſe are called *Aphthæ* of *Celſus*.

APICES, of a Flower, are thoſe little Knobs that grow on the Tops of the *Stamina*, in the middle of the Flower: They are commonly of a dark purpliſh Colour. By the Microſcope they have been diſcovered to be, as it were, a ſort of *Capſulæ Seminales* or *Seed Veſſels*; containing in them ſmall Globular, and often Oval Particles, of various Colours, and exquiſitely formed, as I have often with Admiration obſerved my ſelf: In the Plant called *Germanium Robertianum* or *Herb Robert*, theſe *Apices* are of a deep purple Colour, and the Pulviſcular Matter within of a glorious Yellow; they are exquiſitely Spherical, and afford a very pleaſant Proſpect in the Glaſs.

What the Uſe of theſe ſo finely elaborated Particles is, is not yet, that I know of, diſcovered: Some have gueſſed it to be a kind of *Male-Sperm*, which falling down into the Flower, they will have to help, fœcundate and ripen the Seed; but this I take to be a meer Fancy.

APNOEA, a Depravation and Diminution, or an entire Suppreſſion of Breathing, at leaſt to Senſe, as it happens in Swoonings, Fits of the Mother, and Strong Apoplexies.

APOCHYLISMA, is any Juice boiled and thickened with Honey or Sugar into a kind of hard Conſiſtence. This is called alſo *Rob. Rubab*, and *Succago*.

APOCOPE, a Figure in Grammar, wherein the laſt Letter of a Word or Syllable is cut off.

APOCROUSTICKS, are (according to ſome Phyſicians) ſuch Medicines as hinder the Influx of the Humours to any particular part of the Body, and reject thoſe which are beginning to flow thither.

APODICTICAL *Argument* or *Syllogiſm*, ſignifies a plain Proof or Demonſtration of a thing.

APODICTICK, the ſame with *Apodictical*.

APODIOXIS, a Figure in Rhetorick, wherein any Argument or Objection is with Indignation rejected as abſurd.

APOGEE or APOGÆUM, in Aſtronomy, is the fartheſt diſtance that any Planet can be at from the Earth in its whole Revolution; as *Perigæum* is its neareſt diſtance.

How to find both *Apogæum* and *Perigæum*, ſee the Geometrical Method of *Caſſini*, with ſome Conſiderations upon it by Mr. *Mercator*, in *Philoſ. Tranſ. N.* 57.

APOGEE of the *Equant*, is the fartheſt diſtance of it from the Earth, or that Point where the Circumference of the *Equant* is interſected by the *Linea Apſidum* in the remoteſt part of the Diameter; as the *Perigee of the Equant* is the oppoſite Point of the neareſt part of the Diameter. The *Mean*.

APOGEE of the *Epicicle*, is a Point where the *Epicicle* is cut above by a Right Line drawn from its Center to the Center of the *Equant*, or the Point of the *Epicicle* moſt remote from the Earth.

APOLOGETICAL, is what is ſaid or written by way of Excuſe or Apology for any Action.

APOLOGUE, is an inſtructive Fable, like thoſe of *Æſop*.

APOMECOMETRIE, is an Art teaching the Practiſer how to meaſure things at a Diſtance, *viz.* how far they are off from him.

APONEUROSIS, is (with Anatomiſts) the ſpreading or extenſion of a *Nerve* or a *Tendon* out in Breadth, in the manner of a *Membrane*: Alſo the *cutting off* a *Nerve* or *Tendon* is ſo called.

APORE, in Mathematicks, is a Problem which tho' it be not impoſſible, yet it is very difficult to be reſolved; and hath not yet actually been ſo: Thus the *Quadrature* of the Circle may be called an *Apore*, becauſe there is yet no *Way* or *Path* diſcovered to lead us into it.

APORIME: See *Porime*.

APOPHLEGMATICAL *Medicines*, are ſuch as are endowed with the Faculty of drawing cold

pituitous Humours from the Head, and discharging them by the Nose or Mouth.

APOPHYGE, in Architecture, signifies that part of a Column where it seems to fly out of its Base, like the Process of a Bone in a Man's Leg, and begins to shoot upward. But this *Apophyge* is really no more than the Rings or Ferrils heretofore fastened at the Extremities of wooden Pillars to keep them from splitting, and afterward imitated in Stone Work.

APOPHYSIS, is a Protuberance made by the Fibres of a Bone, produced above its Superficies, and is ordinarily upon the Extremity of the Bones.

APOPLEXY, *Attonitus Stupor*, *Syderatio*, and *Morbus attonitus*, is a profound Sleep, wherein the Patient being either vehemently shaken, tossed or pricked, yet perceives nothing, nor affords any Sign of Action, accompanied with a Difficulty of Respiration for the most part, and sometimes with none at all. *Blanchard.*

APORRHEÆ, are Vapours and Sulphureous *Effluviums* which exhale through the Pores of the Body.

APORRHEAS, a Word used by Mr. *Boyle* for *Effluviums*; of the same Sense with the former.

APOSIOPESIS, (a Figure in Rhetorick) is, when on a sudden, a Person changes his Passion, cutting off his Discourse, so that the Hearer cannot easily imagine what it is he intends: As it is very common upon Occasion of threatning, to say, *If I* — &c. *But*, &c. —

APOSTARE LEGES, and *Apostatare Leges*, signifies, wilfully to break or transgress the Laws.

APOSTATA CAPIENDO, is a Writ directed to the Sheriff, for to take the Body of one, who having enter'd into, and professed some Order of Religion, leaves it and departs from his House, and wanders about the Countrey.

APOSTEM, the same with *Apostbume*.

APOSTROPHE, is a Figure in Rhetorick, when the Speaker is in an extraordinary Commotion, turns himself on all Sides, and addresses himself to all Beings, whether sensible or insensible; whom he, for the present, supposes to be *equally* capable of hearing his Complaint, and of returning an Answer to his Demands.

APOSTROPHE, also is an *Accent* in Grammar, shewing there is a Vowel to be rejected, and is expressed thus (') and placed over the Head of the Letter. *Vossius* writes it *Apostrophus*.

APOTHEGM, is a short pithy instructive Sentence spoken by some grave and considerable Man; or else made in Imitation of such. As the *Apothegms* of *Plutarch*, or those of the Ancients collected by *Lycosthenes*.

APOTOME, in Mathematicks, is an Irrational Remainder, or Residual Root; when from a *Rational Line*, as suppose *a*, you cut off a part as *b*, which is only *commensurable in Power* to the whole Line. Then 'tis expresst thus $a - \sqrt{b}$, and is called *Aporome*, because it signifies a Remainder left by *cutting off b*.

APOTOME, in Musick, is the Differenee between the greater and the lesser Semitone.

APOZEME, is a Decoction of Roots, Woods, Barks Herbs, Flowers, Fruits, Seeds, *&c.* which is boyled down commonly to Twelve, Fifteen or Twenty Ounces. It is either Purging, Loosening, Altering or Drying, *Cephalick*, *Stomachick*, *Diuretick*, *Splenetick* or *Hepatick*, according as the Indications of the Disease direct.

APPARENT CONJUNCTION: See *Conjunction Apparent.*

APPARENT HORIZON: See *Horizon.*

APPARENT *Place of a Star*, is a Point determined by a Line drawn from the Eye through the Center of the Star; whereas the *True* or Real Place is determined by a Line drawn from the Center of the Earth to the Star or Planet.

APPARENT PLACE *of any Object in Opticks*, is that (different from the real one) in which it appears when seen through one or more Glasses. For when by Refraction through Glasses, that parcel of Rays which fall on the Pupil of the Eye from each Point of any near Object, is made to flow as close together as that which comes from a distant one; or when by the same way, the Rays coming from distant Objects are made to *Diverge* as much as if they flowed from nigh ones, then the Eye must necessarily see the Place of the Object changed; which Change is its *apparent Place.*

If an Object be placed nearer to a Convex Glass than is the Distance of its Focus, its Apparent Place may be determined; as Mr. *Molyneux in Dioptr.* p. 116. shews.

But if the Object be in the *Focus* of the Glass, the *Locus Apparens* of the Object cannot be determined; only, as Dr. *Barrow* saith, it will appear vastly remote.

Nor can the *Locus Apparens* be determined, if the Object be beyond the *Focus* of a Convex Glass. But if an Object be more distant from a Convex Glass, then its *Focus* and the Eye lie beyond the *distinct Base*, the *apparent Place* of the Object will be in the *distinct Base.*

APPEAL of *Mayhem*, (in Law) is an accusing of one that hath maimed another: But that being no Felony, the Appeal is but a kind of Action of *Trespass*, because there is nothing recoverd but Damages.

APPEAL, (in Law) is a removing of a Cause from an Inferior Judge to a Superior: Also a private Accusation of a Murtherer, by one who had Interest in the murthered Party; or of any Felon, by one of his Complices in the Fact.

APPEAL *of wrong Imprisonment*, a Term in Law, is by some used for an Action of *wrong Imprisonment.*

APPELLANT, is he that brings an Appeal.

APPELLATIVE, a Term in Grammar, signifying a Name in Opposition to Proper, and which belongs to a whole Species or Kind, as *Man*, *Chymist*, &c.

APPELLOR or *Appellant*, the same with *Approver.*

APPENDANT and *Apurtenant* (in Law) are things that by time of Prescription have belonged, appertained, and are joyned to another principal thing, by which they pass and go as accessary to the same special thing, as Lands, Commons, *&c.* to a Mannor; Courts, Ways, *&c.* to a House, Office, or such others.

APPENDICULA VERMIFORMIS, so some Anatomists call the *Intestinum Cæcum*, or Blind Gut, from its Figure and manner of Scituation, which in some Animals hangs pendulous like a Worm, and is not filled with Excrement, as it is in others.

APPEN-

APPENDIX, the ſame with *Epiphyſis*.

APPENSA, the ſame with *Periapta*, ſuch things as are hung about the Necks of diſeaſed Perſons, to free them from ſome Diſtempers which they labour under; ſuch as a dried Toad to ſtop Bleeding, Peony Roots for Convulſions, *&c.*

APPERTINANCES, ſignify, in the Common-Law, Things both Corporeal, belonging to another thing, as the more principal; as Hamlets to a chief Mannor, Common of Paſture, Turpary, Piſcary, and ſuch like; and Incorporeal, as Liberties and Services of Tenants.

APPLICATE, in Geometry, is a Right Line, otherwiſe called the *Ordinate* or *Semi-ordinate* in a *Conick Section*: See the Word *Ordinate*, or any Treatiſe of *Conick Sections*.

APPLICATION, is ſometimes the Geometrical Term for Diviſion, the Reaſon of which ſee in *Geometrical Diviſion*. But *Application* alſo ſignifies the fitting or applying one Quantity to another, whoſe Area's, but not Figures, are the ſame. *Thus*, Euclid, Book 6. Prop. 28. *teaches how to a Right Line given, to apply a Parallelogram equal to a Rectilineal Figure given.*

APPLICATE ORDINATE, (a Term in Geometry) ſee *Ordinate*. It ſignifies a Right-line applied at Right-angles to the Axis of any Conick Section, and terminated by the Curve.

APPLY, a Term uſed by Geometricians in in three Senſes.

1. It ſignifies to transfer a Line given into a Circle (moſt uſually) or into any other Figure, ſo that it ſhall be there fitted or *Accomodated*, (which is alſo another Word they uſe for the ſame thing) according to its proper length.

2. Tis alſo uſed to expreſs Diviſion in Geometry, eſpecially by the Latin Writers, who, as they ſay, *Duc* 8 *in* 9, when they would have 9 multiply'd by 8; ſo they ſay, *Applica* 4 *ad* 12, when they would have 12 divided by 4: See *Diviſion Geometrical*, or in Lines, where the Reaſon of this way of ſpeaking is explained.

3. It ſignifies alſo to fit Quantities whoſe Area's are equal, hut Figures different, ſo that they ſhall conform to one another; as when *Euclid* in his ſixth Book, teaches how, *on a Line given, to apply a Parallelogram equal to a Rectilineal Figure given.*

APPORTIONMENT, is a dividing into Parts a Rent which is dividable, and not entire or whole; and foraſmuch as the thing out of which it was to be paid is ſeparated and divided, the Rent alſo ſhall be divided, having Reſpect to the Parts.

APPORTUM, in Law, ſignifies Revenu, Gain or Profit, which a thing brings to its Owner.

APPOSALE *of Sheriffs*, is the charging them with Money received upon their Account in the *Exchequer*.

APPOSITION, in Grammar, is the putting of two or more Subſtantives together in the ſame Caſe.

APPRENDRE, in Law, ſignifies a Fee or Profit to be taken or received.

APPREHENSION, is the ſimple Contemplation of things that preſent themſelves to the Mind, as when we conſider the Sun, the Earth, a Tree, Rotundity, a Square, Cogitation, Entity, pronouncing nothing expreſly concerning them; and the Forms under which they are conſidered are called *Ideas*.

APPROACHES, in Fortification, are Works caſt up on both ſides; ſo called becauſe the Beſiegers by that Means may draw near a Fortreſs without fear of being diſcovered by the Enemy. Or *Approaches* are all ſorts of Advantages by the Help of which an Advancement may be made toward a place beſieged.

APPROPRIARE COMMUNAM, to diſcommon, that is, to ſeparate and encloſe any parcel of Land that was before open Common.

APPROPRIATION, is when the Advowſon of a Parſonage is given, or belongs to any Biſhoprick, Religious Houſe, College, *&c.* And to their Succeſſors, ſo that the Houſe or Body is both Patron or Parſon, and ſome one of the Members officiates as Vicar. 'Tis called *Appropriation*, becauſe the Profits of the Living are appropriate to the uſe of the Patrons.

APPROPRIATE *ad* HONOREM, a Term in Law, ſignifying to bring a Man not within the Extent or Liberty of ſuch an Honour.

APPROVEMENT, is where a Man hath Common within the Lord's waſte Ground, and the Lord encloſes part of the Waſte for himſelf, having nevertheleſs ſufficient Common, with Egreſs and Regreſs for the Commoners. This Incloſing is called *Approvement*.

APPROVER, (in Law) is he who hath committed ſome Felony, which he confeſſes; and to ſave himſelf, impeaches his Accomplice or Accomplices; and he is ſo called, becauſe he muſt *Prove* that which he hath alledged in his Appeal.

APPROVERS *of the King*, are thoſe that have the letting of the King's Demeans in ſmall Mannors for the King's greater Advantage.

APPROXIMATION, in *Arithmetick*, or *Algebra*, is a continually coming ſtill nearer and nearer to the *Root* or *Quantity* ſought, without expecting to have it exactly. Of theſe Methods of *Approximations*, Dr. *Wallis* gives ſeveral Specimens in his Hiſtory of *Algebra*, P. 317. and ſome have been invented ſince: They are all nothing but a *Series infinitely converging* or approaching ſtill nearer to the Quantity required, according to the nature of the *Series*.

In Philoſoph. Tranſ. N. 215. That excellent Mathematician hath a Diſcourſe about the Methods of *Approximation* in the Extraction of *Surd Roots*, in which he deſignedly ſhews the Grounds and Reaſons of the whole Buſineſs, and which therefore is very well worth the Reader's peruſal: The Subſtance of what the Doctor delivers, is as followeth.

To begin with the *Square Root*.

From any non-quadrate Number or Quantity propoſed (ſuppoſe n) ſubſtract (in the uſual manner) the greateſt Square in Integers therein contained (ſuppoſe $a\,a$) the Remainder (ſuppoſe $b = 2a\,e + e\,e$) is to be the Numerator of a Fraction, for deſigning the near Value of e the remaining part of the Root ſought ($a + e = \sqrt{n}$) whoſe Denominator or Diviſor is to be $2a$ (the double Root of the ſubſtracted Square) or $2a + 1$ (that double Root increaſed by one) the true Value falling between theſe two; ſometime the one, ſometime the other, being neareſt to the true Value. But (for avoiding negative Numbers) the latter is commonly directed.

The true Ground of the Rule is this; $a\,a$ being (by Conſtruction) the greateſt Integer Square contained in n, 'tis evident that e muſt be leſs than 1, (otherwiſe not $a\,a$, but the Square of $a + 1$,

or

or ſome greater than it, would be the greateſt Integer Square contained in n.) Now if the remainder $b = 2a + ee$ be divided by $2a$, the reſult will be too great for e, (the Diviſor being too little, for it ſhould be $2a + e$ to make the Quotient e) But if (to rectify this) we diminiſh the Quotient by increaſing the Diviſor, adding 1 to it, it becomes too little, becauſe the Diviſor is now too big. For (e being leſs than 1) $2a + 1$ is more than $2a + e$, and therefore too big.

As for Inſtance; If the Non-quadrat propoſed be $n = 5$, the greateſt Integer Square therein contained is $aa = 4$ (the Square of $a = 2$) which being ſubſtracted, leaves $n - aa = 5 - 4 = 1 = b = 2ae + ee$; which being divided by $2a = 4$, gives $\frac{1}{4}$; but divided by $2a + 1 = 4 + 1 = 5$, gives $\frac{1}{5}$: That too great, and this too little for e. And therefore the true Root ($a + e = \sqrt{n}$) is leſs than $2\frac{1}{4} = 2{,}25$, but greater than $2\frac{1}{5} = 2{,}2$: And this was anciently thought an *Approach* near enough.

If this *Approach* be not now thought near enough, the ſame Proceſs may be again repeated; and that as oft as is thought neceſſary.

Take now for a, $2\frac{1}{5} = 2{,}2$, whoſe Square is $4{,}84 = aa$ (now conſidered as an Integer in the ſecond place of Decimal Parts) this ſubtracted from 5,00 (or, which is the ſame 0,84, the exceſs of this Square above the former, from 1, which was then the remainder) leaves a new remainder $b = 0{,}16$; which, divided by $2a = 4{,}4$, gives $\frac{16}{440} = \frac{2}{55} = 0{,}03636 +$, too much: But divided by $2a + 1 = 4{,}5$, it gives $\frac{16}{450} = \frac{8}{225} = 0{,}3555 +$, too little. The true value (between theſe two) being 2,236 *proxime*, whoſe Square is 4,999696.

If this be not thought near enough, ſubſtract this Square from 5,000000: The remainder $b = 0{,}000304$, divided by $2a = 4{,}472$, or by $2a + 1 = 4{,}473$, gives (either way) $0{,}000068 -$; which added to $a = 2{,}236$, makes $2{,}236068 -$, ſomewhat too big; but $2{,}236067 +$, would be much more too little.

Which gives us the Square Root of 5, adjuſted to the ſixth Place of Decimal Parts, at three ſteps. And by the ſame method, if it be thought needful, we may proceed further.

It were eaſie to compound the Proceſs of two or more Steps into one, and give (for the Rule) the Reſult of ſuch Compoſition, which would make it ſeem more intricate and myſterious, to amuſe the Reader.

In the *Cubick Root* (conſonant to the Quadratick) the Rule is this:

From the *Non-Cubick* propoſed (ſuppoſe n) ſubſtract the greateſt Cube in Integers therein contained (ſuppoſe aaa) the Remainder (ſuppoſe $b = 3a\,ae + 3a\,ee + eee$) is to be the Numera. of a Fraction for deſigning the value of e, (the remaining part of the Root ſought, $a + e = \sqrt{n}$). To this Numerator, if (for the Denominator or Diviſor) we ſubjoin $3aa$, the Reſult will certainly be too great for e, becauſe the Diviſor is too little: (For it ſhould be $3a\,a + 3a\,e + e\,e$, to give the true value of e). If for the Diviſor we take $3a\,a + 3a + 1$, it will certainly be two little, becauſe the Diviſor is too great. (For e by conſtruction is leſs than 1.) It muſt therefore (between theſe Limits) be more than this latter; and therefore this latter Reſult being added to a, will give a Root whoſe Cube may be ſubſtracted from the Non-Cubick propoſed in order to another ſtep.

But if for the Diviſor, we take $3a\,a + 3a$ (or even leſs than ſo) the Reſult may be too great; or (in caſe b be ſmall) it may be too little, and oft is ſo.)

Which comes to paſs from hence, becauſe e (by Conſtruction) is leſs than 1; and therefore $3a\,e$ leſs than $3a$; and perhaps ſo much, as that the Addition of $e\,e$ will not redreſs it. And when it ſo happens $3a\,a + 3a$ is a better Diviſor than $3a\,a + 3a + 1$, (or even ſomewhat leſs than either). But becauſe it doth not always ſo happen (tho' for the moſt part it doth) the Rule doth rather direct the other; as which doth certainly give a Root leſs than the true value, whoſe Cube may always be ſubſtracted from the Non-Cubick propoſed. The Deſign being to have ſuch a Cube, as (being ſubſtracted) may leave another b to be ordered in like manner for a new Approach. But for the moſt part $3a\,a$ may be ſafely taken for the Diviſor: For tho' the Reſult will then be ſomewhat too big, yet the exceſs may be ſo ſmall as to be neglected; or at leaſt we may thence eaſily judge what Number (ſomewhat leſs than it) may be ſafely taken; and if we chance to take it ſomewhat too big, the Inconvenience will be but this, that b for the next ſtep will be a Negative; of which Caſe we ſhall ſpeak anon.

Thus for Inſtance; if the *Non Cube* propoſed be $9 - n$, the greateſt Integer *Cube* therein contained is $8 = a\,aa$ (whoſe Cubick Root is $a = 2$) which Cube ſubſtracted, leaves $9 - 8 = 1 = b = 3a\,ae + 3a\,ee + eee$. This divided by $3a\,a = 12$, gives $\frac{1}{12} = 0{,}08333 +$, too big for e; but the ſame divided by $3a\,a + 3\,a + 1 = 12 + 6 + 1 = 19$, gives $\frac{1}{19} = 0{,}05263 +$, too little; or if but by $3a\,a + 3a = 2 + 6 = 8$, it gives $\frac{1}{18} = \frac{5}{90} = 0{,}05555 +$, yet two little. For the Cube of $a + 0{,}06 = 2{,}06$, is but $8{,}742 -$, which is ſhort of 9: And ſo much ſhort of it, that we may ſafely take 2,07 as not too big; or perhaps 2,08 (which, if it chance to be too big) it will not be much too big (as ſhall be farther ſhewn:) And upon tryal it will be found not too big; for the Cube of 2,08, is 8,998912.

If this Step be not near enough, this *Cube* ſubſtracted from 9,000000 leaves anew $b = 0{,}001085$, which divided by $3aa = 12{,}9796$, gives $0{,}000084 -$, which will be ſomewhat too big, but not too much (for e is now ſo ſmall) as that $3a\,e$ may be ſafely neglected (and ee much more) ſo that if to 2,08 we add $0{,}000084 -$, the Reſult 2,080084 will be too big, but 2,080083 will be more too little; (as will appear if we take the Cube of each) ſo that either of them at the ſecond Step, gives the true Root within an Unite in the fixth place of Decimal Parts.

He ſays, (*taking the Cube of each*; which he does) that the thing may be more clearly apprehended, but it is not neceſſary that we trouble our ſelves with the whole Cube: For $a\,a\,a$ being already ſubſtracted, for finding $b = 3a\,ae + 3a\,ee + eee$, we have no more to try, but whether $3a\,ae + 3a\,ee + eee$ be greater or leſs than b, according as we take 0,000084, or 0,0000083, for e.

Which may be conveniently done in this manner: Take $3a + e$ and multiply this by e (or e by it) ſo have we $3ae + ee$; to this add $3\,a\,a$, and multiply the whole by e (ſo have we $3\,a\,ae + 3aee$

$3aae + eee$) to see whether this be greater or less than b.

That is, in the present Case, if we take $e = 0{,}000084$, and add to this $3a = 6{,}24$, then is $6{,}240084 = 3a + e$: This multiply'd by $e = 0{,}000084$, is $3ae + ee = 0{,}000524 +$; to which, if we add $3a\,a = 12{,}9792$, it is $3a\,a + 3ae + ee = 12{,}979724$, which multiply'd again by $e = 0{,}000084$, is $0{,}0010902 +$, $= 3a\,a\,e + 3a\,e\,e + e\,e\,e$, which is more than $b = 0{,}001088$.

But if we take $e = 0{,}000083$, and proceed as before, we shall have $3a\,ae + 3a\,ee + eee = 0{,}001077 +$, which is less than b, and therefore (if we substract that from this) the Remainder 0,000011, will be another b for the next Step, if please to proceed further.

Hitherto we have pursued the Method most affected by the Ancients, in seeking a Square or Cube (and the like of other Powers) always less than the just Value, that it might be substracted from the Number proposed, leaving b a positive Remainder, thereby avoiding Negative Numbers.

But since the Arithmetick of Negatives is so well understood, it may in this (and other Operations of like nature) be advisable to take the next greater (in case that be nearer to the true value) rather than the next lesser.

According to this Notion for the Square Root of 5, I would say, it is $(2 +)$ somewhat more than 2, and enquire, how much more? But for the Square Root of 8, I would say, it is $(3 -)$ somewhat less than 3, and enquire, how much less? Taking in both Cases that which is nearest to the just Value.

Thus, in the Cubick Root before us, I take for e (in the last Enquiry) 0,000084 (where, for the near Step, we have $b = -\ 0{,}000002$) rather than $0{,}000083 +$ (where, for the next Step, we should have $b = +\ 0{,}000011$). In this latter Case we are to divide $b = +\ 0{,}000011$, by $3a\,a = 12{,}980236 -$, to find (by the Quotient) how much is to be added to 0,000083. In the other Case, we are to divide $b = +\ 0{,}00002$, by $3a\,a = 12{,}980248$, to find (by the Quotient) what is to be abated of 0,000084, so have we $\frac{0\ 0000011}{12\,98043\,6} = 0{,}00000085 +$, to be added to 6,240083: Or $\frac{0\ 0000002}{12\,98024\,8} = 0{,}00000015 +$ to be abated of 6,240084: (Or it may suffice in either, to divide by $12{,}98 +$, or even by $13 -$, without being incumbred with a long Divisor) either of which gives us, for the Root sought, 2,08008385 *proxime*. True (at the third Step) to the eighth place of Decimal Parts. And if this be not near enough, the Cube of this compared with the Number proposed, will give us another b, for the next Step, and so onwards as far as we please.

Now, what is said of the Cube, is easily applicable to the higher Powers.

That of the Biquadrate may be omitted, because here perhaps it may be thought most advisable to extract the Square Root of the Number proposed; and then the Square Root of that Root.

But if we would do it at once, we are from n (the Number proposed, being not a Biquadrate) to substract a^4 (the greatest Biquadrate contained in it) to find the Remainder $b = 4a^3 e + 6a^2e^2 + 4ae^3 + e^4$, which Remainder, if we divide by $4a^3$, the Quotient will certainly be too big for e (tho' perhaps not much).

If by $4a^3 + 6a^2 + 4a + 1$, it will certainly be too little (for Reasons before mentioned.) And we are to use our Discretion in taking some intermediate Number. And if we thence chance not to hit on the nearest, the Inconvenience will be but this, that our leap will not be so great as otherwise it might be, which will be rectify'd by another b at the next Step.

For the *Surfolid* (of the five Dimensions) we are from n (the Number proposed, being not a perfect *Surfolid*) to substract a^5 (the greatest *Surfolid* therein contained) to find the Remainder.

$$b = 5a^4e + 10a^3e^2 + 10a^2e^3 + 5ae^4 + e^5.$$

which (as before) if we divide by $5a^4$, the Result will be somewhat too big (because the Divisor is too little).

If by $5a^4 + 10a^3 + 10a^2 + 5a + 1$, the Result will certainly be less than the true e. The just Value of e being somewhat between these two, where we are to use our Discretion, what intermediate Number to take; which according as it proves too great or too little, is to be rectify'd at the next Step.

If to direct us in the choice of such intermediate Numbers, we should multiply Rules of Precepts for such choice, the trouble of observing them would be more than the advantage to be gained by it. And for the most part it would be safe enough (and least trouble) to divide by $5a^4$, which gives a Quotient somewhat too big; which we may either rectify at Discretion (by taking a Number somewhat less) or proceed to another b (affirmative or negative as the Case shall require) and so onward to what exactness we please (which is, for substance, in a manner coincident with Mr. *Raphson*'s Method, even for affected Equations.

Thus, in the present Case; if the Number proposed be $n = 33$, then is $a^5 = 32$, and $b = 33 - 32 = 1 = 5a^4e + 10a^3e^2 + 10a^2e^3 + 5ae^4 + e^5$, which if we divide by $5a^4 = 5 \times 16 = 80$, the Result $\frac{1}{80} = 0{,}0125$ is somewhat too big for e, but not much. And if we examine it, by taking the *Surfolid* of 2,0125, or of $2\frac{1}{80}$, we shall find a Negative b (for the next Step) but not very considerable. Or if we think it considerable, we may proceed further to another Step, or more than so.

The like Method may be apply'd (with more advantage) in the higher Powers, according as the Composition of each Power requires. And the same Method may be of use (with good Advantage) in long Numbers (if duely applied) even before we come to the place of Units, for the same will equally hold there also.

APPURTENANCES, in the Common Law, are the same with *Appendante*: Which see.

APSIS, in Astronomy is used as well for the *highest part* of an Orbit, to which when a Planet comes, it is at the greatest distance from the Earth, and is called the *Apogæum*; as the *lowest part* of that Orbit, when the Planet is in his nearest distance to the Earth, which is called the *Perigæum* of that Planet.

APTITUDE, is the natural Disposition that any thing hath to be fitting for such or such a Pur-

Purpoſe. Thus Oil hath an Aptitude to burn; and Water to extinguiſh Fire.

APTOTE, (in Grammar) is a Noun Indeclinable, or which is without the variation of *Caſe*.

APYREXY, is an Intermiſſion, cooling, or abating of a Fever; the Cauſe of it is, that all the Morbifick Matter is ſpent in one Fit, and ſo it intermits till new come, and begins to ſwell and ferments as the other. *Blanchard.*

AQUÆ DUCTUS, (in Anatomy) is the Bony Paſſage of the *Tympanum* of the Ear, reaching into the Palate of the Mouth.

AQUA FORTIS, is made by diſtilling in a cloſe Reverberatory Furnace a Mixture of equal Parts of *Puriſied Nitre*, *Vitriol calcined white*, and Potter's Earth or Clay dried and powdered. A ſmall Fire is uſed at firſt to warm the *Retort*, and to draw off the *Phlegm*; but as ſoon as the Spirits begin to appear in the Receiver in Red Clouds, the Fire is raiſed to the moſt intenſe Degree, and kept ſo till White Fumes begin to come forth; then unlute the Veſſels, and you have the *Aqua Fortis* in the Receiver. 'Tis uſed to diſſolve Metals.

AQUALICULUS, the loweſt part of the Belly, being the ſame with *Hypogaſtrium*.

AQUARIUS, a Conſtellation in the Heavens, being the Eleventh Sign in the *Zodiac*; it is commonly marked with this Character ♒, and conſiſts of 33 Stars.

AQUATICK or AQUATILE, is that which belongs to, or lives moſtly in in the Water: Thus thoſe Animals or Plants that live or grow uſually in Water, are called *Aquatick Animals* and *Plants*.

AQUEDUCT, is the Term in Architecture for a Conduit or Work to convey Water (without Force of Engines) to any Place.

AQUEOUS HUMOUR, or the watry Humour of the Eye, is the utmoſt being traſparent, and of no Colour; it fills up the Space which lie between the *Cornea* Tunicle and the *Chryſtalline* Humour.

AQUILA ALBA, or *the white Eagle*, the ſame with *Mercurius Dulcis*, which ſee.

AQUILA, or *Vultar Volans*, a Conſtellation in the Northern Hemiſphere, conſiſting of 32 Stars.

ARA, the *Altar*, a Southern Conſtellation, containing 8 Stars.

ARACNOIDES, is the *Chryſtalline Tunic* of the Eye; by ſome called alſo

ARANEA TUNICA, or *Chryſtallina*; and is that which ſurrounds and contains the *Chryſtalline Humour*; by reaſon of its light thin *Contexture*, like that of the Web of a Spider, it has the Name of *Aranea*. This Coat, by means of the *Ciliary Proceſſes*, helps to move the Chryſtalline Humour of the Eye nearer to, or farther from the *Retina*, and perhaps alſo to render its Figure more or leſs *Convex*.

ARÆOSTYLE, in Architecture, is a ſort of Edifice where the Pillars are ſet at a great Diſtance one from another.

ARBITRATOR, is an extraordinary Judge in one or more Cauſes between Party and Party, choſen by their mutual Conſents. The *Civilians* diſtinguiſh between *Arbiter*, who is to proceed and judge according to Law and Equity mingled, and *Arbitrator*, who is permitted wholly to uſe his own Diſcretion, without Solemnity of Proceſs, or Courſe of Judgment, to hear and determine the Controverſy committed unto him.

ARBITREMENT, is a Power given by two or more contending Parties, to ſome Perſon or Perſons to determine the Matter in Diſpute between them; and to pronounce the ſame, to which they bind themſelves under a Penalty to ſtand: And the Determination thus made is called an *Award*; or the Reſult of an *Arbitration*.

ABOR DIANÆ: See *Diana's Tree*.

ARBOR MARIS, a Name by ſome Chymiſts given unto *Coral*, becauſe it grows like a Tree or Plant under the Water of the Sea.

ARBOREOUS, is by the Botaniſts uſed for ſuch *Fungi* or *Muſci* which grow upon Trees, whereas others grow on the Ground. Thus *Agaric* is a *Fungus Arboreus*, becauſe it always grows on the *Larix*. But the *Fungus Pulverulentus* is *Terreſtrial*, always growing on the Ground.

ARBORIST, is one that hath good Skill in the ſeveral Kinds and Natures of Trees; and knows how to propagate and preſerve them well for their ſeveral Uſes.

ARCANUM CORALINUM, is the Red Precipitate of Mercury, on which hath been burnt ſix times, well rectify'd Spirit of Wine, in order to burn off ſome of the Acids, and to ſweeten the Precipitate ſo as that it may be fit to be taken inwardly.

ARCANUM DUPLUM, is a kind of a Salt gain'd by waſhing the *Caput Mortuum* remaining after the Diſtillation of double *Aqua Fortis* with warm Water; which Water is aftewards filtrated and evaporated, and the Salt remains at the Bottom of the Glaſs.

ARCANUM JOVIS, is an *Amalgama* made of equal Parts of Tin and Mercury, powder'd and digeſted with good Spirit of Nitre; and from it the Spirit being drawn in a Retort, the dry Maſs is powdered again, and then digeſted with Spirit of Wine till the Powder be inſipid.

ARCH or ARC, in Geometry is any part of the Circumference of a Circle.

ARCHAISMS, are obſolete Expreſſions now out of uſe, and to be found only in ancient Authors.

ARCHES, (or the Court of the *Arches*) is the chief and moſt ancient Conſiſtory belonging to the Archbiſhop of *Canterbury*, and it is ſo called from the Arches of the Church where the Court is kept namely, *Bow-Church* in *London*.

ARCHÆUS, with the *Paracelſians*, is the Principle of Life, Health and Vigour in any Animal Body.

ARCHIPELAGUS, in Geography, is a part of the Sea containing many ſmall Iſlands one near another, and conſequently ſeveral little Seas denominated from thoſe Iſlands; as the Grecian *Archipelago* or *Ægean Sea*.

ARCHITECTONICK, is that which builds a Thing up regularly according to the Nature and Properties of it. Thus that plaſtick Nature, Power, Spirit, or whatever it be called, which hatches the *Ova* of Females into living Creatures of the ſame Species, is by ſome called the *Architectonick Spirit*.

ARCHITECTURE, is the Art or Science of Building, and is uſually divded into *Civil* and *Military*; *Civil Architecture* teaches how to make any kinds of Buildings, Palaces, Churches or private Houſes. *Military Architecture* inſtructs us in the

the beſt way to fortify Cities, Camps, Sea-Ports, or any other Places of Strength.

The Ancients at ſeveral Times, and on ſeveral Occaſions, eſtabliſh'd 5 *Orders of Architecture*, that is, 5 ſorts of Pillars, *viz.* the *Tuſcan*, the *Dorick*, the *Ionick*, the *Corinthian*, and the *Compoſite* or *Roman Order*, *(which ſee under thoſe Words.)* The Difference between which *Orders* conſiſts in the *Column*, with its *Baſe* and *Capital*, and the *Entablature*, that is, the *Architrave*, *Friſe* and *Cornice*; for theſe are the Parts which conſtitute the *Order*, and each one hath its proper and peculiar Meaſures.

Beſides theſe five Ancient Orders, ſome Authors mention two more, as that of the *Caryatides* and the *Perſick*, (which ſee.)

The Rules of *Architecture* require, That in a well-built Fabrick there ſhould be *Solidity*, *Convenience* and *Beauty*; to which ſome Writers add, *Order*, *Diſpoſition*, *Proportion*, *Decorum* and *Oeconomy*: And theſe Eight, they ſay, make the neceſſary Parts of *Architecture*. *Solidity*, implies the Choice of a good Foundation, and good ſound Materials to work with. *Convenience* conſiſts in ſo ordering and diſpoſing the Parts of an Edifice, that they may not hinder or embaraſs one another. *Beauty* is that agreeable Form and pleaſing Appearance which it exhibits to the Eye of the Spectator. *Order* (they ſay) gives each Part of the Building a convenient Bigneſs, whether we conſider them apart, or with Relation to the Whole. And *Diſpoſition* they make the due Ranging and agreeable Union of all the Parts.

Proportion, is the Relation that all the Work hath to its Parts, and which every one ſeparately hath to the *Idea* of the Whole: For among Works that are perfect, from any particular Part we may make a certain Judgment of the Greatneſs of the whole Work: *v. gr.* the *Diameter of a Pillar*, or the Length of a *Triglyph*, gives us a right Idea of the Whole to which they belong. And to expreſs the Relation that many things have to one another, as to their Greatneſs, and the different number of their Parts, *Vitruvius* indifferently uſes thoſe three Words; *Proportion*, *Eurithmy* and *Symmetry*; the two laſt of which are of much the ſame Senſe with the firſt.

Decorum or *Decency* comes next to be conſidered, which conſiſts in making the whole Aſpect of the Fabrick ſo *correct*, that nothing ſhall appear but what is founded upon, and approved by ſome Authority: And they ſay, *Decorum* teaches you to have a Regard to theſe three things, *Deſign*, *Cuſtom* and *Nature*. The Regard to *Deſign* makes us chooſe (for Inſtance) other Diſpoſitions and Proportions for a Palace than a Church. The Reſpect we pay to *Cuſtom*, makes us adorn the Porches and Entries into ſuch Houſes as are within Rich and Magnificent. And the Regard we have to the *Nature* of the Places, makes us pitch upon different Proſpects for different Parts of a Building: As for Example, we expoſe Bed-Chambers and Libraries to the Morning Sun: Winter Apartments to the *Weſt*, and Cloſets of Pictures, *&c.* to the *North*, becauſe they require an equal Light.

Oeconomy teaches the Architect (they ſay) to have regard to the Expences that are to be made, and the Quality of the Materials, near the Places where he builds, and to take his Meaſures rightly for the Order and Diſpoſition, *viz.* to give the Fabrick a convenient *Form* and *Magnitude*.

ARCHITRAVE, is the chief Beam in any Building, and the firſt Member of that which is called the *Entablature*, *viz.* that part of a Stone Pillar which is above the *Capital*, and below the *Frize*. And 'tis called the *Reaſon-Piece* or *Maſter-Beam* in Timber Buildings; but in Chimneys it is called the *Mantle-Piece*, and over the Jambs of Doors or Lintels of Windows *Hyperthyron*. The *Greeks* called it the *Epiſtyle*.

ARCTICK CIRCLE, is a Leſſer Circle of the Sphere drawn on the Globe, parallel to the Equator, and at 23°. 30′. diſtant from the North Pole of the World, from whence it takes its Name. This, and its oppoſite the *Antarctick*, are called the *two Polar Circles*. They may be conceived to be deſcrib'd by the Motion of the Poles of the Ecliptick round the Poles of the Equator, or of the World.

ARCTOPHYLAX, ſee *Bootes*.

ARCTOSMINOR, the ſame with *Urſa Minor*.

ARCTURUS, a fixed Star of the firſt Magnitude placed in the Skirt of *Arctophylax*: Its *Longitude* is 199°. 39′. *Latitude* 31°. 2′. *Right Aſcenſion* 210°. 13′. and *Declination* 20°. 58′.

ARDENT SPIRITS, in Chymiſtry, are ſuch Spirits as being diſtilled from fermented Vegetable, will take fire and burn, as Spirit of Wine, Brandy, Aqua Vitæ, *&c.* They are uſually diſtilled in an Alembick, or in a Copper Body with its Moor's Head and Refrigeratory.

ARDOR VENTRICULI, is the Diſeaſe commonly called the *Heart-burning*.

ARDOR URINÆ, is the ſame with *Dyſuria*.

AREA, of any Figure in Geometry, is its Internal Capacity or Superficial Content reckoned in the Square Parts of any Meaſure; as if a Field be in the Form of a Square, and its Side be 40 Yards in length, its *Area* or Superficial Content will be 1600 ſquare Yards: Or will contain 1600 little Squares, each of which is a Yard every way.

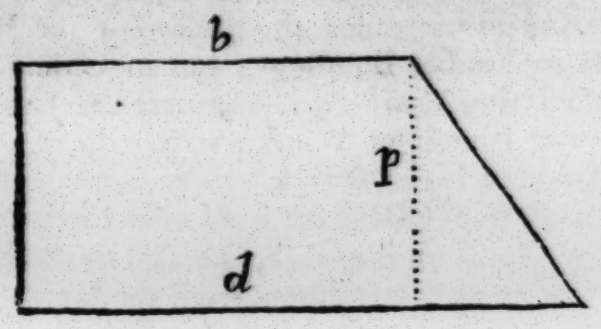
Problems. To find the *Area* of all ſorts of *Plane Figures.*

1. For a *Square* or *Rectangle*, multiply one Side found in any known Meaſure by another: The Product is the true *Area*. The Reaſon of which you have under *Multiplication in Geometry*: which ſee.

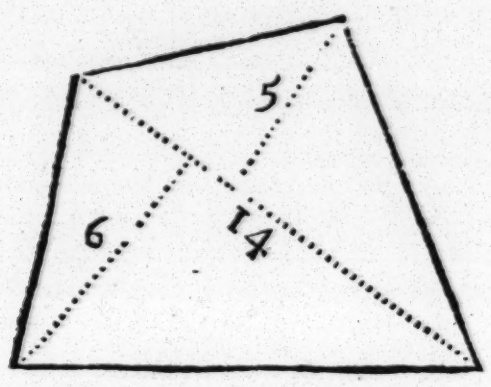
2. *For all Parallelograms*, multiply the Perpendicular let fall from any ſide, by the ſide it falls upon; and the Product is the *Area*. Becauſe all ſuch Figures are equal to Rectangles of the ſame or equal Baſe and Altitude.

3. *For all Plane Triangles*, multiply half the Perpendicular let fall from an Angle, by the oppoſite ſide, or half that ſide by the Perpendicular, and the Product is the true *Area*; becauſe Triangles are the Halves of Parallelograms of the ſame or equal Baſes and Altitudes.

4. *For a Trapezium*, where two Sides are Parallel, multiply the Sum of the Parallel Sides (*b* and *d*) by half (*p*) the Perpendicular.



5. *For any other Trapezium, or any Multangular Plane Figure*, resolve it Diagonally into Triangles; and add the *Area's* of those Triangles (found by the 3d *Problem*) into one Sum; which will be the true *Area* of the whole. Thus, suppose a *Trapezium* whose Sides are not parallel, divide it into two Triangles by a Diagonal, and let fall a Perpendicular from the other Angles thereto; then multiply the whole Base by half the Sum (or half the Base by the whole Sum) of the Perpendiculars, the Product is the *Area*.



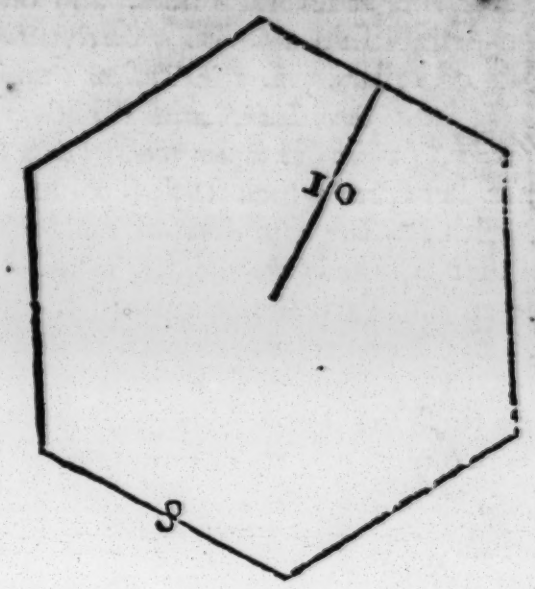
Base 14, its half 7
Sum of the Perpend. 11, its half 5,5.

14		11	
5,5		7	
70		77	*Area* 77.
70			
77			

6. *For all Regular Figures or Polygons*, multiply the half Sum of all the Sides by the length of a Line drawn from the Center to the Middle of any one Side, the Product gives the *Area*.

Because that Line will be equal to the height of each Triangle in the *Polygon*, and their Bases will be also equal, because they are Sides of a *Regular Polygon*.

Thus in a *Hexagon*, whose Side is 8 Yards,



and the Distance from the Center to the Middle of any of the Sides 10 Yards.

The Sum of the Sides is $6 \times 8 = 48$, whose half is 24, which multiplied by 10, produces 240 Yards, the *Area* of the *Hexagon*.

7. *For all Circles*, multiply half the Circumference by the *Radius*, because every Circle is equal to a Rectangle △, one of whose Legs is the *Periphery*, and the other the *Radius*, as *Archimedes* hath demonstrated. For Practice, measure the Semidiameter, then say, As 1000 : 3141 :: So is the Semi-diameter : To the Circumference : which found, multiply by half the Diameter (or Radius) the Product is the *Area*.

8. *For a Sector of a Circle*, multiply the *Radius*, or one of its Legs by half the Arch (or half the *Radius* by the whole Arch) the Product gives the Content.

9. *For all Segments of Circles*, find the *Area* of the *Sector* insisting on the *Ark*, and also the *Area* of the *Triangle*, and substract that of the *Triangle* from that of the *Sector*, the Remainder is the *Area* of the *Segment*.

10. *For an Ellipsis*, multiply the longest Diameter by the shortest, and extract the Square Root of the Product, it gives the Diameter of a Circle, whose *Area* is equal to the *Area* of the *Ellipsis*; because the Diameter of such a Circle is a mean Proportional between the Diameters of the *Ellipsis*.

11. *For a Parabola*, multiply the entire Ordinate by the Abscissa or intercepted Ax; then double that Product, and divide the whole by 3; the Quotient is the *Area*.

AREOLA PAPILARIS, a darkish coloured Circle about the Nipple.

AREOMETER, is an Inſtrument to meaſure the Gravity of Liquor. 'Tis uſually made of a thin fine Glaſs of this Figure, and ſealed at the Top, there being firſt as much running Mercury put into it, as will ſerve to keep it ſwimming in an erect Poſition. The Stem is divided into Degrees, and by the Depth of its Deſcent into any Liquor, its Lightneſs is concluded; for that Fluid or Liquor in which it ſinks leaſt, muſt be heavieſt, and that in which it ſink loweſt, will be lighteſt.

AREOSTYLE, in Architecture, is a Building where the Columns ſtand a little too thick, as ſome ſay; or as the *French Dictionary of Arts and Sciences* expreſſes it, *Loin a loin*, that is, at a convenient Diſtance.

AREOTECTONICKS, is that part of Fortification and Military Architecture which teaches how to attack ſafely, and to fight an Enemy advantageouſly.

AREOTICK MEDICINES, are ſuch as open the Pores of the Skin, and render them large enough for the Morbifick Matter to be carried off by Sweat, or inſenſible Tranſpiration. *Blanchard.*

ARGEMA, a little Ulcer of the Eye in the Circle of the *Iris*, having its Seat in a part of the White, and alſo ſome part of the Black of the Eye. *Blanchard.*

ARGENT, the Name in Heraldry of the white Colours which is uſed for Gentlemen, Knights and Baronets: But Barons, and all Nobles, have the white Colour called *Pearl*, as all Sovereign Princes have it called *Luna*; Without either this or *Or*, the Heralds ſay, there can be no good Armory. This is expreſſed in Engraving, by the Parts being left plain without any Strokes from the Graver.

ARCO NAVIS, a Southern Conſtellation conſiſting of 42 Stars.

ARGUMENT, in Aſtronomy, is an Ark by which we ſeek another Ark unknown, and proportional to the firſt; as the

ARGUMENT of INCLINATION, is an Ark of the Orbit intercepted between the *Node* aſcending, and the Place of the Planet from the Sun, being numbred according to the Succeſſion of the Signs.

ARGUMENT *of the Moon's* Latitude, is her Diſtance from the *Dragon's Head* and *Tail*, *viz.* where the Orbit of the *Moon* in two Points Diametrically oppoſite, is interſected by the Ecliptick, whereby we find out the Quantity of the real Obſcuration in *Eclipſes*, or how many Digits are darkened.

ARGYROCOMUS, according to ſome Writers, is a Silver-coloured Comet differing very little from the *Solar Comet*, except that it is of a brighter Silver Colour, and ſhines with ſo great a Luſtre that it dazles the Eyes of the Beholders.

ARIES, a Conſtellation of Stars drawn on the Globes in the Figure of a Ram: 'Tis the firſt of the 12 Signs of the *Zodiack*, and is mark'd thus ♈, and conſiſts of 19 Stars.

ARISTA, in Botany, ſignifies that long ſlender Needle-like *Beard* which grows out from the Husk of Corn or Graſs: By ſome 'tis called the *Awn*.

ARITHMETICK, is the Art of numbring truly; or, as ſome define it, the Science of diſcrete Quantity: 'Tis divided into two general Branches; *Common Arithmetick*, and *Algebra*.

ARITHMETICAL COMPLEMENT, of a Logarithm, is what that Logarithm wants of 10.0000000. That the Arithmet. Complement of 7.1079054 is 2.8920946, where each Figure but the laſt is taken from 9, and that from 10.

ARITHMETICAL PROGRESSION, or *Proportion*, ſee the Word *Progreſſion*.

ARK, the ſame with *Arch*, which ſee.

ARK of DIRECTION or *Progreſſion*, in *Aſtronomy*, is that Ark of the *Zodiack* which a Planet appears to deſcribe when its Motion is forward according to the Order of the Signs.

It is alſo in the *Ptolemaick* Syſtem, the *Ark of the Epicicle*, which a Planet deſcribes when it is Progreſſive according to the Order of the Signs.

ARK of RETROGRADATION, is that which a Planet deſcribes when it is *Retrograde*, or moves contrary to the Order of the *Signs*.

ARK *of the Firſt and Second Station*, is the *Ark* which a Planet deſcribes in the former or the latter Semi-circumference of his *Epicicle* when it appears *Stationary*.

ARMARIUM UNGUENTUM, the ſame with the *Hyplo*, *Chryſma*, *Magnes Microcoſmicus*; or a Weapon Salve, whereby *Wounds*, as they pretend, may be cured at any diſtance, by dreſſing the Weapon only. They preſcribe it to be made of the Fleſh of a Man hanged, or which died ſome ſuch violent Death, at the Increaſe of the *Moon*, and in a good Sign, *&c.* according to the fooliſh and wicked Superſtition of Aſtrologers. See a good Refutation of this Impoſture, and of the Arguments brought for it, by the Author of *Philoſophiæ Moſaicæ*, *in Athan. Kircher de magnete*, *Lib.* 3. *pars* vii.

ARMED, is ſaid at Sea of a Man of War fitted out and provided in all reſpects. Alſo a *Croſs-Barr-Shot* is ſaid to be *Armed*, when ſome Rope-Yarn, or the like, is rowled round about one end of the Iron-Barr which runneth thro' the Shot, both that the Shot may be the better *rammed* down into the Gun; and alſo chiefly, leaſt the ſharp end of the Bar ſhould catch into any *Honey Combs* within the Cylinder of the Piece.

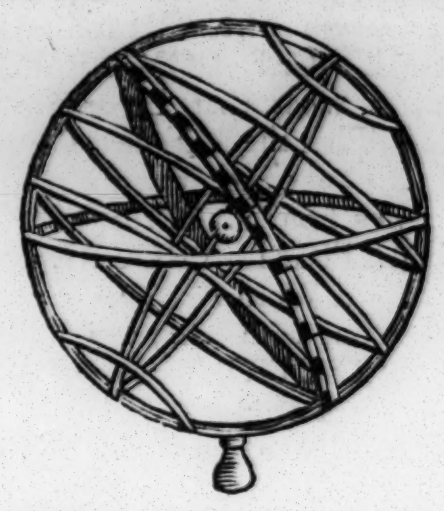
A Load-ſtone is alſo ſaid to be *Armed*, when it is *capped* or *caſed*, or ſet in Iron; in order to make it up the greater Weight, and alſo to diſtinguiſh readily its Poles. *Kircher*, in his Book *de Magnete*, tells us, That the beſt way to arm a Loadſtone, is to drill a Hole thro' the Stone from Pole to Pole, and in that to place a Steel Rod of a moderate length; which Steel Rod will, he ſaith, at the end, take up more Weight, than the ſame Stone armed the common way can do; as he ſaw tried at *Rome*.

ARMED, is the proper Term in Heraldry for Blazoning the Beaks and Feet of Cocks, and all Birds of Prey; and theſe are always painted of a different Colour from the Bird it ſelf, and therefore they ſay he beareth a Cock, or a Falcon *Armed Or*, *Gules*, &c.

ARMILLARY SPHERE, is when the greater and leſſer Circles of the Sphere being made of

Braſs, *Wood*, *Paſt-board*, *&c.* are put together in their natural Order, and placed in a Frame, ſo as to repreſent the true Poſition and Motion of thoſe Circles.

See the Figure following.



ARMONIACK SALT, ſee *Sal Almoniack.*

ARMONIACK *Volatile Spirit*, ſee *Volatile Spirit of Sal Armonick.*

ARMORY, the ſame with Heraldry, being the Art of truly *Blazoning* and *Marſhalling* all Coats of Arms, and appropriating them to their proper Bearers.

AROMATICK, the ſame with Odoriferous, or Sweet Scented.

AROMATICK *Volatile Salt*, the ſame with *Sal Volatile Oleoſum*, which ſee.

AROMATIZATION, or *Aromatizing* of Medicines, is mingling them with a due Proportion of Aromatick Spices, *&c.* in order to make them more grateful and uſeful.

ARQUEBUSE, or *Harquebuſs*, is a large Hand-Gun ſomething bigger than our Muſquet; by ſome 'tis called a *Caliever*.

ARRAIGN, is to put a thing in order, or in his Place.

ARRAIGNE the *Aſſize*, is to cauſe the Tenant to be called, to make the Plaint, and to ſet the Cauſe in ſuch order as the Tenant may be enforced to anſwer thereto.

Alſo a Priſoner is ſaid to be *arraign'd*, when he is indicted and put to his Tryal.

ARRAY, (in Law) is the ranking or ordering a Jury or Inqueſt of Men that are Impannelled upon any Cauſe.

ARRENTATION, ſignifies the licencing an Owner of Lands in the Foreſt to encloſe them (with a Hedge and a little Ditch) under a yearly Rent.

Saving of the Arrentation, is the ſaving Power to give ſuch Licences for a yearly Rent.

ARRERAGES, are Duties behind unpaid after the Days and Times in which they are due, and ought to have been paid, whether they be Rents of a Mannor, or any other thing reſerv'd.

ARREST, is when one is legally taken and reſtrain'd from his Liberty.

ARRESTANDIS *bonis ne diſſipanter*, is a Writ which lies for him whoſe Cattel or Goods are taken by another, who, during the Controverſy, doth, or is like to waſte or conſume them, and will hardly be able to make Satisfaction for them afterwards.

ARRESTANDO *ipſum qui pecuniam recepit ad proficiandum in obſequium Regis*, *&c.* is a Writ that lieth for the Apprehenſion of him that hath taken Preſt-money towards the King's Wars, and hides himſelf when he ſhould go.

ARRESTO *facto ſuper bonis mercatorum alienigenorum*, is a Writ that lies for a *Denizon* againſt the Goods of Strangers of another Country, found within the Kingdom, in Recompence of Goods taken from him in that foreign Country, after denial of Reſtitution. This, among the *Civillians*, is called *Clarigatio*, but now barbarouſly *Repriſalio*.

ARRETTED, (in Law) is he that is convented before any Judge, and charged with a Crime.

ARRIERE-GARDE, ſee *Rear-Guard*.

ARSENAL, is a Royal or Publick Magazine, or Place appointed for the making and keeping of all Arms neceſſary either for Defence or Aſſault.

ARSIS & THESIS, are certain Terms in Muſical Compoſition; as where a Point being inverted, is ſaid to move *per Arſin & Theſin*, that is to ſay, where a Point riſeth in one part, and falls in another; or on the contrary, where it falls in one part, and riſeth in another; whence is produced a very agreeable Variety.

ARTERY: There are three kinds of Ducts in an Animal Body which bear the Name of *Artery*, the *Aſperia Arteria* or *Trachea*, the *Arteria Pulmonaris* or *Vena Arterioſa*; both which ſee: And moſt properly, the *Aorta* or *great Artery*, which carries the Spirituous Blood from the left Ventricle of the Heart by its Branches, to all Parts of the Body; *This*, and its Ramifications, are the only true *Arteries*. The Word *Artery*, ſome ſay, is derived from ἀπὸ τῦ αἴρειν, becauſe 'tis continually riſing or moving with a Pulſe like Motion; and may be defined to be an Organical and Similar Part, oblong and round, appointed to convey Spirituous Blood to all Parts of the Body.

The greateſt *Aorta* in the whole Body is the *Aorta*, for that Reaſon often called the *Arteria magna*; and from it all the *Arteries* in the whole Body are derived, except the *Arteria Pulmonaris*. A brief Account of which, and how they ſpring from the *Aorta*, I ſhall here ſubjoin.

Before it comes out of the *Pericardium*, it ſends out ſometimes one, but oftner two ſmall *Arteries*, on each ſide one, which compaſs the *Baſis* of the Heart like a Garland in their Circuit, ſending down divers Twigs lengthways on the Heart; and theſe are called the *Arteriæ Coronariæ*. When theſe two ſmall *Arteries* have encompaſſed the Baſis and meet, they inoſculate one with another, but not with the Veins: At their riſe out of the *Aorta*, there is a Valve to hinder the Reflux of the Blood into the *Aorta*. Theſe Coronary Arteries Dr. *Ruyſch* obſerves, ſend Branches to the *Auricles*, and to the very Subſtance of the Heart it ſelf, and to the Root of the Trunk of the *Aorta*.

The *aſcending* Trunk then running up under the *Vena Cava*, lies upon the Wind-pipe, and preſently ſendeth forth two large Branches, whereof one paſſeth to the Right, the other to the Left Arm: They are called *Rami ſubclavii*, becauſe they march under the *Calviculæ*; and as ſoon as they are gone out of the Breaſt, are called *Axillares*. The Right is the larger, and riſing higher, goes a more direct way towards the Right Arm; the Left is leſs, and riſing lower, aſcends more obliquely towards the Left Arm. They ſend

out

out ſeveral Branches both from their *lower* and *upper* ſide.

From the *Lower* proceeds the *Superiour Intercoſtal*, which runs along the Interſtices or Intervals of the four uppermoſt Ribs, and ſends Slips to the neighbouring Muſcles and ſpinal Marrow. Theſe ſometimes are propagated from the Cervical Arteries coming out thro' the Holes of the *Vertebræ*.

From the *upper* ſide of each *Subclavian* ſprings firſt the *Mammari*, which deſcends towards the Breaſt thro' the Muſcles that fill up the Interſtices of the Cartilages of the true Ribs; and a conſiderable Branch of each deſcending out of the *Thorax* by the Sides of the *Cartilago enſiformis*, run down the *Abdomen* under the *Muſculi Recti*, ſpreading there into many Twigs, which are ſaid to inoſculate with the Extremities of the like Twigs of the Epigaſtrick Artery aſcending. But that Opinion is ſo oppoſite to the Circulation of the Blood, that it is impoſſible to be true; for no Blood can aſcend by the *Mammariæ*, nor deſcend by theſe aſcending Twigs of the *Epigaſtriæ*.

The next is *Cervicalis* (otherwiſe called *Vertebralis*) which ſendeth Slips to the *Vertebræ* and Muſcles of the Neck, at whoſe ſeventh *Vertebra* it enters in by the Holes of the tranſverſe Proceſſes, and pierceth the Membrane that inveſts the Spinal Marrow, beſtowing Twigs both on the Membrane and Marrow, and runs up therewith in at the great Hole of the *Occiput*, and being enter'd the Skull, both Branches (the Right and Left) join under the *Medulla Oblongata*, and then are divided into innumerable moſt ſmall Twigs, which make wonderful Net-like *Plexus* in the *Pia Mater* about the *Cerebellum*, and run into the Subſtance of the *Cerebellum* it ſelf; and ſome of them being united with thoſe of the *Carotides*, make part of the very *Rete mirable*.

The third *Artery* that riſeth out of the *upper* ſide of the *Subclavian* is *Muſcula*, which is ſpent on the Muſcles of the Neck, and ſometimes alſo on ſome of the Arm.

After the *Subclavians* have had all theſe Pairs of Arteries going out of them, they paſs out of the *Thorax*, and begin to be called *Axillar*.

At the ſame Place, or very near, where the aſcending Trunk of the *Aorta* ſends out the *Subclavians* ſideways, the remainder of it is divided into two, called *Carotides*, which aſcend directly *upwards* (tho' the Right ſometimes ariſe from the right *Subclavian*.) Theſe, at their riſe, are ſuſtained by the *Thymus*; and having beſtowed Twigs on the *Larynx*, *Tongue*, the Muſcles of the *Os Hyoides*, and the neighbouring Gland, paſs up on each Side by the ſides of the Wind-pipe to the Jaws, with the Internal Jugular Vein, and there are each ſubdivided into the *External* and *Internal* Branches.

The *External* is ſmaller, and is diſperſed into all the Muſcles of the Cheeks, Fore-head, Temples, Lips, and, in general, thro' all the outer Parts of the Head and Face.

The *Internal*, which is larger, ſends forth ſome more Twigs to the *Larynx*, *Tongue*, &c. as alſo to the Glands behind the Ears, and the ſpongy Parts of the Palate and Noſe. Then it entreth the upper Jaw, and beſtows a ſmall Slip on the Root of each Tooth (as the *External* did on the Roots of the Teeth of the lower Jaw) whereby ſharp Humours flowing in upon them, ſometimes cauſe a very painful Tooth-ach. The remainder of it climbs upon the Skull, being about the *Baſis* divided into two Branches: The *leſs* and hinder whereof having ſent one Slip to the inner Muſcles of the Neck, and another thro' the Hole of the uppermoſt *Vertebra* into the Membrane that inveſts the Spinal Marrow, aſcending farther, enters the Skull, at the Hole by which the ſixth Pair of Nerves (commonly ſo called) comes out, and creeping along the *Dura Mater*, ends near its *Sinus* (which yet ſome ſay it enters.) The *larger* Branch, tending upwards, is carried thro' the bony Channel in the Wedge-like Bone, with a winding Duct to the *Sella equina*; at whoſe *Baſis*, after it has ſent out a Twig on each Side into the *Dura Mater*, it opens it ſelf into many ſmall Slips, which being interwoven with thoſe of the Cervical Artery (above-mentioned) make the *Rete mirable*, which is more obſervable in Beaſts than in Men. Yet it is not all ſpent on the ſaid Slips, but perforating the *Dura Mater*, it enters the *Pia Mater* with two notable Branches, which being divided into very ſmall Twigs, are mingled with thoſe of the Cervical Artery, with which they paſs out of the Skull, and accompany the Spinal Marrow even to the Loins: Afterwards it ſends a ſmall Branch thro' the ſecond Hole of the Wedge-like Bone with the Optick Nerve, out of the Skull to the Eye; and yet ſtill ſupplying more Twigs to the Subſtance of the Brain and *Pia Mater*, and being united with ſome other Twigs of Cervical Artery, it makes the *Plexus Choroides*.

The deſcending Trunk of the *Aorta*, which is larger than the aſcending, goes down by the Gullet to which it cleaveth. And hence is a Man that is hot, ſo much cooled with a draught of cool Drink; for the Gullet being cooled thereby, the Blood in the *Aorta* contiguous to it, muſt needs be cooled likewiſe.

Before it arrive at the *Diaphragm* it ſends out of its hinder ſide the *Inferiour Intercoſtals*, which run along the Interſtices of Eight or Nine of the lower Ribs, namely, thoſe which the *Superiour Intercoſtals* did not ſupply. They likewiſe ſend Sprigs by the Holes of the *Vertebra*, made for the Nerves, to the Marrow of the Back, and to the Muſcles which reſt upon the *Vertebræ*, and alſo to thoſe of the *Thorax*. Sometimes above this, and ſometimes below it, there ariſeth alſo out of the hinder part of the *Aorta* and Artery called *Bronchialis*, firſt found out and ſo named by *Frederick Ruych*, which accompanies all the *Bronchia* of the Wind-pipe.

When it comes to the Midriff, there ſprings out of it the *Phrenicæ*, one on each ſide; theſe running all thro' the *Diaphragm*, paſs up into the *Mediaſtinum*, and ſometimes into the *Pericardium*.

Then having penetrated the Midriff it deſcends in one Trunk to the fifth *Vertebra* of the Loins; in which Paſſage it firſt ſendeth forth the *Cæliaca*, which ariſeth ſingle, and is ſo called, becauſe it ſendeth Twigs to the Stomach. This ſpringeth from the fore-part of the Trunk at the firſt *Vertebra* of the Loins, and deſcending under the hollow of the Liver, upon the Trunk of the *Vena Porta*, it is divided into two Branches, the *Right* and *Left*.

The *Right* which is the ſmaller, aſcending, produces in its upper part the *Gaſtrica dextra*, that comes

comes to the *Pylorus*, whence *Spigelius* calls it *Pylorica*: And beſides, the *Cyſticæ gemellæ*, which are very ſmall, and are diſperſed thro' the Gall-Bladder. And out of its lower ſide there ſpring;

1. *Epiploïs dextra*, which runs thro' the right ſide of the inner or hinder Leaf of the Caul and the *Colon* that it is annexed to.

2. *Inteſtinalis*, beſtow'd on the *Duodenum* and beginning of *Jejunum*.

3. *Gaſtro-epiploi dextra*, on the right ſide (to the middle) of the bottom of the Stomach, and alſo on the Caul that it is knit to its bottom.

4. *Hepaticæ*, which are two ſmall ones: Theſe are ſpent on the inveſting Membrane of the Liver (for its *Parenchyma* is nouriſhed by the *Porta*) the *Capſula Communis*, the Gall-Bladder and *Porus Bilarius*.

The Remainder of this *Right* Branch enters the Meſentery with many Twigs.

The *Left* Branch of the *Cœliaca*, which is call'd *Splenicus* (ſometimes ſpringing immediately from the *Aorta*) is larger than the *Right*; and as it goes towards the Spleen, it ſendeth forth of its *upper* ſide *Gaſtrica major*, which after it hath beſtow'd a Slip upon the upper and middle part of the Stomach, is divided into two others; the firſt whereof is called *Coronaria Stomachica*, which encompaſſes the upper Orifice of the Stomach like a Garland, and ſends many Twigs to the Body of the Ventricle it ſelf; the other *Gaſtrica ſiniſtra* which (according to *Diemerbroeck*) is carried towards the Right Hand into the upper part of the Stomach, and to the *Pylorus*. Out of its lower ſide ſpring, firſt *Epiplois poſtica*, which runs to the hinder Leaf of the *Omentum*, and the *Colon* annex'd to it; ſecondly, *Epiplois ſiniſtra*, which is beſtow'd on the lower and left ſide of the *Omentum*.

Juſt as the Splenick Branch is entring into the Spleen, there ariſes out of its upper part *Vas breve arterioſum*, which goeth ſtreight to the Left part of the bottom of the Stomach; and the *Gaſtro-epiplois ſiniſtra*, which being ſuſtain'd by the upper or fore-leaf of the *Omentum*, ſends ſome Twigs thereto, and alſo to the Left part of the bottom of the Stomach, and to both its fore and hinder ſides, then it enters into the Spleen.

All theſe Arteries ſpring from the *Cœliaca*, and accompany the Veins of the *Porta* of the like denomination.

The next that ariſeth out of the Trunk of the *Aorta* is the *upper Meſenterick*, which ſprings from the fore-part of it as the *Cœliack* did. It accompanies the *Vena Meſariaca* of the *Porta*, and runs thro' all the upper part of the Meſentery, and beſtows many Branches on the Guts, *Jejunum Ileum*, and that part of *Colon* that lieth in the right Hypochonder.

Immediately below this, about the ſecond *Vertebra* of the Loins, there go out of each ſide of the deſcending Trunk of the *Aorta* an *Emulgent Artery*, each of which being after its riſe divided into two, and ſometimes into three Branches, enters the Kidney on its own ſide. The Right ſprings out of it a little lower than the Left: both are ſubdivided into innumerable Twigs in the *Parenchima* of the Kidneys, (all of which are inveſted with the Veins in one common *Capſula* borrow'd from the *Pelvis*) and their Capillaries end in the Glands, wherein the *Serum* that theſe Arteries bring with the Blood is ſeparated there-from, and carried from them by the Urinary *Siphons* into the *Pelvis*.

Next to theſe ariſe the *Spermaticæ* (called *Arteriæ præparantes*). Theſe go out of the fore-part of the Trunk very near together (very ſeldom either of them out of the Emulgents, as the Left Spermatick Vein does) and the Right paſſes over the Trunk of the *Vena Cava*: About 2 Fingers breadth from their riſe they are each joyn'd with the *Vena præparans* of their own ſide, and deſcend with them, in *Men*, thro' the Proceſs of the *Peritonæum* to the Stones, being divided into two Branches a little before they arrive at them, one of which runs towards the *Epididymis*, and the other to the *Teſtes*. In *Women*, when they come near the *Teſtes* (or *Ovaria*) they are divided alſo into two Branches, one whereof goes to the *Teſtes*, and the other to the bottom of the Womb. Next below the Spermatick ſprings the *lower Meſenterick* out of the Trunk a little before it is divided into the *Rami Iliaci*. This entreth the lower Region of the Meſentery, and diſtributes many Branches to the Left part of the *Colon*, and to the ſtreight Gut; and laſtly, deſcending to the *Anus*, makes the internal Hemorrhoidal Artery.

Very near to this, out of the Trunk ſtill ariſe the *Lumbares*, reckon'd four in number: Theſe go out of the back-ſide of the *Aorta*, and are diſtributed, not only to the neighbouring Muſcles of the Loins, and to the *Peritonæum*, but enters in at Holes of the *Vertebra* of the Loins, and run along the Membrane that involves the Spinal Marrow, and penetrates into the Marrow it ſelf.

Beſides theſe ſome reckon other two, on each ſide one, call'd *Muſculæ Superiores* (which run to the Muſcles of the *Abdomen*) unleſs theſe be two of the four call'd *Lumbares*.

When the Trunk is deſcended as low as the fifth or laſt *Vertebra* of the Loins, and the top of *Os Sacrum*, it begins to climb upon the *Vena Cava*, under, or behind which it paſſed thus far: But as it begins to get upon it, it is divided into two equal Branches call'd *Rami Iliaci*, and at its very diviſion there ſprings out of it *Arteria Sacra*, whoſe ſmall Twigs entring in at the Holes of the *Os Sacrum* penetrate into the Marrow contained in it.

The Trunk of the deſcending *Aorta* being divided into the *Rami Iliaci*, theſe are ſub-divided preſently into the *interiour* and *exteriour* Branches. From the *interiour*, which is leſs, proceed three others.

Firſt, The inferiour *Muſcula* (called otherwiſe *Glutæa*) which is beſtow'd on the Muſcles, named *Glutæi* that makes the Buttocks, and alſo on the lower end of the Iliack Muſcle and the *Pſoas*.

Secondly, The *Hypogaſtrick*, which is large, and at the lower end of the *Os Sacrum* runs to the Bladder and its Neck, and the Muſcles that cover the *Oſſa Pubis*. In Men it goes alſo along the two Nervous Bodies of the *Penis* as far as the *Glans*; and in *Women* it is diſtributed in numerous Branches into the bottom of the Womb and its Neck, out of which, for the greateſt part, iſſue the *Menſes* in their Monthly Purgation. It goes alſo to the *Podex*, where it makes the external Hemorrhoidal Artery.

Thirdly, The *Umbilical Artery*, which aſcending by the ſides of the Bladder, and being inſerted into the *Peritonæum*, proceeds betwixt the two Membranes thereof to the Navel, out of which it paſſes in a *Fœtus* in the Womb, and runs into the *Placenta Uterina*: But after the Infant is born, when there is no more uſe of it, it cloſes up, and turns into

into the nature of a Ligament, in ſome meaſure ſuſtaining the ſides of the Bladder, and hindring it from preſſing on its Neck.

From the *Exteriour Branch* of the *Ramus Iliacus* two Arteries ariſe.

Firſt, The *Epigaſtrick*, which turning upwards on the outſide of the *Peritonæum* runs betwixt it and the *Muſculi Recti* of the *Abdomen* as high as the Navel, where the Mammary Artery meets it, and according to Tradition (tho' falſe) inoſculates there with it.

Secondly, *Pudenda*, which ſends forth a notable Artery on each ſide into the Nervous Body of the *Penis* in Men, and into the *Clitoris* in Women. Hence it is carried inwards by the joynting of the *Oſſa Pubis* to the *Pudenda* and Groins, and their Glands, and is ſpent on the Skin of thoſe Parts, and of the Yard, in Men. When all theſe pairs of Arteries have ariſen out of the *Rami Iliaci*, they run down out of the *Abdomen* to the Thighs, where they begin to be called *Crurales*.

ARTERIA VENOSA: See *Pulminaria Arteria*.

ARTERIOTOMY, is the artificial opening of an Artery for the letting of Blood in an inveterate Head-ach, Madneſs, Falling-ſickneſs, Pain and Inflammation in the Eyes and Ears, and the Section is made in the Fore-head, Temples, or behind the Ears: The manner of it is thus; after the Ligature is made in the Arms or Neck, the Artery is cut juſt as a Vein is, and when the Blood is emitted, you apply a very Aſtringent Plaiſter with a Leaden Plate to the Orifice, and then ſwathe it well. *Blanchard.*

ARTHRITIS, *Morbus Articularis*, the Gout, is a Pain in the Joints of the Limbs, ſometimes accompanied with a miſerable Contraction of the Nerves, Tendons, Ligaments, and thin Membranes about the Bones, with Swelling and Redneſs, and now and then with hard chalky Concretions. They account it four-fold: *Chyragra* the Hand Gout; *Iſchias*, the Gout in or about the Bone connected to the *Os Ilium*, which therefore ſome call the Hip-Gout: *Gonagra*, in the Knees; and *Podagra*, in the Feet.

ARTHRITIS PLANETICA, } the wandring
ARTHRITIS VAGA, } Gout, which flies or moves from one Limb to another.

ARTHRITICK, or *Arthritical*, Gouty, Diſeaſed in the Joints, *&c.*

ARTHRODIA, is the Articulation of one Bone into the ſhallow *Sinus* of another, as the *Radius* receives the *Humerus*.

ARTHROSIS, the ſame with *Articulation*.

ARTICK POLE, is the *North Pole* of the World.

ARTICK CIRCLE: See *Polar Circle*.

ARTICLE, in Arithmetick, is *Ten*, with all other whole Numbers that may be juſtly divided into ten Parts, as 20, 30, 40, *&c.* they are ſometimes called *Decads*, and ſometimes Round Numbers.

ARTICLE, in Grammar, is a ſmall Word or Particle uſed to Decline or Vary the Caſes, and to diſtinguiſh the Genders of Nouns and Pronouns, as *Hic*, *Hæc*, *Hoc* in the Latin Tongue.

ARTICULATION, is that part of *Grammar* which treateth, firſt of Sounds and Letters (which are called the Elements of Speech) and then of the manner of their Combination for the compoſing of Syllables and Words; ſo that he which pronounces his Words clearly and diſtinctly, is ſaid to pronounce them *articulately*. And ſuch Sounds as can be expreſſed by Letters, and which form Words, are called *Articulate Sounds*.

ACTICULATION, in Anatomy, is a Conjunction of the Limbs of an Animal Body, for the due performance of Motion: Some make this twofold, *viz. Diarthroſis*, which is a more looſe, and *Synarthroſis*, which is a more cloſe Conjunction.

The Term is alſo uſed by the *Botaniſts* for the Joints or Knots that are in ſome *Siliquæ*, as thoſe of the *Ornithopolium*, and in the Roots of the *Polygonatum*, and the Diſtance or Space between Knot and Knot, or Joint and Joint they call the *Internodium*.

ARTIFICIAL DAY: See *Day*.

ARTIFICIAL NUMBERS, *Secants*, *Sines* and *Tangents*: See *Logarithmetical Numbers*, *Secants*, *Sines* and *Tangents*.

ARTIFICIAL LINES, on any Sector or Scale are Lines ſo contrived as to repreſent the Logarithmetick Sines and Tangents, which, by the help of the Line of Numbers, will ſolve all Queſtions in Trigonometry, Navigation, *&c.* tolerably exact.

ARTILLARY, is all ſorts of great Fire-Arms with their Appurtenances; as Cannons of all ſorts, Mortars, Muskets, Carbines, *&c.*

ARYTÆNOIDES, or *Gutturales*, are two Cartilages which with others make up the top of the *Larynx*; and theſe are ſo called, becauſe when their Proceſſes are joined together, they repreſent the Month of an Ewer *(Gutturium)* or the indented Lip of a Cup or Veſſel.

ARYTÆNOIDEUS, is the ſmalleſt Muſcle belonging to the *Larynx*; it's in the Opinion of ſome, double; but has always (ſays Mr. *Cowper*) appeared to us ſingle. It ariſes from the external part of one of the *Aritenoidal Cartilages*, and running tranſverſly, is inſerted to the other. This pulls the *Arytenoidal Cartilages* nearer each other, and ſhuts the *Rimula* adequately, by forcing down the *Epiglotis*, which quite cloſes the *Glottis* ſo that no Air can enter.

ASAPHY, is a lowneſs of the Voice, proceeding from an ill Conſtitution, or Contemporation of the Organs of Speech.

ASBESTINE *Paper* or *Cloth*, is ſuch as will burn in the Fire, be purified by it, and yet not conſume. 'Tis made of the *Asbeſto* or *Lapis Amianthus*, and is by ſome called *Linum Vivum*.

ASCARIS, or *Aſcarides*, are little Worms which breed in the *Inteſtinum Rectum*, and tickle and trouble it.

ASCENDANT, is that part of the Heavens which aſcends, or is coming up above the Horizon in the *Eaſt*.

ASCENSION, is the riſing of the *Sun* or *Star*, or of any part of the *Equinoctial* with it, above the *Horizon*. *Deſcenſion* is the ſetting of the ſame. Theſe *Aſcenſions* and *Deſcenſions* are either *Right* or *Oblique*; which ſee.

ASCENSIONAL *Difference*, in Aſtronomy, is the *Difference* between the *Right* and *Oblique Aſcenſion* or *Deſcenſion*; or, it's the ſpace of Time, the *Sun riſeth* or *ſetteth* before, or after ſix of the Clock.

To find the *Aſcenſional Difference* Trigonometrically, having the Latitude of the Place, and the *Sun*'s Declination given.

Say,

Say, As the Co-Tangent of the Latitude: Is to the Tangent of the Sun's Declination :: So is the Radius: To the Sine of the *Aſcenſion Difference.*

Example. Suppoſe the *Latitude* be 51°. 30'. and the *Sun's Declination* be 9°. 00'.

Then to the Ar. co. of the Co-Tangent of	51°. 30'. --	0,099395
add the Tangent of --	9°. 00'. --	9,199712
Sum is the Sine of	11°. 29 =	9,299107

Which is the *Aſcenſional Difference* required; and being reduced into Time, by allowing 4 Minutes of an Hour for every Degree, 'twill be 44'. 29".

ASCII, are the Inhabitants of the *Torrid Zone*, which twice a Year have the *Sun* (at Noon) in their *Zenith*, and conſequently, then their Bodies caſt no Shadow; whence comes the Name of *Aſcii*, ἄσκιοι.

ASCITES, is a Dropſie or ſwelling of the *Abdomen*, and conſequently, of the *Scrotum*, Thighs and Feet, proceeding from a Serous, and ſometimes Lymphatick or Chylous Matter, like the waſhing of Fleſh, collected in the Cavity of thoſe Parts.

ASCITICK, is he that is affected with the *Aſcites*.

ASCLEPIAD, a Greek or Latin Verſe of four Feet, containing a *Spondee*, a *Coriambus*, and two *Dactyles*; as,

Sublimi feriam ſidera vertice.

ASPARAGUS, in Botanicks, ſignifies the firſt *Germen*, *Sprout* or *Shoot* of a Plant; which is either edible by it ſelf, or boiled in Broth: It comes out before the Leaves are unfolded. And hence (*i. e. a* σπείρω) the famous Plant of this Name receives its Denomination.

ASPECT, a Term in Aſtronomy, ſignifying the Situation of the Stars and Planets, in reſpect of one another. Of theſe they uſually reckon five.

1. The *Sextile*, when two Stars or Planets are 60 *degr.* from one another.
2. *Quartile*, when they are 90 *degr.* diſtant.
3. The *Trine*, when they are diſtant 120 Degr.
4. *Oppoſition*, when they are 180 diſtant.
5. *Conjunction*, when they are both in the ſame Degree.

Kepler added 8 new *Aſpects* more; as the *Demiſextile* of 30°. the *Decile* of 36°. the *Octile* of 45°. the *Quintile* of 72°. the *Tredecile* of 108°. the *Seſquartile* of 135°. the *Biquintile* of 144°. and the *Quincunx* of 150°.

How the Diſtance is reckoned, and on what Circle, ſee the Word *Secondary Circles*.

ASPERA *Arteria*, or *Trachea*, is an oblong Pipe conſiſting of various Cartilages and Membranes, which begins at the Throat, or lower part of the Jaws, lies upon the Gullet, deſcends into the Lungs, and is diſperſed by manifold Ramifications or Branches thro' their whole Subſtance: The upper Part is called *Larynx*, and the Lower *Bronchus*, to which *Malpighius* adds a third, or loweſt, called by him *Veſicular*: It is ſubſervient to Speech and Reſpiration.

That part of the *Aſpera Arteria* which is called the *Bronchus*, contains all of it, but the *Larynx*; being the Body of the Pipe as well before as after its Inſertion into the Lungs, all the Cartilages of this *Bronchus* are like the loweſt of the *Larynx*, to which the uppermoſt of the *Bronchus* adheres. Theſe Cartilages are ſeated one below another at equal Diſtances, and keep in their Places by both the Membranes of the *Trachea*, which fill up their Interſtices, and tye them one to another like Ligaments. Yet theſe Rings have not their Circle entire, but on the backſide of the *Bronchus* next the Gullet, that they might give way to the Meat in ſwallowing, they paſs into a Membrane, ſo that they are in Figure like the Letter C. But this Interſtice in their Circle, which moſt Anatomiſts affirm to be Membranous, *Caſp. Bartholin* (after his Father) ſays, is rather a Carnous Fibres that run from one Side or End of the Cartilage acroſs to the other, which, in Expiration (eſpecially violent) contracting themſelves, draw the Ends of the Cartilage towards one another on each Side, and thereby ſtraiten the Pipe of the *Trachea*.

And tho' the Cartilages, ſo far as they are contiguous to the Gullet (being about twenty in number) are thus ſemilunar as it were; yet thoſe of the Branches of the *Bronchus* within the Lungs, have no Interſtice in their Circumference, being all Cartilaginous, tho' not all of a Circular Figure, but ſome Four-ſquare, other Triangular, *&c.* as *Diemerbroeck* obſerves, the inner Membrane is plentifully beſet with military Glands, out of which a good part of that mucous Matter that bedaubs its Inſide iſſues, for the lubricating of it. The *outer* Membrane helps to connect the Cartilages the more firmly one to another, and the whole *Trachea* to the neighbouring Parts, that it may more ſafely and firmly deſcend into the *Thorax*. This is much thinner than the other; for the Inner (according to Dr. *Wallis*) has two Rows of Muſcular Fibres, the Outer ſtreight, the Inner Oblique, the Firſt by their Contraction ſhorten the *Trachea*, the Latter ſtraiten it; ſo that he thinks they aſſiſt Expiration, eſpecially when it is violent, as Coughing, Hawking, or the like. Yet he ſays, this inner Membrane has two others growing upon it, as it were, one Glandulous, and another Vaſcular. Thro' this latter do the Blood-Veſſels and Nerves every where run; and the Glands placed in the former, receive and keep all the ſuperfluous Moiſture or *Lympha* depoſited by the Arteries, which the Veins do not imbibe, till they can remand it by the Lympheducts (which ſpring from them) or if it be over plentiful, ſo that the Lympheducts cannot receive it at all, then it iſſues both out of theſe Glands, and out of the Arteries into the Cavity of the Wind-pipe, and cauſes a Catarrh. But the Inſide of this Membrane is naturally moiſt, being beſmear'd with a fattiſh and muccous Humour, to hinder its drying, and to make the Voice ſmoother; ſo that when this Humour is fretted off in Catarrhs, or the Inſide of this Membrane becomes rough from any Cauſe, the Voice becomes hoarſe; and when it is dried by too much Heat, as in Feavers, it becomes ſqeaking.

The *Aſpera Arteria* has *Veins* from the external Jugulars. *Arteries* from the *Carotides*, and from the *Arteria Bronchialis* (firſt found out by *Frederick Ruyſch*) which ſprings from the backſide of the deſcending Trunk of the *Aorta*, a little above the lower Intercoſtals. *Nerves* it receives from the recurring Branches of the *par Vagum*, which run moſtly along its inner Membrane, whence it becomes ſo exquiſitely ſenſible.

When it is deſcended as low as the fourth *Vertebra* of the *Thorax*, it is divided into two Trunks, whereof one goes into the right Lobe of the Lungs, the

the other into the left, and each is presently again divided into two, and those into others, till at last they end in very small Branches, which are dispersed among the like Branches of the Pulmonary Artery and Vein, and end in and are continued with the little Bladders that make up the greatest part of the Bulk of the *Lungs*.

ASPERIFOLIÆ *(Plantæ)* is one of the Divions or kinds of Plants: See (*Plants*, *N.* 11.)

In this kind of Plants, the Leaves stand alternately, or without any certain order on the Stalks: The Flowers are *monopetalous*, but having the Margin cut into 5 Divisions, sometimes deep, sometimes shallow; and the upper Spike or top of the Plant is often curved back something like a Scorpion's Tail. They are called *Asperifoliæ* because they are usually *rough leaved*, but they are not always so. After each Flower of this kind of Plants, there usually succeed four Seeds: There being only the *Cerinthe* reckoned by Mr. *Ray* to belong to this Genus, which hath less than four Seeds at the Root of each Flower, but that hath but two.

The *Herbæ Asperiofolæ* are, the *Pulmonaria Maculosa*, *Cynoglossa*, *Borago*, *Buglossa*, *Anchusa*, *Echium*, *Linum Umbilicatum*, *Heliotropium majus*, *Aparine major*, *Consolida major*, *Lithospermum*, *Echium Scorpoides* and *Cerinthe*.

ASPERITY, is the inequality or roughness of the the Surface of any Body, whereby some parts of it do so stick out above the rest, as to hinder one's Hand, *&c.* from passing over it easily and freely.

ASPHYXIA, or a Cessation of the Pulse of the whole Body, is the highest degree of Swooning, and next to Death.

ASPIRATION, or the pronouncing of any Syllable or Word strongly, with a good deal of Breath and some Vehemency; as we do those Words which have the Letter *H* before them, as *have*, *hear*, *heat*, &c. whereas they are sounded much softer and easier without the *H*; as *ear*, *eat*, &c.

ASPYXIA, a sensible decayed Pulse, the same with *Asphyxia*.

ASSART, a Term in Law, signifying an Offence committed in the Forest, by plucking up the Woods by the Roots: Also to make Glades in a Wood, to grub up or clear a Ground of Bushes and Shrubs, *&c.* or to lop off the Boughs of a Tree.

ASSATION, is a Term in Pharmacy, used for a peculiar kind of *Decoction* or Boiling of Plants, *&c.* in their own Juice.

ASSAULT (in Law) signifies a violent kind of Injury offered to a Man's Person, of a more large extent than Battery; for it may be committed only by offering to give a Blow.

ASSAULT (in the Art of War) is taken also for a general Attack made upon the Fortress to get it by main Force, without defending themselves in the Attack by any Works: The Words are, to *give an Assault* to such a Place; *to be commanded to the Assault*; *to stand an Assault*, *to second an Assault*; *to repulse an Assault*; *to carry by Assault*, &c. While an Assault lasts, and both Parties are mixt, there is no fear of Cannon on either Side, for they are afraid of destroying their own Men thereby.

ASSETS (in Law) signifie Goods enough to discharge that Burden which lies upon the Executor or Heir, in satisfying the Testators or Ancestors Debts or Legacies.

ASSEWIARE, signifies to draw or drain out Water from a Marshy Ground.

ASSIGN, (a Law Term) is he that is appointed or deputed by another to do any Act, or perform any Business, or enjoy any Commodity: And it is either in *Deed* or in *Law*.

ASSIGN *in Deed*, is he that is appointed by the Person himself.

ASSIGN *in Law*, is he whom the Law so makes, without any appointment of the Person.

ASSIMILATION, is a Term in Anatomy, by which they express the Change that is made either of Chyle into Blood, or of the Nutritious Juice into the Substance of an Animal Body. Thus the Modern Anatomists say, Sanguification is not performed by the Liver only, as the Ancients supposed, but by a gradual changing of the Chyle into Blood by frequent Circulations, and the manner of this Change they call *Assimilation*.

ASSISA *Cadere*, in Law, signifies to be Nonsuited.

ASSISA *Nocumenti*, an Assize of Nuisance.

ASSISA *Continuanda*, is a Writ directed to the Justices assigned, to take an Assize for the continuance of a Cause, where certain Records alledged cannot in time be procured by the Party that would use it.

ASSISA *Proroganda*, is a Writ directed to the Justices of Assize for the stay of Proceedings, by reason of the King's Business, wherein the Party is employed.

ASSISE, *de mort d' ancestor*: See *Cosinage*.

ASSISE *de utrum*, lieth for a Parson against a Lay-Man, or a Lay-Man against a Parson, for Land or Tenement doubtful whether it be Lay-fee, or Free-Alms.

ASSIZE, in Law, properly signifies a Writ that lies where any Man is put out of his Lands, Tenements, or of any Profit to be taken in a certain Place, and so disseised of his Free-hold. In an *Assize* it is needful always that there be one Disseisor, and one Tenant, or otherwise the Writ shall abate.

There is also another *Assize*, called *Assize of fresh Force*, and lies where a Man is disseised of Tenements which are devisable; as in *London* or other Boroughs that are Franchises: For there the Tenant shall come into the Court of the Town or Borough, and enter his Plaint, and accordingly shall have a Writ directed to the Mayor or Bayliffs, *&c.* and thereupon shall pass a Jury in manner of *Assize of Novel Disseisin*; and in case the Officer delay Execution, the *Plaintiff* shall have another *Writ of Execution*, then a *sicut alias*, and after that a *Pluries*, &c. And from things of this Nature being done by the Judges in their Circuits; when at any Place they sit to do Justice by Commission, that Court or Meeting is called the *Assizes*.

But besides this, the Judges of the *Assizes* have several other Commissions; as, 1. A Commission of *Oyer* and *Terminer*, directed to them, and to many others of the best Account in their Circuits; but here the Judges are of the *Quorum*, so as without them there can be no proceeding: By this Commission they enquire into and punish Murders, Treasons, Felonies, *&c.* 2. They have a Commission of *Goal Delivery*; this is directed only to themselves, and the Clerk of the Assize Associate, and by this Commission they deal with all Prisoners in Goal, for whatever Offences there committed. 3. They have also a Commission of *Nisi*

Prius, directed to the Judges themſelves and the Clerk of the Aſſize, by which they are commiſſionated to take *Niſi Prius*, &c. 4. They have alſo a Commiſſion of the Peace, in which all the Juſtices of the Peace of the ſeveral Circuits are obliged to aſſiſt them; for Default of which they are fineable at the Diſcretion of the Judges.

ASSIZE *de darrain Preſentment*: See *Quare impedit*.

ASSIZE *of Novel Diſſeiſin*, lies where a Tenant in Fee-ſimple, Fee-tail, or for term of Life, is lately diſſeiſed of his Lands or Tenements, or elſe of a Rent-ſervice, Rent-ſeek, or Rent-charge of Common, of Paſture, of an Office, *&c.*

ASSIZE *of the Foreſt*, is a Statute or Condition, touching Orders to be obſerved in the King's Foreſt.

ASSIZE *of Bread and Beer*, is the Power a Magiſtrate has of aſſizing or adjuſting their Weights and Meaſures.

ASSOCIATION, is a Patent ſent by the King, either of his own Motion, or at the Suit of the Party Plantiff to the Juſtices of Aſſize, to have other Perſons aſſociated to them to take the Aſſize: And upon this Patent of the Aſſociation, the King will ſend his Writ to the Juſtices of Aſſize, by it commanding them to admit them that are ſo ſent.

ASSODES *Febris*, is a kind of burning Fever, in which the ſick Perſon inceſſantly tumbles and toſſes, being exceeding reſtleſs, and ſubject to Sickneſs at the Stomach, and Vomiting, by reaſon that the Diſtemper uſually ariſes from the Vexation of the Stomach, by ſharp and cholerick Humours, biting the Orifice or Coat thereof. *Blanch.*

ASSOYLE, (a Law Term) ſignifies to deliver or diſcharge a Man of an Excommunication,

ASSUMPSIT (in Law) or *Nude Contract*, is a voluntary Promiſe made by Word, by which a Man aſſumes and takes upon him to perform, or pay any thing to another: Or a Promiſe may ariſe in Law, as upon the ſale of Goods, *&c.*

ASSUMPTION, in Logick, is the *Minor* or *Second Propoſition* in a *Categorical Syllogiſm*.

ASTERICK, is a ſmall Star ſet over any Word or Sentence, to make it the more conſpicuous or taken notice of by the Reader.

ASTERISM, the ſame with *Conſtellation*; or a Collection of many Stars into one Claſs or Syſtem, which is uſually on the Globe repreſented by ſome one particular Image or Figure, to diſtinguiſh the Stars that compoſe this Conſtellation from thoſe of others.

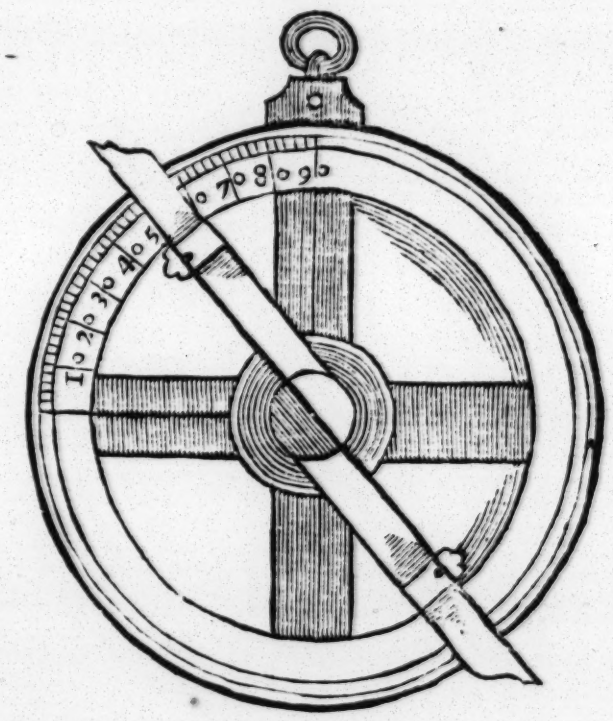
ASTHMA, or *Phthiſick*, is a difficulty of breathing, proceeding from the ill affection of the Subſtance of the Lungs, and the intercoſtical Muſcles ſerving to Reſpiration.

ASTRAGAL, in Architecture, is by the *French* called the *Talon*, by the *Italians* *Tondino*, and is a kind of half *Tore*, ſometimes wrought (in the Richer Orders) like a kind of overcaſt Hem or Edge to the larger *Tore*; which frequently is placed between, as in the *Ionick Baſe*, with two *Scotia's* or *Trochiles*; and ſometimes, but rarely, juſt about the Plinth of the Baſe. Sometimes it is taken for the Collar or Cincture next the *Hypotrachelium* and Diminution of a Pillar liſted on both Edges; and it runs alſo round under the *Echinus* of the *Ionick*. We find it alſo ſometimes dividing the *Faſcia* of the Corinthian Architrave, where it is wrought in Chaplets, and Beads or Berries; and ſometimes 'tis uſed both above and below the *Liſts*, and joining immediately to the Square or Die of a Pedeſtal, where the *Stylobata* is introduced. Freart's *Parallel of Architect.*

ASTRAGAL, in Gunnery, is the Cornice Ring of a Piece of Ordinance.

ASTROLABE, is a Mathematical Inſtrument ſerving to take the Height of the Sun or Stars. It conſiſts of an entire Circle, whoſe Limb (or what Part of it is neceſſary) is divided into Degrees and Decimal Parts of a Degree, with a moveable Ruler or Label which turns upon the Centre, and carries two Sights. At the Zenith is a Ring to hang it by in time of Obſervation, and then you need only turn it ſo to the Sun, that the Rays may paſs freely through both the Sights, and the Edge of the Label cuts the Altitude in the Limb. This *Aſtrolabe*, though now not much in uſe at Sea, yet if well made, graduated and poiſed, and of a great Thickneſs and Weight, that it may hang the ſteadier, it may be a very ſerviceable Inſtrument, eſpecially between the Tropicks, where the Sun comes near the Zenith; and in calm Weather. There are alſo ſome Projections of the Sphere which are called by this Name, as that of *Gemma Frizius* and *Stoffler*.

The Common Sea Aſtrolabe.



ASTROLOGY, is an Art which pretends to foretel future things from the Motion of the Heavenly Bodies, and their Aſpects to one another; and alſo from ſome Imaginary Qualities, which the fooliſh Admirers of this Cheat will have to be in the Stars, as the Cauſes of great Sublunary Effects; though they have no tolerable Grounds to prove that there are any ſuch things. And therefore as I wiſh that ſuch a ridiculous Piece of Foolery as this may be quite forgotten, ſo I have every where omitted explaining any of its Terms, unleſs they fall in with *Aſtronomy*.

ASTRONOMICAL *Calendar*, is an Inſtrument engraved on Copper Plates, printed on Paper, and paſted on Board, with a Braſs Slider, which carries a Hair, and ſhews, by Inſpection, the *Sun's Meridian*, *Altitude*, *Right Aſcenſion*, *Amplitude*, *Declination*, *Time of its Riſing and Setting*, &c. to greater nicety than the largeſt Globes now made.

ASTRONOMICAL *Numbers*: See *Sexageſimal Fractions*.

ASTRONOMICAL *Place of a Star or Planet*, is its *Longitude* or Place in the Ecliptick, reckoned

ed from the beginning of *Aries*, *in Conſequentia*, or according to the natural order of the Signs.

ASTRONOMICAL *Quadrant*, is an Inſtrument curiouſly framed, and the Degrees exactly and minutely divided by the help of a Screw on the Edge of the Limb, fitted with Teleſcopes, and either apply'd to a Wall in the Meridian; or on a ſtrong Axis or Pedeſtal, with two Semi-circles placed at Right Angles on two endleſs Screws, which readily direct or guide the Inſtrument to take Obſervations of the Sun, Moon or Stars.

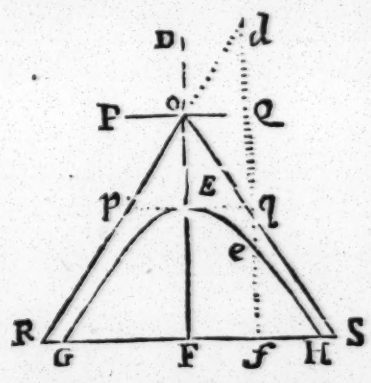
ASTRONOMY, is a Mathematical Science, teaching the Knowledge of the Stars or Heavenly Bodies, and their Magnitudes, Diſtances, Eclipſes; Order, and Motions: By ſome 'tis taken in ſo large a Senſe, as to contain in it alſo the Doctrine of the Mundane Syſtem, the Laws of the Planetary Motions, *&c.* which others reckon as a part of Phyſicks or Natural Philoſophy.

ASYMMETRY, the ſame with *Incommenſurability*, which ſee.

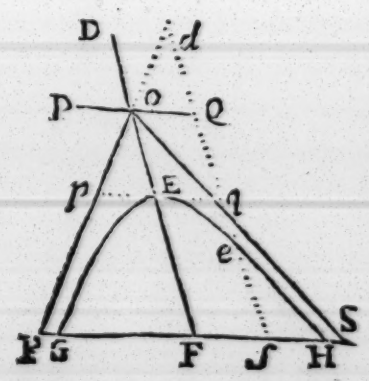
ASYMMETRAL, the ſame with *Incommenſurable*.

ASYMPTOTES, are Lines which continually approach nearer to each other, but tho' continued Infinitely, can never meet. Of theſe there are many kinds, as the *Curve* of the *Conchoid*, &c. but it may be enough here to mention the Famous.

ASYMPTOTES in *Conick Sections*, which are the Lines *OS* and *OR*; and are thus drawn; Imagine, in the *Hyperbola*, the *Second* or *Conjugate Axis PQ* to deſcend ſtill keeping parallel to the *Ordinates*, till it touch the *Vertex* of the Section *E*, for then, if thro' the Centre *O*, you draw Lines thro' the Ends of this Tangent Line *p q*. Theſe are the Famous *Aſymptotes* mentioned by *Apollonius*, *Lib.* 2. *Prop.* I. and of which he demonſtrates, that tho' infinitely produced, and tho' the Curve come continually nearer and nearer to them, yet can they never be Co-incident with the Sides of the *Hyperbola*, nor ever meet it, or touch it; whence comes their Name of *Aſymptotes*: And by ſome Latin Writers they are called *Intactæ*, for the ſame reaſon. This *Non-Co-incidence* appears very plainly, where the Section of the *Hyperbola* is made parallel to the Triangular Section of a Cone by the Ax; As,

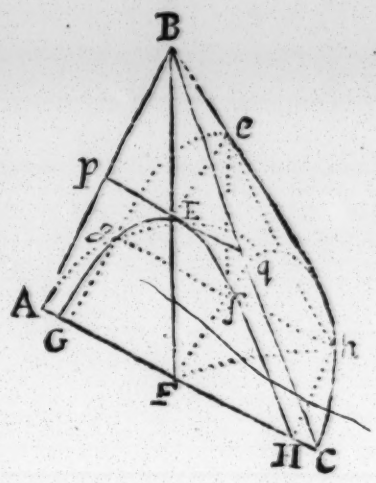


Suppoſe along the Line *e f* parallel to *E F*. For if you imagine the Hyperbola *g e b* to be moved forward parallel to it ſelf, as far as the length of the equal and parallel Lines, *g G*, *f F*, *E q*, *H b*, till it come to be in the poſition *G E H*, or to be co-incident with the Triangular Section by the Axis, then it will be manifeſt, that the Hyperbolick Line *G E H* is diſtant each way from the Aſymptotes *BC*, *BA*, by the length of the verſed Sines of the equal Arks *b C* and *g A* in the Circumference of the Circular Baſe of the Cone; and that at the ſame time it comes, if produced, ſtill nearer and nearer to them. And conſequently, I ſay,



1. *RG* and *HS*, or *AG* and *HC* being always equal to one another; as are alſo the Ordinates *GF* and *FH*, &c. The Rectangles *RGS* and *SHR*, *AGC* and *CHG*, will always be reſpectively equal to one another.

2. The *Curve* and the *Aſymptote* can never meet, becauſe the Circles generated by *E Q*, and the Rings generated by *RS*, and *HC*, &c. (which will ariſe from the Imaginary Revolution of the whole Figure round the Axis *FE*) will always be equal to one another, and to the Circle made by the Revolution of the Radius *E q*, as is plain by comparing this laſt Figure with the former in N°. 1, 2.



For the Spaces generated by the Lines *E q*, *FC*, &c. will be as the Squares of their Diameters, or of the Generating Lines. But 'tis certain, that the Square of *Fb* or of *FC*, exceeds the Square of *Fb*, by the Square of *bH* or *fF*; that is, by the Square of *E Q*, by the Suppoſition above; wherefore the Circle generated by the Motion of *FC*, will exceed that generated by *FH*, by that Circle generated by *E Q*. But the Space generated by *FC*, exceeds that generated by *FH*, by the Ring generated by *HC*; wherefore that Ring made by *HC*, muſt be equal to the Circle made by *E Q*, *Q E D*. And this will always be ſo; and therefore the Line *HC*, can never grow of no length, and conſequently the Curve and the *Aſymptote* can never meet.

There are other *Aſymptotes* to other *Curves*; and tho' the *Parabola* hath no *Aſymptote*, yet two *Parabola's* may be drawn *Aſymptotically* to each other.

The following general Obſervations about *Aſymptotes* and *Aſymptotick Curves*, I had communicated from Mr. *Humphrey Ditton*, now Maſter of the New Mathematical School in *Chriſt's Hoſpital*, a Perſon peculiarly skilful in theſe Matters, and are as follows.

Some General Obſervations about Aſymptotes, *and* Aſymptotical Curves.

I. Tho' it be certain that all ſuch *Curves* as have *Aſymptotes*, be of the Number of thoſe which (running on in *Infinitum*) do not include a Space; yet is not true, on the other hand, that whereever we have a Curve of that Nature and Property, we find an *Aſymptote* alſo. For this infinite Continuation of the Curve, is viſible in all thoſe of the Parabolick Family, and yet none of all theſe can have an *Aſymptote*; that is, not any Right Line placed in any Poſition to the Curve, which can infinitely approach to it, and yet not cut it, as is not hard to be demonſtrated.

II. Of thoſe Curves that have an *Aſymptote*, ſome there are that have two, others that have only one. Inſtances of the former kind are all the ſorts of Hyperbolick Curves, which from the Principle of their Geneſis (as being formed from Reciprocal Series) are eaſily proved to have two *Aſymptotes*. And of the latter ſort we have the *Conchoid*, the *Ciſſoid*, and the *Logarithmick Curve*,

the Nature of which conſidered, as clearly ſhews that they have one and no more.

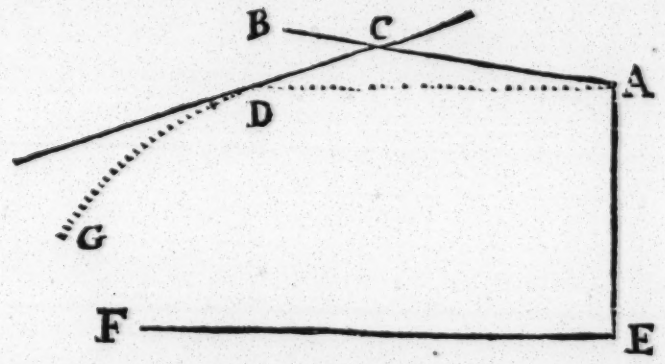
III. As a Right Line and a Curve may be *Aſymptotical* to one another, ſo alſo may Curves and Curves: And here are two or three Varieties to be conſidered.

1. Any of theſe Curves that have from their own Nature and Conſtruction an *Aſymptote*, are capable of being Aſymptotical to one another. Thus in Conick Sections 'tis demonſtrated, that Hyperbola's that have the ſame common *Aſymptote*, are alſo themſelves *Aſymptotes* to each other; and this ſhall afterwards be ſhewn univerſally of all ſuch Curves.

2. Not only thoſe Curves which are endowed with an *Aſymptote*, but even ſuch as in their own Nature admit of no ſuch thing, may alſo have this Affection. The Parabola (for inſtance) we know has no *Rectilineal Aſymptote* belonging to it; and yet two Parabola's, with their Axes placed in the ſame Right Line, will be Aſymptotical to each other; as *De la Hire* has demonſtrated, *Sect. Conic. Lib.* 6.

3. But no Curve that has any *Aſymptote* belonging to it, can ever be Aſymptotical to another whoſe Nature refuſes a *Rectilineal Aſymptote*; for if it were ſuppoſed to be ſo, then this latter Curve would have the *Aſymptote* of the former Curve for its own *Aſymptote* too, which is contrary to the Hypotheſis of its having none at all. Thus, for Inſtance, a Parabola and an Hyperbola can never be Aſymptotical to one another; for were it ſo, the *Aſymptote* of the Hyperbola would be alſo an *Aſymptote* to the Parabola; which is impoſſible, ſince that Curve can have no *Aſymptote*.

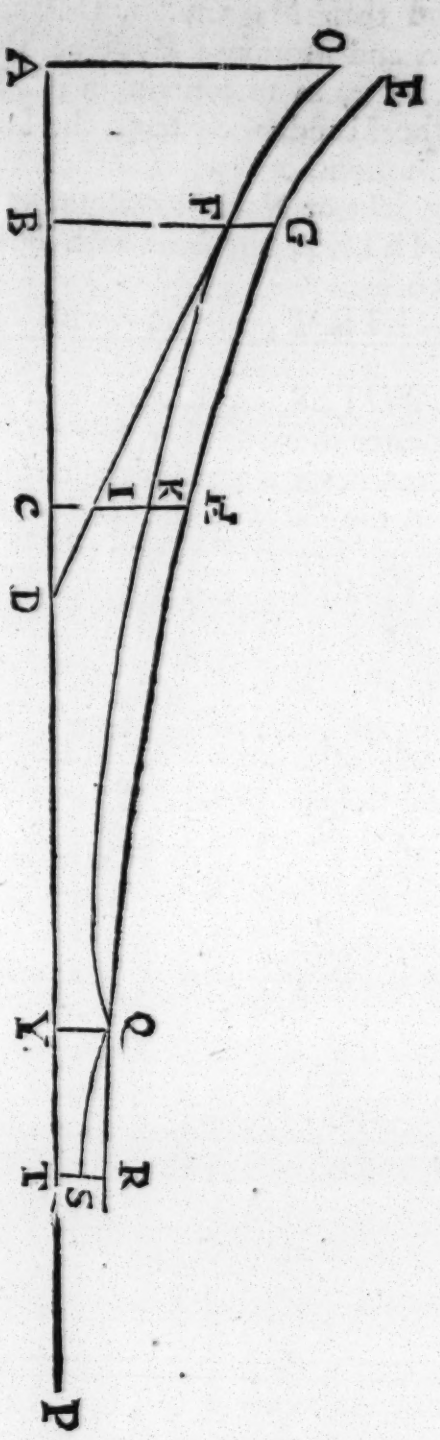
IV. No Right Line can ever poſſibly be an *Aſymptote* to a Curve that is every where concave towards that Right Line: This is very clear from the bare Conſideration of the Curvature, and the Tendency of it; and may be thus brought into Demonſtration.



Let the Curve *ADG* (whoſe Ax is *AE*) be concave in all its Parts towards the Right Line *FE*; this Line then *FE*, ſhall never be an *Aſymptote* to the Curve *ADG*. Let *AB* touch the Curve in the Vertex *A*, and be imagined parallel to *FE*; then any other Tangent as *CD*, ſuppoſe ſhall, if it be produced, meet with *FE* in ſome Point or other; but becauſe *CD* is a Tangent, therefore the Curve Line it ſelf falls between the Tangent and the Line *FE*; but it is by the Hypotheſis alſo concave to all its Parts; therefore if the Tangent *CD* produced, interſects *FE*, *a fortiori*, the Curve *CDG* ſhall meet with it alſo; and therefore *FE* is not an *Aſymptote*.

V. But a Right Line may be an *Aſymptote* to a mixt Curve that is partly Concave and partly Convex towards the ſame Line. An Inſtance of this we have in the *Concboid* of *Nicomedes*, which is Concave (for ſome Parts of it) to its *Normal*, and then after the *Punctum Flexus*, in which 'tis neither Concave nor Convex, it is for ever Convex towards the ſame. Concerning which *Punctum Flexus*, ſee *Schoten. Comment upon Cart. Geometry*, Lib. 2.

VI. All Curves that have one and the ſame *Common Aſymptote*, are alſo Aſymptotical to one another.

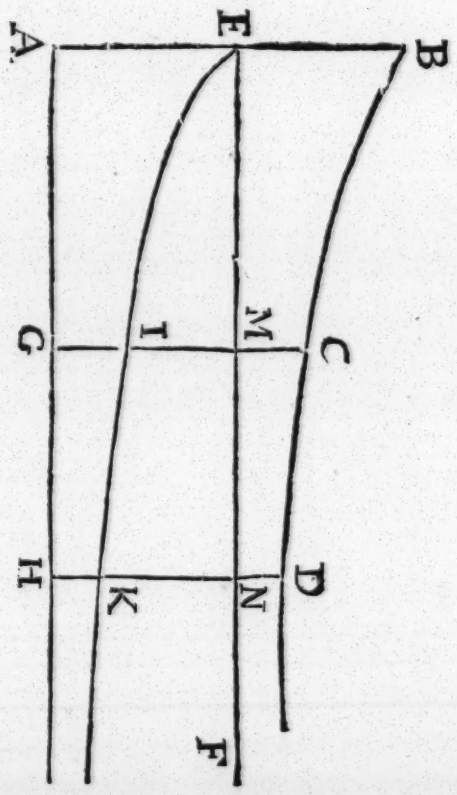


Let the Curves *EGH*, *OFK*, have the common Aſymptote *ADP*; then they ſhall be Aſymptotical to each other. Firſt of all it is evident, that they continually approach to one another; for inſtance, drawing the Line *FD* a Tangent to the Curve *OK* in *F*, to meet with the Aſymptote in *D*, and producing *BF* to *G* in the Curve *EH*, draw *GH* a Subtenſe in that Curve parallel to *FD*; and then from *H*, the Line *HKC* parallel to *GB*, 'tis clear, that *FG*=*HI*, and *HI* ⌋ *HK*, becauſe *FD* touches in *F*; therefore *FG* ⌋ *HK*, that is, the Curves are nearer to one another in the Points *H*, *K*, than in *F*, *G*; and the ſame may be ſhewn of any other Points taken from the Parts of *B*, *C*, towards *P*. But then again, theſe Curves can never poſſibly meet with, or cut one another. For imagine they could, and did interſect each other, at the Point *Q* ſuppoſe; and let *QY*, *RT* be parallel to *BG*, *HC*. The Curve *OKF* goes above

above the Curve *EGH* (after the Interſection in *Q*) into *R* ſuppoſe, and the other falls below, as ſuppoſe at *S*. Now if two Curves as *QR*, *QS*,

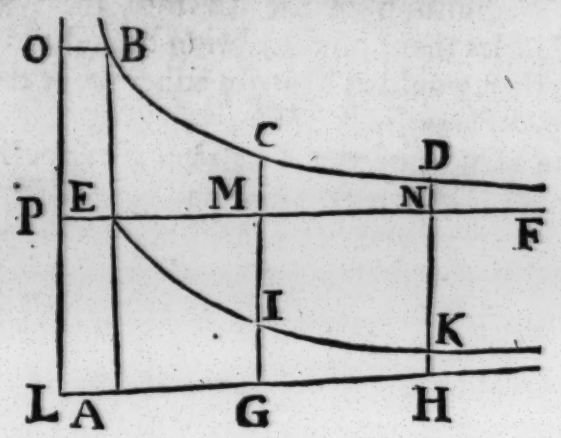
cut in *Q* the Curve *QR* departing from *QS*, 'tis plain that ſome Point, as *R*, may be taken in the Curve *QR*, from whence a Right Line, as *RT*, drawn to another Line, as *YT*, ſhall be equal to *QY*, the Line from *Q*, the common Section of the Curves to the ſame Line *YT*. This follows from the Nature of Curve Lines in general. Now let us ſuppoſe theſe Curves that cut thus to have the Line *YT* for their common *Aſymptote*; then from the general Nature of Curves, we can find the Point *R*, from whence *RT* ſhall be = *QY*, but upon the Hypotheſis that *YT* is an *Aſymptote*, 'tis impoſſible that *RT* ſhould be = *QY*, for the Lines intercepted between the Curve and its *Aſymptote*, are ſtill leſs and leſs, and therefore *RT* muſt be leſs than *QY*, becauſe of the *Aſymptote*; and from hence 'tis certain, that two Curves, which have one and the ſame *Aſymptote*, can never cut each other.

VII. Two equal Curves of the ſame ſort, whoſe *Aſymptotes* are parallel, with themſelves be equidiſtant in all their Points. Theſe Curves are ſuppoſed to be ſuch as have but one *Aſymptote* a piece.



Let *EF* be the *Aſymptote* of the Curve *BCD*, and *AH* the *Aſymptote* of the Curve *EIK*; and the Curves being by the Hypoth. of the ſame kind and equal, therefore *EB* = *EA*, and *IG* = *CM*, and *DN* = *KH*, and *IG* + *IM* = *CM* + *IM*, and ſo *DN* + *NK* = *KH* + *NK*; but *KH* + *NK* = *IG* + *IM* (for *EH* is a Parallelogram) therefore *CM* + *IM* = *DN* + *KN*, that is, *CI* = *DK*; and ſo in all other Points from whence the Curves are equi-diſtant.

VIII. The ſame thing is true alſo of equal Curves of the ſame ſort that have two *Aſymptotes* each, but with a Limitation. Suppoſe *LO* to be one common *Aſymptote* to both Curves, and *PN* the other for the Curve *BCD*, as *LH* is for the Curve *EIK*; where the lower Curve cuts the



Aſymptote of the upper in *E*, drawing *BEA* parallel to *OL*; 'tis evident that from the Points *B* and *E* to the Parts of *D* and *K* infinitely, the Curves are equi-diſtant from one another: For by the Hypotheſis, the Points *P* and *L* are the Concourſes of the *Aſymptotes*, and *PE* being = *LA*, *BE*, *CM*, *DN*, are ever = *EA*, *IG*, *KH*, &c. from whence the Concluſion follows as before.

ASYNDETON, is a Figure in Grammar, implying a Defect or want of Conjunctions in a Sentence (as *Polyſyndeton* is a Redundancy of them) as in this Inſtance, *Græculus Eſuriens, in Cœlum juſſeris, ibit*; where the *Si* before *Juſſeris* is omitted.

ATCHIEVEMENT, in Heraldry, ſignifies the Coat of Arms of any Gentleman duly Marſhalled with Supporters, Helmet, Wreath and Creſt, and with Mantles and Woods, or as the Heralds call it, with *Heaulme* and *Timbre*, *i.e.* with *Helmet* and *Creſt*. Such are uſually hung out on the Fronts of Houſes after the Death of the Lord, Lady, Maſter, or ſome conſiderable Perſon; and are now corruptly called *Hatchments*.

ATHANOR, a kind of digeſting Furnace in Chymiſtry, fix'd and large, and made with a Tower, which is contrived ſo as to keep a conſtant Heat for 14 Days, a Month, *&c.* or the Heat may be encreaſed or diminiſhed at pleaſure, by opening or ſhutting the *Regiſters*.

ATHEROMA, a ſort of Tumour or Swelling conſiſting of a thick and tough Humour like Pap, contained in a Bag or Membranous Coat. It neither cauſes Pain, nor changes the Colour of the Skin. It doth not eaſily yield to the Touch, nor leaves any dint after it is compreſſed.

ATHYMIA, is a Dejection or Anxiety of Mind.

ATLAS, in Anatomy, is the firſt *Vertebra* of the Neck under the Head; ſo called, becauſe it ſeems to hold up the Head: it wants Marrow.

ATMOSPHERE, is the lower part of the Region of the Air or Ether, with which our Earth is encompaſſed all round; and up into which the Vapours are carried, either by Reflection from the Sun's Heat, or by being forced up by the Subterranean Fire.

The Preſſure of the *Atmoſphere*, Mr. *Boyle* undertakes to demonſtrate from many Experiments, as,

1. That two poliſhed Marbles of about three Inches Diameter, and which would in the open Air ſuſtain a Weight of 80 *lb.* before they would fall aſunder, would, in the exhauſted Receiver, fall aſunder with a Pound, and ſometimes with half a Pound Weight. Nay, though when the Re-

Receiver was evacuated, the upper Marble being let down to touch the other, it would by no means adhere to it; yet when this was tryed after the Re-admiſſion of the Air into the Receiver, the Marbles then, on their being brought to touch each other, would as ſtrongly adhere as at the firſt. *Hiſtory of Firmneſs*, P. 288.

The Height of the *Atmoſphere* is variouſly conjectured: *Kepler* makes it about eight Miles; but other eminent and later Aſtronomers, eſpecially the Learned and Diligent *Ricciolus* makes it probable, that the *Atmoſphere* may be at leaſt fifty Miles high.

Mr. *Boyle* makes the common Height of the *Atmoſphere*, when the Mercury in the *Baraſcope* is at 30 Inches, to be 35000 Foot, or ſeven Miles; but this Account is upon a Suppoſition, that all our Air is of the ſame Denſity and Weight from the Surface of the Earth to the Top of the *Atmoſphere*; which can by no Means be ſuppoſed, and therefore he rightly concludes it muſt be much more. Nay, in his Book againſt *Linus* he ſuggeſts, that 'tis probable it may be ſome *Hundreds*, and even *Thouſands* of Miles high, in caſe the *Atmoſphere* be not a bounded Portion of the Air, but reach as high as it.

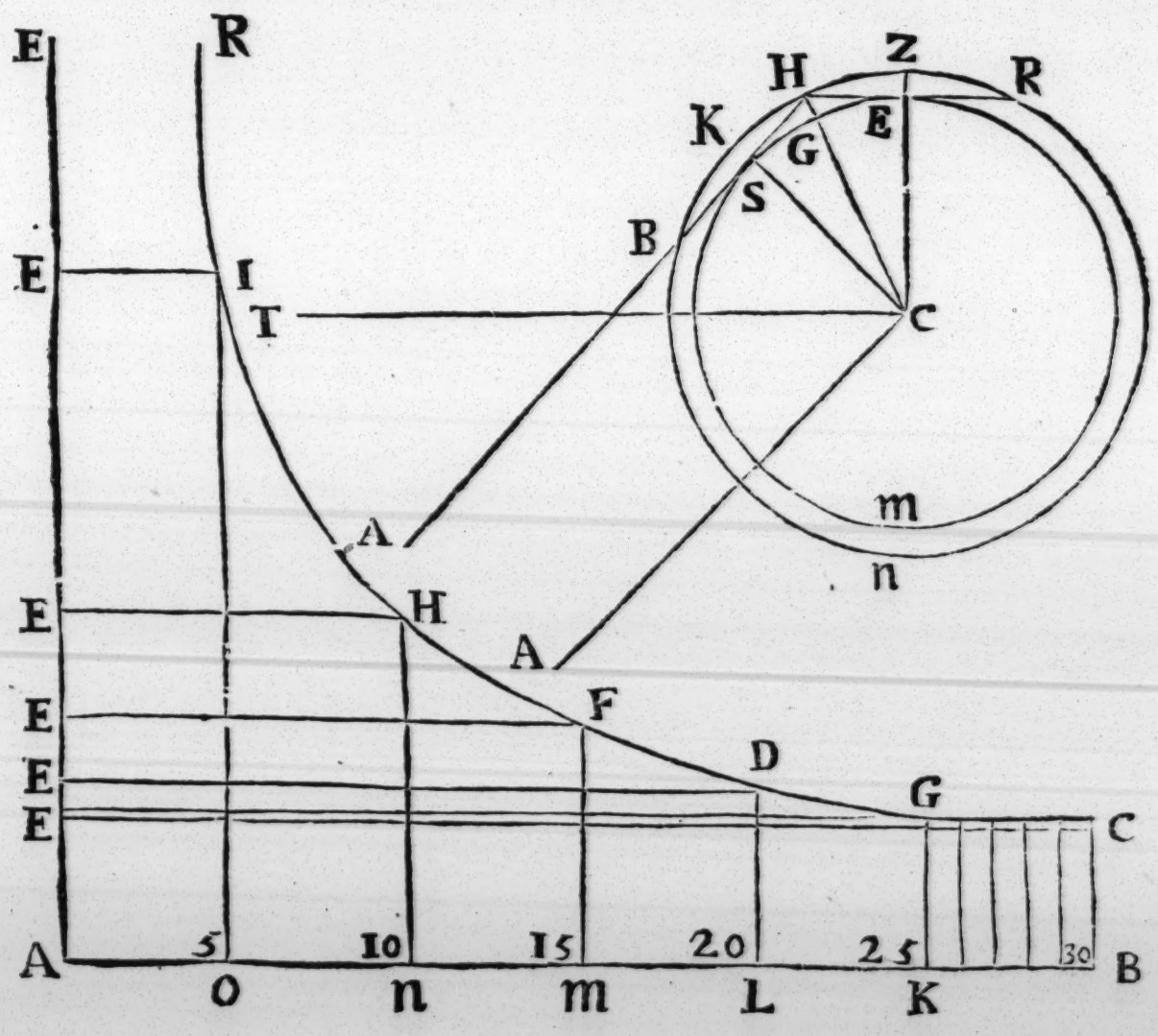
The ſame Honourable Philoſopher got a hollow Cylinder of Braſs to be exactly turned by a good Artiſt, whoſe Length was 3 Inches, and the Diameter of its Bore juſt an Inch: This had a Bottom nicely fitted to it; and then being filled with Quickſilver (the Weight of the Cylinder being before known) it held as much as weighed 17 *Oz.* 1 *Drachm*, 45 *gr. Troy*. This being multiplyed by 10 (becauſe the Baraſcope then ſhewed the Mercury to be at 30 *gr.*) gave 14 *lb.* 2 *oz.* and above 3 *drachms Troy*, for the Weight of a Column of Mercury of an Inch in Diameter, and 3 Inches in Length. And ſo much conſequently was the Weight of a Column of Air of an Inch in Diameter, and of the whole Height of the *Atmoſphere*.

Hence, knowing the Proportions of Cylinders, (*which ſee under* Cylinder) 'tis eaſy to calculate the Weight of a Cylinder of Mercury, and conſequently of Air to the Top of the *Atmoſphere*, of any given Diameter. For as 1. the Square of the Diameter of the Cylinder above-mentioned, is to the Square of the given Diameter of the Cylinder ſought (which, if it were two Inches Diameter, will have its Square 4) :: So is the Weight of the Cylinder above-mention'd, to the Weight of that ſought. Work as in the Rule of Three, and you have your Deſire.

In Mr. *Boyle*'s Deſcription of his *Statical Baroſcope*, he tells us, That he found a Pillar of Air incumbent on a ſquare Inch, to weigh 18 *lb.* $\frac{1}{3}$ *Troy*. From which Account I calculated the Weight of the whole Air, all round the Globe, to be 8.990405732208000000 Pounds *Troy*, which agrees nearly with the Weight of it calculated by Mr. *Paſchal* (tho' he proceeded a very different way) for he makes it to be 8.283889440000000000.

Mr. *Halley* by undoubted Experiments, found that the Weight of *Mercury* to Water, is as $13\frac{1}{2}$ to 1, or very near it; and that the Specifick Gravity of *Air* to Water, is as 1 to 800, ſo that the Weight of *Mercury* to *Air*, is as 10800 to 1; and a Cylinder of *Air* of 10800 *Inches* or 900 *Feet*, is equal to an *Inch* of *Mercury*; ſo that were the *Air* of an equal Denſity like Water, the whole *Atmoſphere* would be no more than $5\frac{1}{10}$ *Miles* high; and in the Aſcent of every 900 *Feet*, the *Barometer* would ſink an Inch. But the Expanſion of the *Air* encreaſing in the ſame Proportion as the incumbent Weight of the *Atmoſphere* decreaſes, that is, as the *Mercury* in the *Barometer* ſinks, the upper Parts of the *Air* are much more rarified than the lower, and each Space anſwering to an *Inch* of *Quick-ſilver*, grows greater and greater; ſo that the *Atmoſphere*, muſt be extended to a much greater Height.

To determine the Height of the Mercury at any aſſigned Height of the Air; or having that given, to find the Height of the Place where the Barometer ſtands.



Sine

Since the Expanſion of the *Air* is Reciprocally as the Height of the *Mercury*, it is evident, that by the help of the Curve of the *Hyperbola* and its *Aſymptote*, the ſaid Expanſions may be expounded to any given Height of the *Mercury*.

For by the 65th *Prop. Lib.* 2. *Conic. Mydorgii*, the Rectangles *ABCE*, *AKGE*, *ALDE*, &c. are always equal; and conſequently the Sides *CB*, *GK*, *LD*, &c. are reciprocally, as the Sides *AB*, *AK*, *AL*, &c. If then the Lines *AB*, *AK*, *AL*, be ſuppoſed equal to the Heights of the *Mercury*, or the Preſſures of the *Atmoſphere*, the Lines *CB*, *KG*, *LD* anſwering thereto, will be as the Expanſions of the *Air* under thoſe Preſſures, or the Bulks that the ſame quantity of *Air* will occupy; which Expanſions being taken infinitely many, and infinitely little (according to the Method of Indiviſibles) their Sum will give the Spaces of *Air*, between the ſeveral Heights of the *Barometer*; *viz.* the Sum of all the Lines between *CB* and *KG*, or the Area *CBKG* will be proportioned to the Diſtance or Space intercepted between the Levels of two Places in the *Air* where the *Mercury* would ſtand at the Heights repreſented by the Lines *AB*, *AK*; ſo then the Spaces of *Air* anſwering to equal Parts of *Mercury* in the *Barometer*, are as the *Area's CBKG*, *GKLD*, *DLFM*, *&c.* But theſe *Area's* are proportionate to the *Logarithms* of the Numbers expreſſing the *Rationes* of *AK* to *AB*, of *AL* to *AK*, of *AM* to *AL*, *&c.* as was demonſtrated by *Gregory* St. *Vincent*; ſo then, by the common Table of *Logarithms*, the Height of any Place of the *Atmoſphere*, having any aſſigned Height of *Mercury*, may moſt eaſily be found; for the Line *CB* in the *Hyperbola*, whereof the *Area's* deſign the *Tabular Logarithms*, being 0,0144765; 'twill be as 0, 0144765, to the difference of the *Logarithm* of 30, or any other leſſer Number, ſo 900 *Feet*, or rhe Space anſwering to an Inch of *Mercury*, if the *Air* were equally preſt with 30 *Inches* of *Mercury*, and every where alike to the Height of the *Barometer* in the *Air*, where it will ſtand at the leſſer Number of Inches: And by the Converſe of this Proportion may the Height of the *Mercury* be found, having the Altitude of the Place given.

Upon theſe Suppoſitions 'twill appear, that at the Height of 41 *Miles* the *Air* is ſo rarified, as to take up 3000 times the Space it occupies here, and at 53 *Miles* high, it would be expanded above 300000 times; but 'tis probable that the utmoſt Power of its Spring cannot exert it ſelf to ſo great an Extenſion, and that no part of the *Atmoſphere* reaches above 45 *Miles* from the Surface of the Earth.

This is further confirmed from the Obſervations of the *Crepuſculum*, which is obſerved commonly to begin and end when the *Sun* is 18 *Degrees* below the *Horizon*; for ſuppoſing the *Air* to reflect Light from its moſt rarifie Parts, and that as long as the *Sun* illuminates any of its *Atoms*, they are viſible to an Eye not intercepted by the Curvity of the Earth; it will follow that the Proportion of the Height of the whole *Air*, to the Semi-diameter of the Earth, is much about, as 1 to 90, or as the Exceſs of the *Secant* of about $8\frac{1}{2}$ Degrees to the *Radius*. For if *E* be the Eye of the Obſerver, *S* a Place where the *Sun* ſets at the end of Twilight in *E*, and the Ark *ECS*, or *TCA*, be found 18 *Degrees*, the Exceſs of the *Secant* of half thereof *ECH*, would be the Height of the *Air*, *viz.* *GH*. But the Beam of the *Sun ASH*, and the viſual Ray *EH*, do each of them ſuffer a Refraction of about 32 or 33 *Minutes*, whereby being bent inwards from *H* towards *G*, the Height of the *Air* need not be ſo great as if they went ſtrait; and having from the Angle *ECS* taken the double *Refraction* of the *Horizontal Ray*; the half of the Remainder will be $8\frac{1}{2}$ *Deg cerciter* whoſe *Secant* being 10111, it follows, that as 10000 to 111, ſo is the Semi-diameter of the Earth, ſuppoſed 4000 *Miles*, to 44, 4 *Miles*, which will be the Height of the whole *Air*, if the Places *ES*, whoſe viſible Portion of the *Atmoſphere ERZH*, and *SHKB* juſt touch one the other, be 18 *Degrees* aſunder.

At this Height the *Air*, is expanded into above 3000 times the Space it occupies here; and we have ſeen the Experience of condenſing it into the 60th part of the ſame Space; ſo that it ſhould ſeem, that the *Air* is a Subſtance capable of being compreſs'd into the 180000th part of that Space it would naturally take up when free from Preſſure.

ATMOSPHERE *of conſiſtent Bodies*: The Honourable Mr. *Boyle* hath written a ſmall Eſſay on this Subject, in which he proves, that very many, and therefore probably all *ſolid*, *firm* and *conſiſtent Bodies* (*i. e.* ſuch as are not Fluid) have, at ſome certain times (at leaſt) *effluvia* of Particles of Matter which exhale from them: For he found, that many ſuch Bodies would in a little time be very ſenſibly diminiſhed in Weight: That ſome *Electrical Bodies*, as Amber and Glaſs, would exert *that Property* uniformly all round them when they were heated; which they uſually exhibit upon Rubbing or Chafing; *viz.* That of attracting ſmall Bodies to them: That Glaſs, Stones and hard Metals, would, on being rubb'd one againſt another, ſtrongly emit not only ſenſible, but even offenſive Odours, *&c.*

ATOME, is ſuch a very ſmall Particle of Matter, that it cannot Phyſically be cut or divided into leſſer Parts: *Epicurus* and his Sect of Philoſophers, firſt called the component Principles of all Bodies, which they ſuppoſed to be infinitely ſmall and hard, by this Name of *Atoms*. Theſe *Atoms* may be ſuppoſed to have theſe 4 inſeparable Properties; 1. That they are all of the ſame Nature, Subſtance or Matter; for all Matter abſtracted from Form is the ſame. 2. That they have all ſome Magnitude or Quantity; for they are not Indiviſible Points, but Phyſical Bodies of ſome (though ſmall) determinate Bulk. 3. They have alſo all of them ſome determinate Figure or Shape. And, 4. They muſt have alſo, each of them, ſome real Gravity or Weight. To theſe *Sextus Empiricus* adds ἀντιτυπία or *Renitency*; but this rather may be ſuppoſed to be the Conſequence of their being *Solid* and *Inſectile*, which they are, as they are *Atoms*.

The Original Qualities of *Atoms* can only be their *Size* and their *Figure*, and theſe taken together make their *Form*.

ATONY, is a Faintneſs, Infirmity or Defect of Strength.

ATRA *Bilis*, is ſuppoſed to be a kind of a Sulphureous Terrene and Aduſt Salt, which being bred in the Body (ſome will needs have it in the Spleen) is circulated about in the Blood, and by that means makes and undue Fermentation in it, and is the Occaſion of Melancholly and other ſuch like Diſtempers.

ATREUS,

ATREUS, is one whose Fundament or Privy Parts are not perforated.

ATROPHY or *Tabes*, a Conſumption ariſing from want of Nouriſhment, and when either the whole Body, or ſome particular Limb, withers and decays away. Though *Tabes* is often taken only for an Ulcer in the Lungs, from whence the whole Body by degrees decays and periſhes.

ATTACHIAMENTA *Bonorum*, a Diſtreſs taken upon the Goods or Chattels of any one ſued for Perſonal Eſtate or Debt by the Legal *Attachiators* or Bayliffs, as a Security to anſwer the Action.

ATTACHIAMENTA *de Spinis & Boſco*, is the Privilege granted to the Officers of a Foreſt to take to their own uſe Thorns, Bruſh and Windfall, within ſuch Precincts or Liberties committed to their Charge.

ATTACHMENT, (in Law) is a Taking or Apprehending by Command or Writ: It differs from an *Arreſt* in this, that an *Arreſt* lies only upon the Body of a Man, whereas an *Attachment* is ſometimes on the Goods only, and ſometimes on Body and Goods.

ATTACHMENT *of Privilege*, either gives Power to apprehend a Man in a Place privileged, or by Vertue of an Office or Privilege, to call another into that Court whereunto himſelf belongeth.

ATTACHMENT *Foreign*, is a Proceſs which is uſed to attach the Goods of Foreigners found within the Liberty or City, for a Debt due to the Party himſelf.

ATTACHMENT *of the Foreſt*, is a Court held there every 40 Days throughout the Year,

ATTACK *of a Seige*, (in the Art of War) is the Effort made by the Beſiegers with Trenches, Mines, Galleries and Breaches, in order to make themſelves Maſters of a Fortreſs in Storming one of its Sides.

ATTACK *Falſe*, is that which is not vigorouſly proſecuted, ſerving only to make a Diverſion among the Beſieged, and to oblige them to divide their Forces, that the true *Attack* may be carried on with greater Succeſs.

To ATTACK *in Flank*, is to *attack* both Sides of the *Baſtion*.

To gain a Place by Right Attack, is to carry it by formal *Attack* and regular Works, without a general Storm.

ATTAINDURE, is when a Man hath committed Felony or Treaſon, and Judgment is paſſed upon him. The Children of a Perſon attainted of Treaſon cannot be Heirs to him, or any other Anceſtor; and if he were Noble and Gentile before, thereby his Poſterity are degraded and made Baſe; and this Corruption of Blood cannot be ſalved but by an Act of Parliament, or unleſs the Judgment be reverſed by Writ of Error.

ATTAINT, (in Law) is a Writ that lies where a falſe Verdict is given by twelve Men, which, if found to be a falſe Verdict, the twelve Men are *Attaint*, and the Verdict ſhall be, that their Meadows ſhall be egred, their Houſes broken down, their Woods turned up, and their Lands and Tenements forfeited to the King. But if it paſs againſt him that brought that *Attaint*, he ſhall be impriſoned, and grievouſly ranſomed at the King's Will.

ATTAQUES: See *Attack*.

ATTENTION, is to regiſter in the Memory thoſe Trains of Idea's which continually offer themſelves to the Mind, and are taken notice of.

ATTENUATING *Medicines*, are thoſe things which opening the Pores with their Acute Particles, cut the thick and viſcous Humours in the Body into ſuch ſmall Particles as that they may eaſily be circulated through the Veſſels, and ſo there is made by degrees an

ATTENUATION, or leſſening of the Power or Quantity of the Morbifick Matter.

ATTICK, a kind of *Order* in Architecture after the Manner of the City of *Athens*. *Vitruvius* makes it the Name of a *Baſis*, which the Modern Architects have ſince given to the *Dorick Pillar*. In our Buildings, the *Attick* is a little *Order* placed upon another much greater, having, inſtead of Pillars, nothing but *Pilaſters* of a particular Form or Faſhion.

ATTIRE, the Heralds call the Horns of a Stag or Buck *his Attire*.

ATTIRE, in Botany, ſignifies, according to Dr. *Grew*, the third part belonging to the Flower of a Plant; of which the two former are the *Empalement* and the *Foliation*. This *Attire* he finds to be of two kinds, *Semini-form* and *Florid*; the *Semini-form Attire* conſiſts of two Parts, *Chieves* (or the *Stamina*, as ſome call them) and *Semets* or *Apices*, one upon each *Attire*. The *Florid Attire* is uſually called *Thrums*, as in the Flowers of *Marigold*, *Tanſey*, &c. Theſe *Thrums* the Dr. calls *Suits*, which conſiſt of two, but moſt times of three Pieces; the outer Part of the *Suit* is the *Floret*, whoſe Body is divided at the Top like a *Cowſlip* Flower into 5 Parts or diſtinct Leaves.

ATTOLLENS *Auriculam*, is a Muſcle which conſiſts of divers fleſhy Fibres, and is annexed to that Part of the *Pericranium* that covers the Temporal Muſcle, whence it deſcends directly to its Implantation at the Superiour Part of the ſecond Wrinkle of the Cartilage of the Ear. Its Name ſhews its Uſe.

ATTOLENS *Oculos*, or *Superbus*, one of the ſix Pairs of Muſcles that belong to the Eye, ſerving to lift them upwards.

ATTOLENS *Nares*, a Muſcle of the Noſe, whoſe Name ſhews its Uſe.

ATTOLLENTES, are a Pair of Muſcles which acting both together, draw all the upper Lip directly upward and outward; but if only one, then one Side of the Lip is drawn obliquely.

ATTONITUS, *Stupor, ſeu Morbus Attonitus*: See *Apoplexy*.

ATTORNATO *faciendo vel recipiendo*, is a Writ which a Man owing Suit to a County, Hundred, Wapentake, or other Court, and deſiring to make an *Attorney* to appear for him, whom he doubteth whether the Sheriff or Bayliff will admit or not, purchaſeth to command him to receive and admit him.

ATTOURNMENT, (in Law) is when one is Tenant for term of Life, and he in Reverſion or Remainder grants his Right or Eſtate to another, then it behoves the Tenant for Life to agree thereto; and this Agreement is called an *Attournment*.

ATTRACTING, or *Drawing* Medicines or Things, are thoſe which opening the Pores with their little Particles, and dilating the Humours and expelling them, where their Reſiſtance is ſmaller, not only ſhews the Parts, and makes them Red,

Red, but by driving more Vapours and Humours out of the Skin and Fleſh, than can make their way thro' the thick inner Skin, gather them under it, and ſwell it into little Bladders.

ATTRACTION, is the drawing of one thing to another. Whether among the Operations of Natural Bodies one upon another, there be any ſuch thing as *Attraction*, properly ſo ſpeaking, is a Queſtion that hath been much debated amongſt Philoſophers: And perhaps *moſt* of thoſe Effects which the Ancients, not knowing ſo well the Cauſes of, did uſe to attribute to *Attraction*, may now be very well ſolved by *Pulſion*. See *James Bernouli*, *de Gravitate Ætheris*, *Amſterdam* 1683, in 8°. However the Word is retained by good Naturaliſts, and in particular, by the Excellent Sir *Iſaac Newton* in his *Principia*; but without there determining any thing of the *Quale* of it, for he doth not conſider things ſo much Phyſically, as Mathematically. This therefore being premiſed, he lays it down as an Axiom; That ſince *Action and Re-action are always equal and directly contrary to each other*; therefore if any thing Attract another, it is it ſelf alſo as much attracted by that other thing; taking *Attraction* in the largeſt and moſt general Senſe, for the *Conatus* of one Body towards another, however it be cauſed. And in *Cor.* 1. *Prop.* 58. he ſhews,

1. That if two Bodies mutually do *attract each other* (by which he means the ſame as *gravitate* towards one another) by Forces proportionable to their Diſtances, they will deſcribe both about the common Centre of Gravity, and about one another Concentrical Ellipſes; and *vice verſa*, if any Body do deſcribe ſuch Figures, their Gravitating or Attacting Forces are proportional to their Diſtances.

2. That if they Attract each other with Forces proportional to the Squares of their Diſtances, they will deſcribe both about the common Centre of Gravity, and alſo about one another, *Conick Sections*, having their *Umbilici* in the Centre about which the Figures are deſcribed; and *vice verſa*, &c.

3. He demonſtrates alſo, That any Particle of Matter within the Superficies of any Sphere or Globe, is attracted or gravitates by a Force proportional to its diſtance from the Centre; but without the Surface of the Sphere, by a Force proportional to the Square of its diſtance from the Centre, *Prop.* 73, 74. *Lib.* 1.

Hence it will follow, he ſaith,

1. That at equal Diſtances from the Centre of Homogeneal Spheres, *The Attraction will be as the Sphere.*

2. And at any Diſtance whatever, the Attracti on is as the Sphere divided by the Square of the Diſtance.

3. Which laſt holds alſo in the Attractions of Spheres towards one another; *i.e.* the Attractions are as the attracting Globes divided by the Squares of the Diſtances, tho' the Globes mutually attract each other.

The Quantity of the Force of Attraction in all Bodies at equal Diſtances, is exactly proportionable to the Quantity of Matter in the Attracting Body, as being in reality nothing but the Reſult or Sum of the united Forces of all thoſe ſingle Particles of which it is compoſed. *See Vol.* II.

ATTRACTIVE, the ſame with *Attracting*.

ATTRIBUTE, is whatever Property belongs properly to any Subſtance or Being, and is affirmed of it, or duly *attributed* to it, or *predicated* of it, as the Logicians ſpeak.

ATTRITION, in Phyſick, is the Rubbing of one thing againſt another; as when Amber and other Electrick Bodies are rubb'd, to make them attract or emit their Electrick Force.

ATTRITION, in Theology, is a Sorrow for offending God, ariſing from the Apprehenſion of being obnoxious to Puniſhment and Miſery on the Account of ſuch Offence.

ATTURNEY, or *Attorney*, in a Legal Acceptation, ſignifies one appointed by another Man to do any thing in his ſtead, and is as much as *Procurator* or *Syndicus* in the Civil Law; or *Attorneys* are ſuch Perſons, as are by the Conſent, Commandment or Requeſt of another, to take heed, ſee to, and to take upon them, the Charge of another Man's Buſineſs in his abſence.

AVANT *Foſſe*, or *Ditch of the Counterſcarp*, in Fortification, is a Moat or Ditch full of Water running round the Counterſcarp on the outſide next the Campaign at the Foot of the *Glacis*. It is not eligible to have ſuch a Water-Ditch where it can be drained dry; becauſe it is a Trench ready made for the Beſiegers to defend themſelves againſt the Sallies of the Beſieged. Beſides, it hinders putting Succours into the Place, or at leaſt makes it more difficult ſo to do.

AVAST, a Word uſed very commonly aboard a Ship, ſignifying to ſtop, hold or ſtay.

AUDIENCE *Court*, is a *Court* belonging to the Archbiſhop of *Canterbury*, of equal Authority with the *Arches Court*, tho' inferiour both in Dignity and Antiquity.

AUDIENDO *& Terminando*, is a Writ, but more properly a Commiſſion, directed to certain Perſons, when any Riotous Aſſembly, Inſurrection, or heinous Miſdemeanour, or Treſpaſs is committed againſt any Place.

AUDITA *Querela*, is a Writ that lies where one is bound in a Statute or Recogniſance, or where Judgment is given againſt him for a Debt, and his Body in Execution thereupon; for if he have a Releaſe, or any other ſufficient Diſcharge, but has no Day in Court to plead it, then he ſhall have this Writ againſt him which hath recovered, or againſt his Executors.

AUDITORY *Nerve* is the ſeventh Pair of Nerves that comes from the *Medulla Oblongata*, ariſing from the hinder part of the *Proceſſus Annularis*; it enters the Hole in the inner Proceſs of the *Os Petroſum*. It is divided into two Branches; that which is ſoft is called *Portio Mollis*, and it is diſtributed into the Labyrinth, *Cochlea*, and the Membranes which cover the Cavities of the Ear. That which is hard, is called *Portio Dura*; it goes out of the Ear by the Hole which is between the *Proceſſus Maſtoides* and *Styloides*; it is divided into two Branches, of which one goes to the Muſcles of the Tongue, or *Os Hyoides*, and it gives a ſmall Branch to the eighth Pair; the other is diſtributed in the External Ear, Noſe, Lips and Cheeks.

AUDITOR, according to our Law, is an Officer of the King or ſome other great Perſon, which yearly, by examining the Accounts of all under Officers accountable, makes up a general Book; with the Difference between their Receipts and Charge, and their Allowances, commonly called *Allocations*; as namely, the Auditors of the Exche-

quer take the Accounts of thoſe Receivers, who collect the Revenues of the Aumentation, as alſo of the Sheriffs, Eſcheators, Collectors and Cuſtomers, and ſet them down, and perfect them.

AUDITORS *of the Preſt or Impreſt*, are Officers in the *Exchequer*, who take and make up the great Accounts of *Ireland*, *Berwick*, the *Mint*, and of any Money impreſt to any Man for the King's Service.

AUDITOR *of the Receipts*, is an Officer of the *Exchequer* that files the Teller's Bills, and makes an Entry of them, and gives the Lord Treaſurer a Certificate of the Money received the Week before. He maketh *Debentures* to every Teller, before they pay any Money, and taketh their Accounts: He keepeth the *Black Book of Receipts*, and the *Treaſurer's Key* of the *Treaſury*, and ſeeth every Teller's Money lock'd up in the New Treaſury.

AVE, ſee *Aile*.

AVELANE, the Form of a Croſs which the Heralds give us, which reſembles four Filberds in their Husks or Caſes, joined together at the great End; from whence it ſeems to take its Name, for a Filberd is *Nux Avellana*.

AVENTURE, (but more properly) *Adventure*, is a Term in Law ſignifying a Miſchance, cauſing the Death of a Man without Felony, as when he is ſuddenly drowned or burnt, falling into the Water or Fire, or killed by any Diſeaſe or Miſchance.

AVENUE, (in Fortification) is an opening or inlet into any Fort, Baſtion, or ſuch like Place.

AVERAGE, (in Law) is that Service which the Tenant owes to his Lord, to be done by the Beaſts of the Tenant.

It alſo ſignifies a certain Contribution which Merchants and others pay proportionably towards their Loſſes that have their Goods caſt away in a Tempeſt, for the ſaving of the Ship or Goods, or the Lives of them that are therein.

AVERIIS *captis in Withernam*, is a Writ for the taking of Cattel to his uſe, that hath his Cattel unlawfully taken by another, and driven out of the County where they are taken, that they cannot be replevy'd.

AVERMENT, (in Law) is where a Man pleads a Plea in Abatement of the Writ, or Barr of Action, which he ſays he is ready to prove, as the Court will award. This offer to prove the Plea is called an *Averment*.

AVERPENY, is to be quit of divers Sums of Money for the King's Arrearages.

AVERRUNCATION, in Agriculture, ſignifies the lopping off ſuperfluous Branches.

AUGE, an Aſtronomical Term, the ſame as *Apogæum*, is that Point of the Orbit, wherein a Planet being, is furtheſt diſtant from the Central Body about which it revolves, and is then ſloweſt in Motion, inſomuch that from this Point the diſtance of a Planet is reckoned, to find thereby the Inequality of its Motion.

AUGMENTATION, was the Name of a Court erected by King *Henry* the Eighth, for the encreaſe of the Revenues of the Crown, by the Suppreſſion of the Abbies and Religious Houſes: This Court was diſſolved in Queen *Mary*'s Reign; but the Office of *Augmentation* remains to this Day, wherein there are many Records of great uſe and importance.

AUMONE, (Tenure in *Aumone*) is a Tenure *per liberam Eleemoſynam*, as where Lands are given to ſome Church, or Religious Houſe, upon Condition that ſome Service or Prayers ſhall be offered at certain times for the good of the Donor's Soul.

AVOWEE, is he to whom the Right of *Advowſon* of any Church appertaineth, ſo that he may preſent in his own Name; and is called *Avowee*, for a difference from thoſe that ſometimes preſent in another's Name, as a Guardian that preſenteth in the Name of his Ward: And alſo to be diſtinguiſhed from thoſe which have the Lands whereunto an *Advowſon* appertaineth, but only for term of their Lives, of Years, or by Intruſion, or by Diſſeiſin.

AVOWRY (a Law Term) is, when one takes a Diſtreſs for Rent or other thing, and the other ſues *Replevin*; now he that took the Diſtreſs juſtifying the Act, is ſaid to *Avow* it.

AURICULÆ *Cordis*, are two *Appendages* to the Heart, ſeated at its Baſis over the Ventricles; they are ſo called from ſome Reſemblance that they bear to the Ears of a Man's Head. They ariſe from a long Baſis, and end in an obtuſe Point, thereby forming an obtuſe Triangle. They are of the ſame Fabrick and uſe with the Ventricles over which they ſtand, being Muſcles as they are, made up of the ſame order of Fibres, which are carried into oppoſite Tendons; whereof that at the Baſis of the Heart is common to it and the *Auriculæ*, and the other runs along their upper part. The Right *Auricle* is larger and ſofter than the Left. The Superfices of both is ſmooth when they are full, but wrinkled when empty, and more ſo in the Left than in the Right One. On being cut open they exhibit many fleſhy Columns running from the Upper Tendon to the Lower, and between them there are pretty deep Furrows or long Cavities, but fewer in the Right Auricle than in the Left. They are dilated and contracted in like manner as the Heart is, but at different times; for the *Syſtole* of the Ventricles is at the ſame time with the *Diaſtole* of the Auricles and *vice verſa*; ſo that the Auricles are receiving their Blood from the Veins, while the Ventricles are expelling theirs into the Arteries: But when the Ventricles are relaxed and empty in their *Diaſtole*, then the Auricles force the Blood into them by their *Sylſtole*. They are nouriſhed by Branches of Arteries ſpringing from the *Coronaria*, which Dr. *Ruyſch* (who ſeems firſt to have taken notice of this) calls therefore *Arteriæ Auriculares*, and no doubt but they have Branches alſo of Veins to attend them. Their Uſe is to receive the Venal Blood which comes immediately out of the *Vena Cava* and *Pulmonaris*, and to meaſure it as it were (ſaith *Gibſon*) into the Ventricles; and to expel it thither with the greater Force, the Internal Fibres or Columns of their Cavity ariſing from their Root where they are joined to the Baſis of the Heart, reach directly outwards towards the *Vena Cava* and *Pulmonaris*; and in the *Diaſtole* of the *Auriculæ*, graſp the Blood contained in their Cavities like ſo many Fingers, and ſqueeze it into the Ventricles, now relaxed in their *Diaſtole*.

AURIGA, a Conſtellation conſiſting of 23 Stars in the *Northern* Hemiſphere.

AURIPIGMENTUM, yellow Arſenick.

AURUM *Fulminans*, or *Saffron of Gold*, is thus made; put a *Drachm* of thin Plates of Gold into a Matraſs, and then pour on it by little and little (or elſe there will be ſo great an Effervescence, that the Matter will boil over the Glaſs) 3 or 4 *Drachms* of *Aqua Regalis*. Set the Matraſs in warm Sand, and when the Ebullitions are over, the *Menſtrum* will have diſſolved as much of the

Gold

Gold as it can contain. Pour off the Solution, by Inclination, into another Glaſs, and then pour into the Mixture gradually, ſome of the Volatile Spirit of *Sal Armoniack*, or Oil of *Tartar per deliquium*, and the Gold will precipitate to the Bottom of the Glaſs: Let it ſtand a while till all is fallen down, then pour off the Liquor, and waſh the Powder carefully with warm Water till it grows inſipid: Then dry it in a Paper by a gentle Fire, taking care it do not fire, which 'tis apt to do with a terrible Noiſe. If you diſſolve a *Drachm* of Gold, there will be 4 Scruples of *Aurum Fulminans* well dried. It takes its Name from its fulminating or making a great Noiſe like Thunder, when 'tis heated over the Fire in a Spoon, for it will go off like a Gun, but without doing any Miſchief, its Force being chiefly downward. The Effect ſeems to come from ſome Parts of the *Aqua Regalis*, which remain ſtill ſticking in the Gold, and theſe being of a very Spirituous and Volatile Nature, do break out with great Violence when the Powder comes to take Fire.

Thoſe who would know a way to make as great, but yet a much leſs expenſive Noiſe, may ſee the Word *Pulvis Fulminans*. If half its Weight of *Sulphur* powdered, be mingled with *Aurum Fulminans*, its fulminating Quality will be deſtroyed.

Though on ſeveral Trials deſignedly made to make Gun-powder take Fire in Mr. *Boyle*'s exhauſted Receiver, it could not be effected; yet he found that *Aurum Fulminans* would take Fire *there*, and go off, both by means of a Burning-Glaſs, and of a Piece or hot Iron.

AURUM *Moſaicum*, is made by mixing and ſubliming Mercury, Tin, Sulphur and Sal Armoniack all together.

AURUM *Potabile*: The Alchymiſts pretend to be able to ſeparate the Salt and Sulphur of Gold, and then diſſolving it in a Liquor, it may be drank, and therefore is called *Aurum Potabile*: But this is a meer Impoſture, the *Aurum Potabile* being nothing uſually but ſome rich Cordial Liquor with Pieces of Leaf-Gold in it.

AUSTERE *Taſt*, is ſuch an one as moderately conſtringes the Mouth and Tongue with ſome Aſperity, as is the Taſt of unripe Fruits.

AUSTRAL, the ſame with *Southern*: Thus,

AUSTRAL *Signs*, are the ſix laſt Signs of the *Zodiack*; ſo called, becauſe they are on the South Side of the *Equinoctial*.

AUTHENTICKS, the Word *Authentick* ſignifies of good Authority; and therefore the 3d Volume or Tome of the Civil Law, is called *The Authenticks*, from the Greek Word αὐθεντεῖν, becauſe it hath its *Authority* from it ſelf, and proceeding from the Emperor's own Mouth; or elſe that they are Originals to other Writings which are tranſcribed out of them. They are a Volume of new Conſtitutions, ſet out by *Juſtinian* the Emperor, after the *Code*, and brought into the Body of the Law, under one Book.

There is not in theſe that good Order and Method obſerved, as there is in the *Code*, or in the *Digeſt*; but as any doubtful Point came to be conſidered, you have here the Princes Determination of it; and that ſet down as the Caſes occaſionally occurred.

The whole Volume is divided into Nine *Collations*, *Conſtitutions* or *Sections* (I mean in the Latin Verſion, for in the Greek there is not this Diviſion into *Collations*) and theſe are ſubdivided into 168 *Novels*, each of which is diſtributed into ſeveral Chapters. They are called *Novels*, becauſe they were *New Laws* in compariſon of the *Code* and *Digeſt*; juſt as the *Conſtitutions* of the Emperors which were *newly* publiſhed after the *Baſilica* were called the *Novels* of *Leo*, *Nicephorus*, *Michael*, &c.

AUTOGRAPHY, is the peculat Hand Writing of any particular Perſon; or the Original of any Treatiſe or Diſcourſe, in reſpect of a Copy.

AUTOMATA, are Mechanical or Mathematical Inſtruments or Engines, that going by a Spring, Weight, *&c.* ſeem to move of themſelves, as a Watch, a Clock, *&c.*

AUTOPSY, is Ocular Inſpection, or ſeeing a thing with our own Eyes.

AUX, the ſame with *Apogæon*.

AUXILLIARY *Verbs*, in Grammar, are ſuch as help to form or conjugate others; as *to have* and *to be* in the *Engliſh* Tongue, *Eſtre* and *Avoir* in the *French*, *Italian*, *Spaniſh*, &c.

AUXILIUM *Curiæ*, a Precept or Order of Court, for the citing or convening of one Party at the Suit of another.

AUXILIUM *Petere*, in Law, ſignifies to pray Suit in a Cauſe; that is, when an inferior Tenant is impleaded, and not capable to defend the Right in his own Name; he prayeth Aid of the Superior Lord to aſſiſt and juſtify his Plea.

AUXILIUM *Regis*, King's Aid, or Money levy'd for the King's Uſe, and publick Service.

AUXILIUM *Vicecomitum*, the Aid or Cuſtomary Dues paid to the Sheriff, for the better ſupport of his Office.

AWARD, (a Term in Law) properly ſignifying the Judgment of one that is neither aſſigned by Law, or appointed by the Judges for the ending a Matter in Controverſie, but is choſen by the Parties themſelves that are at variance.

AWN, in Botany, *Ariſta*, is the Beard growing out of the Husk of Corn or Graſs.

AWNING, aboard a Ship, is when a Sail, a Tarpaulin, or the like, is hung over any part of the Ship above the Decks, to keep off the Sun, the Rain, or the Wind. In a Long-Boat, they make an Awning by bringing the Sail over the Yard and Stay, and boming it out with the Boat-Hook.

AX or *Axe*, the ſame with *Axis*, which ſee.

AXILLAR *Veins*, are the two Branches of the aſcending Trunk of the *Vena Cava*, called *Rami Subclavii*, which running obliquely under the *Claviculæ*, as ſoon as they are paſt them, and go up to the Armpits, are called *Axillares*: And each of theſe parts it ſelf into two Veins, the *Cephalica* and *Baſilica*.

AXILLARY *Artery*, is that part of the *Subclavian* Branches of the aſcending Trunk of the *Aorta*, that is got out of the *Thorax* and comes into the Arm-pits.

AXIOM, is ſuch a common, plain, ſelf, evident and received Notion, that it cannot be made more plain and evident by Demonſtration, becauſe 'tis its ſelf much better known than any thing that can be brought to prove it; as, *That nothing can act where it is not: That a thing cannot be and not be at the ſame time: That the Whole is greater than a Part: That where there is no Law, there is no Tranſgreſſion*, &c.

AXIS, is the third *Vertebra* from the Skull.

AXIS *of a Cylinder*, is that Quieſcent Right

Line, about which the Parallelgram is turned, which by its Revolution forms the Cylinder.

AXIS *of a Conick Section*, is a Line paſſing through the Middle of the Figure, and perpendicular to the Ordinates.

AXIS *of a Figure*, is a Streight Line, conceived to proceed from the Vertex to the Baſe.

AXIS *of a Circle or Sphere*, is a Streight Line paſſing through the Center from one Side to another; and is the ſame with the *Diameter*.

AXIS *of the World*, is an imaginary Line conceived to paſs through the Center of the Earth from one Pole to another.

AXIS *of the Zodiack*, is alſo conceived to paſs through the Earth, and to be terminated in the Poles of the *Zodiack*.

AXIS *of Rotation* or Circumvolution, is an imaginary Line, about which any plain Figure is conceived to be turned to make a Solid: Thus a *Sphere* is conceived to be made by the Rotation of a Semi-circle about its Diameter, and a *Right Cone* by that of a Right angled Triangle about its Perpendicular.

AXIS *Secudus*, in the *Hyperbole* and *Ellipſis*, is the *Conjugate Diameter*, which ſee. This is ſometimes called the *Axis Rectus*.

AXIS, in *Opticks*, is the Ray which of all that are ſent to the Eye falls perpendicularly on it, and which by conſequence, paſſed through the Center of the Eye.

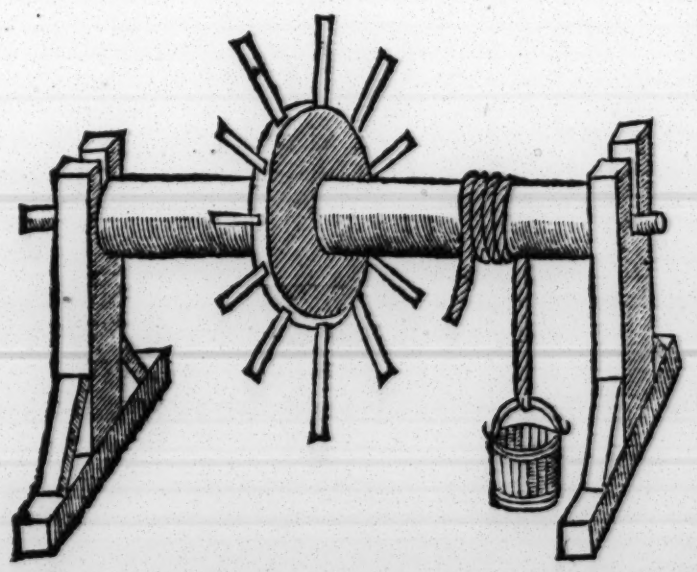
AXIS *Common or Mean*, is a Right Line drawn from the Point of Concourſe of the two *Optick Nerves* through the Middle of the Right Line which joins the Extremity of the ſame *Optick Nerves*.

AXIS *of Incidence*, in Dioptricks, is a Right Line drawn through the *Point of Incidence*, and perpendicular to the Refracting Surface.

AXIS *of Refraction*, is that which is made by the *Ray of Incidence*, directly prolonged on the Inſide of the ſecond *Medium* by the *Ray of Refraction*.

AXIS *of any Glaſs* (in Opticks) is a Right Line drawn perpendicularly through the Centre of the Glaſs; or if it be a *Convex* Glaſs, through the thickeſt Part; if a *Concave*, through the thinneſt Part (which in each is called the *Pole of the Glaſs*) directly on to the Centre of the Sphere, the Glaſs Figure is a Segment of.

AXIS *in Peritrochio*, is a Machine for the raiſing of Weights, conſiſting of a Cylindrical Beam (which is the *Axis*) lying Horizontally, and ſupported at each End by a Piece of Timber; and ſomewhere about it, it hath a kind of *Tympanum* or Wheel, which is called the *Peritrochium*, in whoſe Circumference are Holes made to put in Staves (like thoſe of a Windleſs or Capſtain) in order to turn the *Axis* round the more eaſily, and thereby to raiſe the Weight required by Means of a Rope which winds round the *Axis*. *See Vol.* II.



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To find the Sun's *Azimuth* at Six, having the *Latitude of the Place*, and the *Sun's Declination* given.

Say, As the Co-Sine of the Latitude: Is to the Radius :: So is the Co-Tangent of the Sun's Declination: To the Tangent of the Sun's Azimuth at Six.

Example. Let the Latitude be 51 *Deg.* 30. *Min.* and the Sun's Declination be 11°. 30′.

Then to the Ar. co. of the Co-Sine of	51°. 30′.—0,205850
Add the Co-Tangent of	11°. 31′.—10,690891
Sum is the Tangent of	83°. 50′.=10,896741

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To find the *Azimuth*, having given the Latitude of the Place, the Sun's Altitude at Six, and present Altitude.

In *Summer*.

Say, As the Co-fine of the Altitude: Is to the Tangent of the Latitude :: So is the Difference between the Sines of the Sun's Altitude at 6, and present Altitude: To the Sine of the *Azimuth* from *East* to *West*.

In *Winter*.

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And on theſe *Azimuths* is reckoned the Sun's Altitude, when he is not on the Meridian.

AZOTH, among the Chymiſts, ſignifies ſometimes an Univerſal Medicine, ſometimes the Mercury of a Metal.

AZURE, the Herald's Term for a Blue Colour in the Coats of all Perſons under the Degree of a Baron; but in the Eſcutcheons of the Noblemen 'tis called *Saphir*; and in thoſe of Sovereign Princes 'tis called *Jupiter*. In Engraving 'tis repreſented by Strokes or Hatches drawn only Horizontally, thus, as in the annexed Figure.

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Line, about which the Parallelgram is turned, which by its Revolution forms the Cylinder.

AXIS *of a Conick Section*, is a Line paſſing through the Middle of the Figure, and perpendicular to the Ordinates.

AXIS *of a Figure*, is a Streight Line, conceived to proceed from the Vertex to the Baſe.

AXIS *of a Circle or Sphere*, is a Streight Line paſſing through the Center from one Side to another; and is the ſame with the *Diameter*.

AXIS *of the World*, is an imaginary Line conceived to paſs through the Center of the Earth from one Pole to another.

AXIS *of the Zodiack*, is alſo conceived to paſs through the Earth, and to be terminated in the Poles of the *Zodiack*.

AXIS *of Rotation* or Circumvolution, is an imaginary Line, about which any plain Figure is conceived to be turned to make a Solid: Thus a *Sphere* is conceived to be made by the Rotation of a Semi-circle about its Diameter, and a *Right Cone* by that of a Right angled Triangle about its Perpendicular.

AXIS *Secudus*, in the *Hyperbole* and *Ellipſis*, is the *Conjugate Diameter*, which ſee. This is ſometimes called the *Axis Rectus*.

AXIS, in *Opticks*, is the Ray which of all that are ſent to the Eye falls perpendicularly on it, and which by conſequence, paſſed through the Center of the Eye.

AXIS *Common or Mean*, is a Right Line drawn from the Point of Concourſe of the two *Optick Nerves* through the Middle of the Right Line which joins the Extremity of the ſame *Optick Nerves*.

AXIS *of Incidence*, in Dioptricks, is a Right Line drawn through the *Point of Incidence*, and perpendicular to the Refracting Surface.

AXIS *of Refraction*, is that which is made by the *Ray of Incidence*, directly prolonged on the Infide of the ſecond *Medium* by the *Ray of Refraction*.

AXIS *of any Glaſs* (in Opticks) is a Right Line drawn perpendicularly through the Centre of the Glaſs; or if it be a *Convex* Glaſs, through the thickeſt Part; if a *Concave*, through the thinneſt Part (which in each is called the *Pole of the Glaſs*) directly on to the Centre of the Sphere, the Glaſs Figure is a Segment of.

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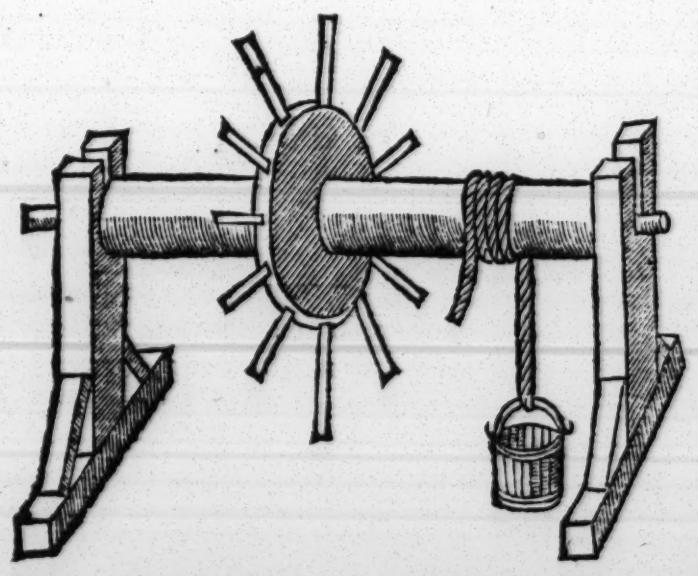

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BACCIFEROUS *Plants*, whether Trees, Shrubs or Herbs, are ſuch as bear Berries; and Berries are Fruits covered with a thin Membrane, in which is contained a Pulp, which grows ſoft and moiſt when ripe, and contains the Seed within the Subſtance. The *Bacciferous Herbs* are the *Chamæmorus*, *Smilax aſpera*, *Bryonia Alba* and *Nigra*, *Angelica Baccifera*, *Aconitum Racemoſum*, *Solanum Racemoſum Americanum*, *Hypogloſſum*, *Laurus Alexandrina*, *Oxymyrſine*, *Polygonatum*, *Lilium Convallium*, *Monophyllon*, *Mandragora*, *Herba Paris*, *Solanum Lethale*, *Malum Inſanum*, *Solanum Vulgare*, *Alſine Baccifera*, *Solanum Somniferum*, *Alkekengi*, *Aſparagus*, *Vitis Idæi palluſtris*, &c.

The *Bacciferous Trees*, Mr. *Ray* divides into four kinds.

1. Such as bear a Caliculate or Naked Berry, the Flower and Calix both falling off together, and leaving the Berry bare, as the *Saſſafras Tree*, &c.

2. Such as have a Naked, *Monopyrenous* Fruit, *i. e.* containing in it only one Seed; as the *Arbutus Terebinthus*, *Lentiſcus*, *Viſcus*, *Phylleræa*, *Sambucus*, *Aquaticus*, *Laureola*, *Chamælæa Germanica* (or *Mezereon*) *Viburnum*, *Cornus*, *Rhamnus*, &c.

3. Such as have alſo a Naked but *Polypyrenous* Fruit; *i. e.* one containing two or more Kernels or Seeds within it; as the *Jaſaminum*, *Liguſtrum*, *Alnus*, *Berberis*, *Alaternus*, *Sambucus Vulgaris*, *Vitis*, the *Tea Plant*, *Euonymus Vulgaris*, *Agrifolium*, *Rhamnus Catharticus*, *Capparis*, *Erica Baccifera*, &c.

4. Such as have their Fruit compoſed of many *Acini* or round ſoft Balls (for the Word *Acinus*, in Botany, is rather a *Grape* than a *Grape-ſtone*) ſet cloſe together like a Bunch of Grapes; as the *Uva Marina*, *Rubus Vulgaris*, *Rubus Idæus*, and the *Rubus minor fructu Cæruleo*.

BACCIVOROUS *Creatures*, are ſuch Animals as feed upon Berries.

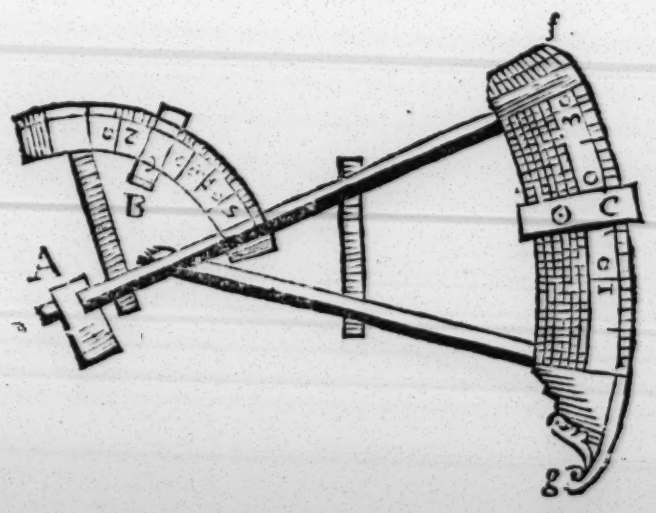
BACCERIND *Thief*, (a Term in Law) ſignifying a Thief taken with the Manner (as the ſay) *i. e.* having on his Back or about him, thoſe things he hath ſtollen. It is by ſome taken for an Offender againſt Vert or Veniſon in the Foreſt.

BACCHIUS, is a Foot of a Latin Verſe, conſiſting of three Syllables, where the firſt is ſhort, and the two laſt long, as *Egeſtas*: This is the Reverſe of a *Dactyle*.

BACILLI, are thoſe Medicines which are of a long round Figure like a Stick, *&c.*

BACK STAYS, of a Ship, ſee *Stays*.

BACK-STAFF, the ſame with *Davis*'s Quadrant, or the *Engliſh* Quadrant, as 'tis called by the



French. 'Twas invented by one Capt. *Davis* a *Welchman*; and is a Sea Inſtrument of good uſe to take the Sun's Altitude at Sea. It conſiſts of three Vanes *A*, *B* and *C*; and of two Arches.

The Vane at *A* is called the *Horizon Vane*; that at *B* the *Shade Vane*; and that at *C* the *Sight Vane*. The leſſer Ark *B* is of 60 *Degrees*, and that of *C* (or *f g*) of 30 *Degrees*. In time of Obſervation the Shadow Vane *B* is ſet upon the 60 Arch juſt to an even Degree of ſome Altitude leſs than you judge the Complement of the Sun's Altitude will be, by 10 or 15 *Degrees*. The Horizon Vane is put on at *A*, and the Sight Vane on the 30th Ark *f g*; and then the Obſerver's Back being turned to the Sun (whence the Name of *Back-Staff* or *Back-Quadrant*) he lifts up the Inſtrument, and looks thro' the Sight Vane, riſing or falling the Quadrant till the Shadow of the upper Edge of the *Shade Vane* fall on the upper Edge of the Slit in the *Horizon Vane*; and if then you can ſee the Horizon thro' the ſaid Slit, the Obſervation is well made: But if the Sea appear inſtead of the Horizon, move the Sight Vane lower towards *g*; If the Sky appear, move it upwards towards *f*: and ſo try till it comes right.

Then obſerve how many Degrees and Minutes are cut by that Edge of the *Sight Vane*, which anſwers to the *Sight Hole*, and to them add the Degrees cut by the upper Edge of the *Shade Vane*: The Sum is the Sun's Diſtance from the Zenith, or the Complement of his Altitude.

To find the *Meridian Altitude* by this Inſtrument, you muſt continue the Obſervation as long as you perceive the Altitude to be increaſing; which you will find by the Sea's appearing ſtill thro' the Slit inſtead of the Horizon, and as you move the *Sight Vane* lower: But as ſoon as ever you ſee the Sky appear inſtead of the Horizon, the Altitude is then diminiſhing, and you muſt deſiſt; and adding as before the Degree and Minutes on the two Arks together into one Sum, it gives the Sun's Zenith Diſtance, or his Co-Altitude; and this ſubſtracted from 90°. leaves the true Altitude above the Horizon.

That excellent Aſtronomer Mr. *Flamſtead*, contrived a Glaſs Lens or double Convex to be placed in the Middle of the *Shade Vane*, which makes a ſmall bright Spot on the Slit of the Horizon Vane, inſtead of the Shade: And this is a great Improvement, if the Glaſs be truly made, for by this Means the Inſtrument may be uſed in Hazy Weather, and a much more accurate Obſervation made in clear Weather, than could be by the Shadow.

But after all, this Quadrant is by no Means ſo accurate as could be wiſhed; and a large heavy Braſs Aſtrolabe muſt needs be a much better Inſtrument.

BACULE (in Fortification) is a kind of Port-Cullis or Gate made like a Pit-fall with a Counterpoiſe, and ſupported by two great Stakes. 'Tis uſually made before the *Corps de Gards* advanced near the Gates.

BACULOMETRY, according to ſome, is the Art of meaſuring acceſſible and inacceſſible Lines, by the help of one or more Staves.

BADGER (in Law) is one that is Licenced to buy Corn or other Victuals in one Place, and carry it to another.

BAILE or *Bale*; the Seamen call lading or casting the Water by Hand out of a Boat *Bailing*; and when the Water is thus Bailed out, they say, the *Boat is freed*. They call also those Hoops that bear up the Tilt of a Boat *Bailes*.

BAILE (in Law) is the setting at liberty one Arrested or Imprisoned upon an Action either Civil or Criminal, under Sureties taken for his Appearance at a Day and Place certainly assigned: And there is both *Common* and *Special Baile*; *Common Baile* is in Actions of small Prejudice, or slight Proof, in which Case any Sureties are taken: *Special Baile* is given in Cases of greater Weight, who must be subsidy Men at the least, and they according to the Value.

BAILEMENT (a Term in Law) signifying the Delivery of things, whether Writings or Goods, to another, sometimes to be delivered back to the Bailor, that is, to him that so delivers them, sometimes to the use of him to whom they are delivered; and sometimes to a third Person.

BAILIFF, is an Officer that belongs to a Mannor, to order the Husbandry, and hath Authority to pay Quit-Rents issuing out of the Mannor, sell Trees, repair Houses, *&c.* This Officer is he whom the ancient *Saxons* called a *Reeve*.

BAILIFF *Errant*, is one that the Sheriff makes and appoints to go about the Country to execute Writs, to summon the Country Sessions, Assizes, *&c.*

BAILIFF *Franchises*, are those which are appointed by every Lord within his Liberty, to do such Offices within his Precincts, as the *Bailiff Errant* doth abroad in the Country.

BAILIWICK, is the Jurisdiction of a Bailiff within his Lord's Franchise.

BAKER's *Central Rule* for Constructing Equations: See *Constructions of Equations*.

BALANI, are certain Excresences usually growing to the Shells of the larger sorts of Sea Shell-Fishes.

BALANUS (as it is called by some) or *Glans*, is the Nut of the Yard covered with the Foreskin; sometimes the *Clitoris* is so called. It often also signifies a Suppository. *Blanchard*.

BALL *and Socket*, is an Instrument made of Brass, with a perpetual Screw to hold any *Telescope*, *Quadrant*, or *Surveying Instrument*, on a Staff for Surveying, Astronomical, or other uses.

BALLANCE or *Libra*, is one of the Six simple Powers in *Mechanicks*, which serves to find out the Equality or Difference of Weights in heavy Bodies. It is only a double Lever whose *Hypomochlion* is at the Centre of its length.

BALLANCE *of the Air*, see *Barometer*.

BALLANCE *of a Watch or Clock*, is that part of it, which by its Motion regulates and determines the *Beats*: The circular Part of it is called the *Rim*, and its Spindle the *Verge*: There belongs to it also two *Pallats* or *Nuts*, which play in the Fangs of the Crown-wheel. In Pocket Watches that strong stud, in which the lower *Pevet* of the *Verge* plays; and in the Middle of which one *Pevet* of the Crown-wheel runs, is called the *Potans*, or rather *Potence*. The wrought Piece which covers the *Ballance*, and in which the upper *Pevet* of the *Ballance* plays, is the *Cock*. The small Spring in new Pocket Watches is called *Regulator*.

BALLANCE or *Libra*, is the Name of one of the twelve Signs of the *Zodiack*; into the first Degree of which when the Sun comes, the Autumnal Equinox happens, and is the 12th of *September*.

BALLAST *of a Ship*, is some heavy Matter, as Stones, *&c.* laid in the Hold next to the Keelson or false Keel, in order to keep a Ship stiff, so that she may bear the more Sail. The Words about it are *Trench the Ballast*, *i. e.* divide it into two or more Parts. The *Ballast is Shot*, that is, 'tis run over from one Side to the other: When a Ship hath not Ballast enough, they say she is *Walt*,

BALLESTER, or *Balluster*, in the Capital of the *Ionick Column*, is the lateral Part of the Scroll which makes the *Curl-turf*,

BALLISTA, an ancient Warlike Engine to cast or shoot Darts or Stones, to batter and shake City Walls.

BALLIVO *amovendo*, is a Writ to remove a Bailiff out of his Office, for want of sufficient living in his Bailiwick.

BALLON or *Balon*, is the *French* Word for a large Receiver or Vessel used in Chymistry, to receive what is distilled or drawn off by the Fire.

BALLON, in Architecture, is taken for a round Globe, or top of a Pillar.

BALLS or *Ballets*, a frequent Bearing in Coats of Arms; but they are never called so in Heraldy, but according to their several Colours have the following Names;

Besants, when the Colour is Or.
Plates, when 'tis Argent.
Hurts, when 'tis Azure.
Torteauxes, when 'tis Gules.
Pomeis, when 'tis Vert.
Pellets or *Agresses*, when Sable. Some write it *Ogresses*.
Golpes, when Purpure.
Orenges, when Tenne.
Guzes, when Sanguine.

And these Nine contain all the Colours usually mentioned Heraldy.

BALLUSTRADE, in Architecture, signifies a Row of little turn'd Pillars, high enough for a Man to rest his Elbows on, fixed upon a Terrass, or upon the Top of a Building; or to make any Separation between one Part of it and another.

BALNEUM, a Word much used by the Chymists; it properly signifies a Vessel of Water, in which the *Body* or *Cucurbite* containing any Matter to be *distilled* is placed, that so the Water heating, may heat the Cucurbite gently and by degrees. And this is what they call corruptly.

BALNEUM *Mariæ*; but it should be *Balneum Maris*, *i. e.* a *Sea* or *Water Bath*. And in respect to the Mildness of the Heat in this way of Distillation, where the Fire never touches the *Cucurbite* immediately. They call several other gentle ways of Distillation by the Name of *Balneum*, as.

BALNEUM *Vaporosum*, where the Vessel containing the Matter to be distilled heated by the Steam of hot or boiling Water.

BALNEUM *Arenæ* or *Sineris*; which they call also sometimes *Balneum Brenosum*, and *Balneum Cinereum*, is when the Cucurbite, or Retort, or Vessel holding the Matter to be distilled is placed in a Pot of *Sand* or *Ashes*, and so is heated by the Heat of the Sand of Ashes.

BALSAM, signifies, 1*st*. The Juice of an *Arabian* Tree called *Opobalsamum*, to which are allied the Natural Balsams, as that of *Toli*, *Peru*, *&c.*

2*dly*, A

2*dly*. A ſometime thick and odoriferous, ſpirituous and penetrating Subſtance, of the Conſiſtence of an Ointment, as *Apoplextick Balſam*, *Balſam of Roſes*, *&c.*

3*dly*, A ſort of Liquors drawn or extracted from Gums and Reſinous Subſtances with Spirit of Wine.

4*thly*, This Name is given alſo by the Chymiſts to the Solutions and Preparations of ſome Salts, as Balſam of *Saturn*, *Tartar*, *Sal-gemm*, *&c.*

5*thly*, Some particular Preparations of Medicines in this Form are called by this Name, as *Balſam of Sulphur*, *&c.*

BALSAM *of Saturn*, is a Solution of *Saccharum Saturni* made with Spirit of Oil of *Turpentine*, and digeſted till the Matter hath gained a Red Tincture.

BAN, is a Proclamation made at the Head of a Body of Troops, or in the ſeveral Quarters of the Army, by ſound of Trumpet or beat of Drums, either of obſerving or Martial Diſcipline, for declaring a New Officer, puniſhing a Soldier, or the like.

BANDELET, is a *French* Term for one of the Ornaments in Architecture, which they call alſo *Regle*: 'Tis greater than the *Liſt*, but a little leſs than what they call a *Platte Bande*; it encompaſſes the Pillar quite round about like a Ring.

BANK, in Common Law, ſignifies the Bench or Seat of Judgment: But there is another ſort of *Bank*, where there is a great Sum of Money let out to uſe, returned by Exchange, or otherwiſe diſpoſed to Profit.

BANKRUPT, one that hath conſumed his Eſtate, or is run out in his Trade.

BANNIMUS, the Form of Expulſion of any Member from the Univerſity of *Oxford*, affixing the Sentence, up in ſome Publick Place, as a Denunciation or Promulgation of it.

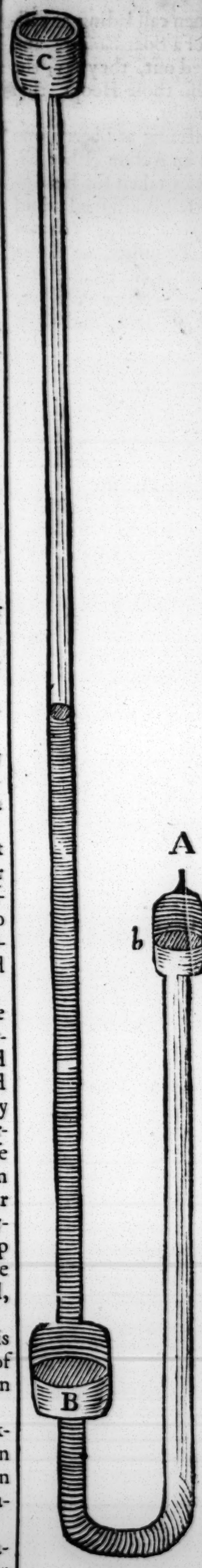
BANQUETTE, in Fortification, is a little Foot Pace or Elevation of Earth in Form of a Step, or the Bottom of a *Parapet*, or that which the Muſqueteers get up to diſcover the *Counteſcarp*, or to fire upon the Enemies in the *Moat*, or in the *Covertway*. Theſe *Banquets* are generally a Foot and a half high, and almoſt three Foot broad.

BARAK or *Baraque*, is an Hutt like a little Cottage for Soldiers to lie in the Camp: Formerly thoſe for the Horſe were called *Baracks*, and thoſe for the Foot *Hutts*; but now *Barack* is uſed for both indifferently. They are made uſually when the Soldiers have no Tents, or when an Army lies long in a Place in bad Weather, becauſe they keep out Cold and Wet much better than Tents. They are generally made by fixing four ſtrong forked Poles in the Ground, and then laying four others acroſs them; then they build up the Walls with Sods, Wattles, or what the Place affords: The Top is either Planked or Thatched, or covered with Turf, as they have Convenience.

BARBE, a Military Word: To fire *an Barbe* is the fire the Cannon over the Parapet, inſtead of putting them through the Embrazures; but then the Parapet muſt be but 3 Foot and $\frac{1}{2}$ high.

BAROCO, one of the barbarous Words expreſſing the Syllogiſtick Moods in Logick; and in this Mood *Baroco*, the firſt Propoſition muſt be an univerſal Affirmative, and the two other Negatives.

BAROMETER, is an Inſtrument for eſtimating the Minute Variations of the *Weight* or *Preſſure* of the Incumbent Air, conſiſting of a long *Tube* of *Glaſs*, *hermetically* ſealed at one End, and being filled with *Quick-ſilver* (according to the *Torricellian* Experiment) is inverted, ſo as to have the open End of it immerſed in Stagnant Quick-ſilver, contained in a larger Glaſs under it, and expoſed to the Preſſure of the outward Air: Out of which open End (after ſuch Immerſion) the Quick-ſilver in the Tube being ſuffered to run as much as it will into the Stagnant Quck-ſilver, in which that Mouth or open End is immerſed, there is wont to remain a Cylinder of Quck-ſilver, ſuſpended in the Tube about 28, 29, or 30 Inches high; meaſuring from the Surface of the *Stagnant Quick-ſilver* perpendicularly; but more or leſs within ſuch Limits, according as the Weight or Preſſure of the Air incumbent on the external ſtagnant Quick-ſilver expoſed to it, is greater or leſſer, leaving the upper Part of the Tube void, or at leaſt empty of common Air.



Dr. *Hook*'s Contrivance to enlarge the Diviſions of the *Barometer* in any given Proportion.

The Glaſs this *Barometer* is repreſented by the adjoining Figure; the Cylinder *A* may be of what Diameter you pleaſe, the bigger the better, but it need not be above two Inches long; the Cane *A D* muſt be ſo long, that the upper Part of the Cylinder *B* may be 29 Inche + ſuch a Part of the Height of the other Cane *B C*, as the Weight or Specifick Gravity of the Liquor that is to fill that Cane is to the Specifick Gravity of *Mercury* below the Line *a b*, in the Cylinder *A*. The third Cylinder *C* may be as high as you pleaſe above the Cylinder *B*, but is moſt conveniently made, ſo as the Square of the Diameter of the Cane *B C* be to the Square of the Diameter of the Cylinders *B* or *C* (which muſt be exactly equal) as the riſe of the

Mercury

Mercury in the Cylinder *B*, is to the whole Length of the Cane *BC*; for in this caſe there will be nothing ſuperfluous, but the Diviſions enlarged to the utmoſt advantage.

To fill this *Baroſcope*;

Let a ſmall Hole be left at the top of the Cylinder *A*, and another near the top of the Cylinder *B*; this latter being well ſtopt, pour in as much *Mercury* at the other Hole in *A*, as ſhall fill both Canes as high as the Level of the ſaid Hole; which done, ſtop either by Hermetically Sealing it, or elſe by a drop of Sealing-wax (the Glaſs being firſt ground rough to make it ſtick) the Hole in *A*; then opening the Hole in *B*, draw off as much of the *Mercury* of the Cane *BC* till it will run no longer; which done, ſtop firmly the Hole in *B* (which you may do as you pleaſe, there being no Preſſure againſt you) and you will have the Cylinder *A* evacuated of *Air* for your purpoſe, and the height of the *Mercury* will be as uſual in the ordinary *Plain* and *Wheel-Barometers*.

Then pour into the Cane *BC* as much Spirit of Wine tinged with *Chochinele* and Oyl of *Turpentine*, equal Parts of each, as ſhall ſtand above the Surface of the *Mercury*, ſo many Feet as you make the enlarged Scale of your *Barometer*, or as is between the middle of the Cylinders *B* and *C*, and you will find the *Mercury* ſink in the Cane *BC*, and riſe in the Cane *AD*, in ſuch proportion, that each 13 Feet of Oyl and Spirit, will raiſe the *Mercury* 10 Inches: Then you muſt pour on, by the Cane *BC*, ſo much *Mercury* as will fill up the Cylinders *A* and *B* to ſuch heights, conſidering the preſent weight of the *Atmoſphere*, that the Surface of the *Mercury* in both, may at the utmoſt Limits, (which have not in *England* been found to exceed 30,6 and 28,6 Inches) always fall within the Bodies of the Cylinders, and never enter into the Canes.

The Effect of this *Baroſcope* will be, that when the *Atmoſphere* is heavy, and the *Mercury* raiſed high in the Cylinder *A*, and retired out of *B*, the *Spirit of Wine* will deſcend into the Cylinder *B*, and the *Oyl of Turpentine* will fill the Cane, ſo as to make the Partition of the two Liquors near the Cylinder *B*. But on the contrary, when the Air is light, the *Mercury* will ſink in *A*, and riſe in *B*, ſo as to drive the *Spirit of Wine* into the Cane, and the *Oyl of Turpentine* into the Cylinder *C*; ſo that the Section of the two Liquors will be near *C*, and the Variation of the height of the *Mercury* will be enlarged into almoſt the length of the Cane, without that the Counter-preſſure from the Liquors will not be in the leaſt altered, the Height and Weight of the Incumbent Cylinder being always the ſame.

The Ingenious Mr. *Hauksbee* (that invented the new Cupping-Glaſſes without Fire, now generally uſed: See his *Air-pump*) ſhewed me a *Baroſcope* where the *Mercury* roſe and fell 60 Inches with very great eaſe, and without breaking or dividing; and it may very eaſily be made for 100 or 200 Inches, if a ſtrait ſmall thin Glaſs Tube can be blown and drawn of that length, and that it were as eaſily manageable.

The *Torricellian* Experiment is made in a Tube of about 31 Inches in length, with a ſmall Ball, or rather Cylindrical Cavity on the Top; at the Bottom of this Tube, at *A*, is a very ſmall Ciſtern with *Mercury* in it, and communicating with the free Air, into which the lower End of the Tube *AB* is put; then at a very Acute Angle, is the ſmall Tube *CD* placed with its open Orifice in the aforeſaid Ciſtern, and juſt under the Surface of the Mercury in it. And thus when the *Atmoſphere* is high and heavy (that is in dry and fair Weather) the Mercury being preſſed up into the Tube *BA*, leaves but little in the Ciſtern, and conſequently there is but a little Weight of Mercury there, to preſs any out into the Tube *CD*, and conſequently then the Mercury will fall or deſcend towards *C*. But when in contrary Weather, the Mercury falls out of the Tube *AB*, there will be more in the Ciſtern, and conſequently the Mercury muſt aſcend further, or run higher up into the Tube *CD*. And this is ſo tender and nice, that while I was in the Room, and looking on it, which was not above an Hour, the Mercury aſcended near 2 Inches (for Rain) in the ſlope Tube.

One great Advantage this Way of managing a ſloping Tube, ſeems to have above the Common One, which is, that the Mercury here moves all together in a Body, without breaking or dragging a Tail after it.

See the Figure of the Plate belonging to the Word Air-Pump.

Baroſcope Statical: So Mr. *Boyle* calls an Inſtrument which he invented to eſtimate the Variations of the Air's Gravity, and is thus deſcrib'd.

A very large and thin Glaſs Bubble (or if ſuch an one cannot be procured, 2 or 3 ſmaller ones added together may do) was counterpoiſed in a very tender Balance which would turn with the 64th Part of a Grain, and then all being hung up in a Frame, he found, that as the Air grew lighter and thinner, the Bubble would preponderate very manifeſtly; but when the Air grew thicker and denſer, the Scale in which the Weights were, would grow heavier, and mount up the Bubble. And this Effect he found would continue and anſwer exactly to the riſe and fall of the Mercury in the common *Barometer* or *Baroſcope*.

The Grounds on which this Noble Gentleman went in contriving this Inſtrument, were theſe:

1. He conſidered, that tho' at firſt ſetting of it up, the Bubble and the Weights would be in *Æquilibrio*, becauſe he carefully made them ſo; yet the Bulk of the Bubble did exceed that of the Metalline Counterpoiſe, by near 200 times (be it more or leſs, according to the Specifick Gravity of the Weights uſed) and therefore he conſidered.

2. That, according to the Laws of Hydroſtaticks, when two Bodies being of the ſame abſolute Weight, but very different Bulks, come to be weighed in another Medium, they can no longer be equiponderant: For if the Medium be heavier or denſer, the greater Body will be more buoyed up there than it was before, and conſtantly will abate of its Weight; but if the Medium ſhould be lighter and rarer, the contrary Effect would follow, and the Weight would be heavier than the Bubble. He conſidered alſo, that this muſt be the Caſe of the Air, whoſe Specifick Gravity is continually changing, according to the various Effluvia it receives from the Terraqueous Globe, and conſequently, that it muſt needs be now denſer, now rarer, and accordingly more or leſs buoy up the Bubble.

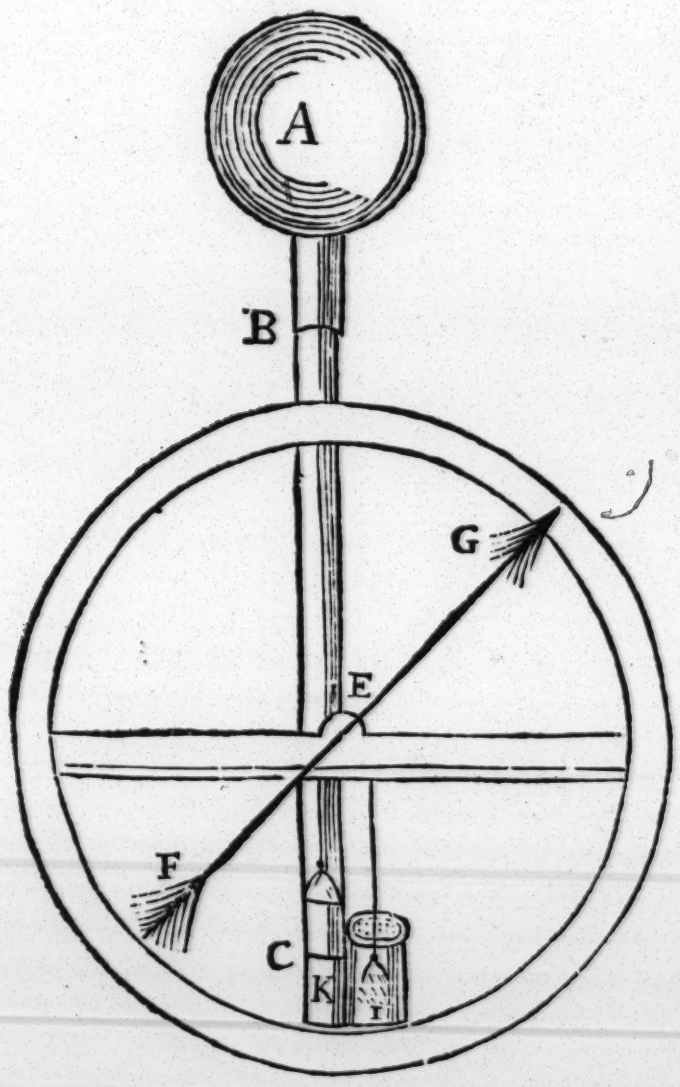
Our Author hints, that this Inſtrument is capable of ſeveral Improvements; and tho' in many Caſes the common *Baroſcope* be preferable before it, yet this hath ſome Advantages above that; as, 1. That this is more parable than the other;

for many Perſons can more eaſily get a Pair of good Scales and a Glaſs Bubble, than they can a Tube and Mercury for the common *Baroſcope*; and this alſo is much more eaſily fitted up than that. This *Statical Baroſcope* is alſo much more eaſily carried from Place to Place. This *Baroſcope* may be adjuſted to the ordinary one, by finding what Weights anſwer exactly to every half Quarter of an Inch of the riſe and fall of the Mercury; and theſe may help us to gueſs at the uſual Variations of the Weather, by ſhewing how much is wanting to bring the Scales to an Æquilibrium.

Alſo an Arch of a Circle, well graduated, may be fitted ſo as that the Tongue of the Balance ſhall play freely by it, and there ſhew the Change of the Gravity of the Atmoſphere, without the Addition of any new Weights at all.

WHEEL-BAROMETER, is a Contrivance for the applying of an *Index* to any *Common Baroſcope*, whether the Glaſs be only a ſingle Cane, or have a round Bolt-head at the Top; and by the Means thereof, the Variation of the Altitude of the *Mercurial Cylinder*, which at moſt is hardly 3 Inches, may be made as diſtinguiſhable as if it were 3 Foot or 3 Yards, or as much more as is deſired.

The *Wheel-Barometer* was invented by Dr. *Hook*, the Manner whereof is viſible in the Figure, where *A B C* repreſents the Tube, which may be either Blunt or with a Head, as *A B C* (by which latter Shape, more room is allowed for any remainder of Air to expand the better.) This is to be filled with Quick-ſilver, and inverted as commonly, and put



into a Veſſel of Stagnant Mercury, made after the Faſhion of *I K*, that is, having its Side about 3 or 4 Inches high, and the Cavity of it equally big both above and below; and if it can be (beſides that Part which is filled by the End of the *Mercurial Tube* that ſtands in it) of equal Capacity with the Hollow of the Cane about *B*, for then the Quick-ſilver riſing as much in the Hollow of *I*, as it deſcends at *B*, the Difference of the Height in the Receiver *I*, will be juſt half the uſual Difference. And if the receiving Veſſel *I K* have a bigger Cavity, the Difference will be leſs; but if leſs, the Difference will be greater. But whether the Difference be made hereby bigger or leſs, 'tis no great Matter, ſince by the Contrivance of the *Wheel* and *Index*, the leaſt Variation may be made as ſenſible as is deſired, by diminiſhing the Bigneſs of the *Cylinder E*, and lengthening the *Index F G*, according to the Proportion requiſite.

But this *Wheel-Barometer* not anſwering fully the deſigned Exactneſs, becauſe the Mercury is apt to ſtick about the Sides of the Glaſs, and would riſe and fall by Leaps, and all at once; and becauſe alſo 'tis very difficult to adjuſt the Ball and Thread, *&c.* and that the Inſtrument is very apt to be out of Order, *&c.* 'tis now out of uſe. And therefore in *Philoſ. Tranſact. N.* 185. the Doctor gives us another Contrivance, (which he had thought of in the Year 1668) by putting the Spirit of Wine, or ſome other Liquor that will not freeze, upon the Mercury; which was deſigned to riſe as the Mercury falls, and fall as it riſes. And by this Means he could, he ſaith, enlarge the Diviſions as much as he pleaſed.

MARINE BAROMETER, is an Inſtrument contrived by Dr. *Hook*, for the Uſe of thoſe that would make a Philoſophical Experiment at Sea.

For the *Mercurial Barometer* requiring a perpendicular Poſture, and the Quick-ſilver vibrating therein with great Violence upon any Agitation, is therefore uncapable of being made at Sea, (tho' it hath lately been contrived to be made portable) ſo it remain'd to find out ſome other Principle, wherein the Poſition of the Inſtrument was not ſo indiſpenſably neceſſary: For this the above-named Perſon invented. Its Deſcription and Uſes the Ingenious Capt. *Halley* in *Philoſ. Tranſact.* N°. 269. gives as follows.

It is about 40 Years ſince, that the *Thermometers* of *Robert de Fluctibus*, depending on the Dilatation and Contraction of included Air by Heat and Cold, have been diſuſed, upon diſcovery, that the Air's Preſſure is unequal; that Inequality mixing it ſelf with the Effects of the Warmth of the Air in that Inſtrument; and inſtead thereof, was ſubſtituted the ſealed *Thermometer* including Spirit of Wine (firſt brought into *England* out of *Italy* by Sir *Robert Southwell*) as a proper Standard of the Temper of the Air, in relation to Heat and Cold, that Ætherial Spirit being of all the known Liquors the moſt ſuſceptible of Dilatation and Contraction, eſpecially with a moderate Degree of either Heat or Cold.

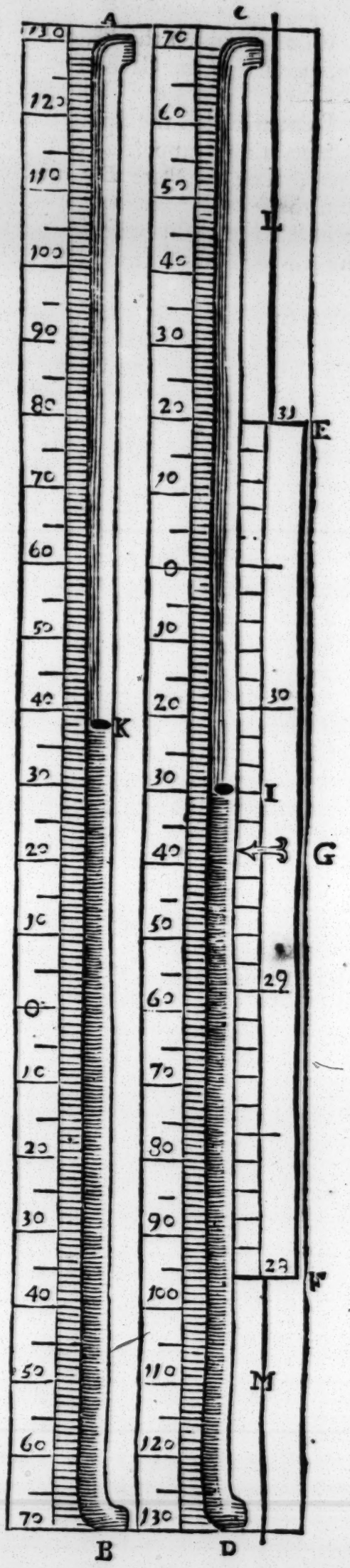
Now this being allow'd as a Standard, and the *Thermometer* that includes the Air being graduated with the ſame Diviſions, ſo as at the time when the Air was included to agree with the *Spirit-Thermometer* in all Degrees of Heat and Cold, noting at the ſame time the preciſe Height of the *Mercury* in the common *Barometers*; it will readily be underſtood, that whereſoever theſe two *Thermometers* ſhall agree, the Preſſure of the Air is the ſame it was when the Air was included and the Inſtrument graduated; that if in the *Air-Thermometer*, the Liquor ſtand higher than the Diviſions marked thereon, correſponding with that on the Spirit Glaſs, it is an Indication that there is a greater Preſſure of the Air at that time, than when the Inſtrument was graduated. And on the

the contrary, it is to be concluded, when the Air-Glaſs ſtands lower than the Spitit, *viz.* that then the Air is ſo much lighter, and the Quick-ſilver in the ordinary Barometers lower than at the ſaid time of Graduation.

And the Spaces anſwering to an Inch of *Mercury*, will be more or leſs, according to the Quantity of Air ſo included, and the Smallneſs of the Glaſs Cane in which the Liquor riſes and falls; and may be augmented almoſt in any Proportion, under that of the *Specifick Gravity* of the Liquor of the *Thermometer* to *Mercury*, ſo as to have a Foot or more for an Inch of Mercury, which is another great Convenience.

In theſe Parts of the World, long Experience has told us, That the Riſing of the *Mercury* forebodes Fair Weather after Foul, and an Eaſterly or Northerly Wind; and that the falling thereof, on the contrary, ſignifies Southerly or Weſterly Winds, with Rain and Stormy Winds, or both; which latter it is of much more conſequence to provide againſt at Sea than at Land; and in a Storm, the *Mercury* beginning to Riſe, is a ſure Sign that it begins to abate, as hath been experienced in high Latitudes, both to the Northwards and Southwards of the Equator.

The Form of this Inſtrument is repreſented by the following Figure.



A B repreſents the *Spirit Thermometer* graduated from *O*, or the Freezing Point, through all the poſſible Degrees of Heat or Cold of the Air, at leaſt in theſe Climates.

C D is the *Air-Thermometer*, graduated after the ſame Manner with the like Degrees.

E F is a Plate applied to the Side of the *Thermometer C D*, graduated into Spaces anſwering to Inches, and Parts of an Inch of Mercury, in the Common Barometers.

G, a Hand ſtanding on the Plate, at the Height of the *Mercury* thereon, as it was when the Inſtrument was graduated; as ſuppoſe here at 29½ Inches.

L M a Wire on which the Plate *E F* ſlips up and down, parallel to the Cane of the *Thermometer C D*.

K, any Point at which the Spirit ſtands at the time of Obſervation; ſuppoſe at 38 on the *Spirit-Thermometer*; ſlide the Plate *E F* till the Hand *G* at 38 on the *Air-Thermometer*, and if the Liquor therein ſtand at 38 likewiſe, then is the Preſſure of the Air the ſame as at the time of Graduation, *viz.* 29, 5; but if it ſtand higher, as at 30 at *L*, then is the Preſſure of the Air greater, and the Diviſions on the ſliding Plate againſt the Liquor, ſhew the preſent Height of the *Mercury* to be 29, 7 Inches.

This may ſuffice as to the Manner of uſing it.

Capt. *Halley* had one of theſe Glaſſes with him in his laſt *Southern* Voyage; and he ſaith, it never failed to give him early Notice of a Storm, and of all the bad Weather they had.

The ſame Ingenious Gentleman, in *Philoſ. Tranſact. N.* 187, hath an excellent Diſcourſe upon the Reaſons of the Riſe and Fall of the Mercury in Fair and Foul Weather: the Subſtance of which is as follows.

1. He premiſes the commonly obſerved *Phænomena* of the Mercurial Baroſcope; which are,

1. That in Calm Weather, when the Air is enclined to Rain, the Mercury is commonly low.

2. That 'tis generally high in good, ſerene, ſettled, fair Weather.

3. That it ſinks loweſt of all on very great Winds, though they are not accompanied with Rain; with Relation to the Point of the Compaſs the Wind blows upon.

4. That, *cæteris paribus*, the greateſt Height of the Mercury is found, when an *Eaſterly* or *North-Eaſterly* Wind blows.

5. That in Calm Froſty Weather the Mercury generally is high.

6. That after very great Storms of Wind, when the Mercury hath been low, it uſually riſes again very faſt.

7. That more *Northerly* Places have a greater Alteration of the Riſe and Fall of the Mercury than the more *Southerly*.

8. That within the Tropicks, and near them, there is little or no Variation of the Mercury's Height in all Weathers.

As to which two laſt *Phænomena*'s, Mr. *Patrick*, the Famous Barometer-maker, tells me, That he hath certain Accounts, that the greateſt Variation of the Baroſcope is in the Latitude of 45°. *N.* or *S.* and that the Riſe and Fall gradually decreaſes towards the Equator and Poles, ſo as in either of thoſe Regions ſcarcely to vary at all.

The Theory that Mr. *Halley* advances to ſolve all which *Phænomena*, is this:

1. He ſuppoſes the principal Cauſe of the riſe and fall of the Mercury, is from the variable Winds, which are found in the *Temperate Zones*, and whoſe great Inconſtancy here in *England* is moſt notorious.

2. A ſecond Cauſe is the uncertain Exhalation and Precipitation of Vapours lodging in the Air, whereby it comes to be at one time much more crowded than at another, and conſequently heavier; but thoſe latter, in a great meaſnre, depend upon the former. Now from theſe Principles, he explicates the ſeveral *Phænomena* of the *Barometer*.

1. *Why in Calm Weather, the Air being inclined to Rain, the* Mercury *is commonly low?*

That the *Mercury*'s being low is an Indication of Rain, becauſe the *Air* being light, the Vapours are no longer ſupported thereby, as being become ſpecifically heavier than the *Medium* wherein they floated; ſo that they deſcend towards the Earth, and in their fall meeting with other Aqueous Particles, they incorporate together, and form little drops of Rain; but the *Mercury*'s being at one time lower than at another, is the Effect of two contrary Winds blowing from the Place where the *Barometer* ſtands; whereby the *Air* of that Place is carried both ways from it, and conſequently, the incumbent Cylinder of *Air* is diminiſhed, and accordingly the *Mercury* ſinks; as for Inſtance, if in the *German Ocean* it ſhould blow a Gale of *Weſterly* Wind, and at the ſame time an *Eaſterly* Wind in the *Iriſh* Sea,; or if in *France* it ſhould blow a *Southerly* Wind, and in *Scotland* a *Northern*, it muſt he granted me, that that part of the *Atmoſphere*, impendant over *England*, would thereby be exhauſted and attenuated, and the *Mercury* would ſubſide, and the Vapours which before floated in thoſe parts of the *Air*, of equal Gravity with themſelves, would ſink to the Earth.

2. *Why in ſerene, good, ſettled Weather, the* Mercury *is generally high?* That the greater height of th *Barometer*, is occaſioned by two contrary Winds blowing *towards* the place of Obſervation, whereby the *Air* of other Places is brought thither, and accumulated; ſo that the Incumbent Cylinder of *Air* being encreaſed both in Height and Weight, the *Mercury* preſſed thereby, muſt needs riſe and ſtand high, as long as the Winds continue ſo to blow; and then the *Air* being ſpecifically heavier, the Vapours are better kept ſuſpended, ſo that they have no Inclination to precipitate and fall down in Drops, which is the reaſon of the ſerene good Weather which attends the greater heights of the *Mercury*.

3. *Why, upon very great Winds or Storms, though accompanied with no Rain, the* Mercury *ſinks loweſt of all, with relation to the Point of the Compaſs upon which the Wind blows?*

This is cauſed by the very rapid Motion of the *Air* in theſe Storms; for the Tract or Region of the Earth's Surface wherein theſe Winds rage, not extending all round the Globe; that Stagnant *Air*, which is left behind, as likewiſe on the ſides, cannot come in ſo faſt as to ſupply the Evacuation made by ſo ſwift a Current; ſo that the *Air* muſt neceſſarily be attenuated when and where the ſaid Winds continue to blow, and that more or leſs according to their Violence. Add to which, that the Horizontal Motion of the *Air*, being ſo quick as it is, may in all probability take off ſome part of the perpendicular Preſſure thereof; and the great Agitation of its Particles, is the reaſon why the Vapours are diſſipated, and do not condenſe into Drops, ſo as to form Rain, otherwiſe the natural Conſquence of the *Air*'s Rarefaction.

4. *Why*, cæteris paribus, *the* Mercury *ſtands higheſt upon an Eaſterly or North-Eaſterly Wind?*

This happens becauſe that in the *Atlantick Ocean*, on this ſide 35th *degree* of *North-Latitude*, the *Weſterly* and *South-weſterly* Winds blow almoſt always *Trade*; ſo that whenever here the Wind comes up at *Eaſt* and *North-Eaſt*, 'tis ſure to be check'd

check'd by a contrary Gale, as ſoon as it reaches the *Ocean*; wherefore, according to what is made out in the Second Remark, the *Air* muſt needs be heaped over this *Iſland*; and conſequently the *Mercury* muſt ſtand high, as often as theſe Winds blow. This holds true in this Country, but is not a general Rule for others, where the Winds are under different Circumſtances; and he himſelf hath ſometimes ſeen the *Mercury* here as low as 29 Inches upon an *Eaſterly* Wind, but then it blew exceeding hard, and ſo comes to be accounted for by what was obſerved upon the third Remark.

5. *Why in calm froſty Weather the* Mercury *generally ſtands high?*

The Cauſe thereof is, That it ſeldom freezes but when the Winds come out of the *Northern* and *North-Eaſtern* Quarters; or at leaſt, unleſs thoſe Winds blow at no great diſtance off, for the *Northern* Parts of *Germany*, *Denmark*, *Sweden*, *Norway*, and all that tract from whence *North-Eaſtern* Winds come, are ſubject to almoſt continual Froſt all the Winter; and thereby the lower *Air* is very much condenſed, and in that ſtate is brought hitherwards by thoſe Winds, and being accumulated by the Oppoſition of the *Weſterly* Wind blowing in the Ocean, the *Mercury* muſt needs be preſt to a more than ordinary height, and as a concurring cauſe, the ſhrinking of the lower Parts of the *Air* into leſſer room by cold, muſt needs cauſe a deſcent of the upper Parts of the *Atmoſphere*, to reduce the Cavity made by this Contraction to an *Æquilibrium*.

6. *Why after very great Storms of Wind, when the* Mercury *has been very low, it generally riſes again very faſt.*

This, he tells you, he has frequently obſerved, and once found it riſen an Inch and a half in leſs than ſix Hours, after a long continued Storm of *South-Weſt* Wind. This ſeems to be occaſioned by the ſudden acceſſion of new *Air* to ſupply the great Evacuation which ſuch continued Storms make thereof in thoſe places where they happen, and by the Recoil of the *Air*, after the Force ceaſes that impelled it; and the reaſon why the *Mercury* riſes ſo faſt, is, becauſe the *Air* being very much rarified beyond its mean Denſity, the neighbouring *Air* runs in the more ſwiftly to bring it to an *Æquilibrium*; as we ſee Water runs the faſter for having great Declivity.

7. *Why in more* Northerly *Places, the Variations of the* Barometer *are greater than in more* Southerly?

The Truth of the matter of fact is proved from Obſervation made at *Clermont* and *Paris*, compared with others made at *Stockholm*, as may be ſeen in the *Appendix* to Mr. *Paſcal*'s Book, *De l' Equilibre des Liquors*. The Reaſon ſeems to be, that the more *Northerly* Parts have uſually greater Storms of Wind then the more *Southerly*, whereby the *Mercury* ſhould ſink lower in that Extream; and then the *Northerly* Winds bring the condenſed and ponderous *Air* from the Neighbourhood of the Pole, and that again being check'd by a *Southerly* Wind, at no great diſtance, and ſo heaped, muſt of neceſſity make the *Mercury* in ſuch caſe ſtand higher on the other Extream.

8. *Why near the* Equinoctial, *as at* Barbadoes *and St.* Helena, *there is very little or no Variation of the Height of the* Barometer?

This Remark, above all others, confirms the *Hypotheſis* of the variable Winds, being the cauſe of theſe Variations of the Height of the *Mercury*, for in the places above-named, there is always an eaſy Gale of Wind blowing nearly upon the ſame Point, *viz. E. N. E.* at *Barbadoes*, and *E. S. E.* at St. *Helena*, ſo that there being no contrary Current of the *Air*, to exhauſt or accumulate it, the *Atmoſphere* continues much in the ſame ſtate: However, upon *Hurricanes*, the moſt violent of Storms, the *Mercury* has been obſerved very low but this is but for once in 2 or 3 Years, and it ſoon recovers its ſettled ſtate of about 29½ Inches: And there is no doubt but the ſame thing is in the *Eaſt* Coaſt of *Africa*, and in *India*, where the *Monſoons* or Winds are Trade for half the Year one way, and half the Year another; only 'tis probable, that there may ſomething worth noting happen, about the time of the change or ſhifting of the Winds; which might be obtained if any Body had the Curioſity to keep the *Barometer* at our *Factories* in *India*.

Snowden-Hill in *North-Wales* was meaſured by Mr. *Caſwell* with Mr. *Adams*'s Inſtruments, and found to be 1240 Yards high.

Mr. *Halley* found by 3 exact tryals the *Mercury* in the *Baroſcope* deſcended at its top 3 Inches, 8 Tenths, and ſomething more, and perhaps 4 Inches may be near enough Truth; if ſo, then divide 1240 by 4, the Quotient is 310 Yards; ſo that any fall of the *Mercury* 1 Inch, argues an Aſcent of juſt 310 Yards in height; but according to Mr. *Halley*'s Account of 3, 8 Inches, he makes 30 Yards height to anſwer to one tenth of an Inch fall; we therefore allow juſt 30 Yards (for Mr. *Halley* thought the fall of the *Mercury* more than $3,\frac{8}{10}$ Inches;) if ſo, then if Dr. *Hook*'s new *Baroſcope* will bear Diviſions of one tenth of an Inch into ten more ſenſible Parts (as I believe it will) each of thoſe ten Parts will anſwer to 3 Yards, and ſo by its help one may take the Level of Places very well, to convey Water, *&c.*

When the *Mercury* is at 30 Inches in the *Baroſcope* (whence may be computed the middle height) the *Atmoſphere* is 5 Miles and ½ high (that is, ſuppoſing the *Air* to be of the ſame Denſity all along; tho' in all probability it is not, but grows more rare in proportion to its Height, which will much encreaſe the Height of the *Atmoſphere.*)

The Ingenious Mr. *Derham*, Rector of *Upminſter*, in *Philoſ. Tranſ. N.* 236, gives an Account of ſome Experiments he made at the Top and Bottom of the Monument; where he found, that at the Height of 32 Feet, the *Mercury* fell $\frac{1}{10}$ of an Inch; and at about 164 Feet, $\frac{2}{12}$ of an Inch, *&c.*

He there alſo deſcribes a *Portable Barometer*, which he conceives might be of great uſe in ſuch Experiments.

In *Philoſ. Tranſ.* N°. 237, he gives a Contrivance to meaſure the Height of the Mercury in the *Barometer*, by a Circle on one of the Weather Plates, to the Hundredth Part of an Inch exactly.

In *Philoſ. Tranſ.* N°. 240, Mr. *Stephen Gray* ſhews alſo a Method of meaſuring the Height of the Mercury in the *Barometer*, by adapting a *double Microſcope* furniſh'd with a *Micrometer* to the *Baroſcope*, by Means of which, the *Mercury*'s Variations may be obſerved to the Thouſandth Part of an Inch.

The following Rules to judge of the Weather by the *Barometer*, I had from Mr. *John Patrick* in *Ship-Court* in the *Old Baily*, the *Torricellian Operator*; and they are the Reſult of his own long Experience and Obſervation.

Rules

Rules and Obſervations on the various Riſing *and* Falling *of the* Mercury, *to foreknow the* Weather *by the* Barometer.

1. It hath been obſerved, That the Motion of the Mercury doth not exceed 3 Inches in its riſing or falling, in the *Barometer* of the Common Form.

2. That its leaſt Alterations are to be minded, in order to the right finding the Weather by it.

3. The riſing of the Mercury preſages, in general, fair Weather; and its falling Foul, as Rain, Snow, high Winds, and Storms.

4. In very hot Weather the falling of the Mercury foreſhews Thunder.

5. In Winter the Riſing preſages Froſt; and in froſty Weather, if the Mercury falls three or four Diviſions, there will certainly follow a Thaw; but in a *continued Froſt*, if the Mercury riſes, it will certainly Snow.

6. When foul Weather happens *ſoon* after the falling of the Mercury, expect but little of it; and judge the ſame when the Weather proves fair *ſhortly* after the Mercury has riſen.

7. In foul Weather, when the Mercury riſes much and high, and ſo continues for two or three Days before the foul Weather is over, then expect a *continuance* of fair Weather to follow.

8. In fair Weather, when the Mercury falls much and low, and thus continues for two or three Days before the Rain comes, then expect a great deal of Wet, and probably high Winds.

9. The unſettled Motion of the Mercury denotes uncertain and changeable Weather.

10. You are not ſo ſtrictly to mind the Words that are engraven on the Plates, tho' for the moſt part it will agree with them, as the Mercury's riſing and falling; for if it ſtands at much Rain, and then riſes up to changeable, it preſages fair Weather; altho' not to continue ſo long as it would have done if the Mercury were higher; and ſo on the contrary.

And I think my ſelf obliged in Juſtice to tell the World, That I have never ſeen better Weather-Glaſſes of all kinds made any where, than by Mr. *Patrick*; who doth really deſerve all poſſible Encouragement for the many Experiments he hath made in order to improve the *Barometer*, and which he is always very willing to ſhew to all Ingenious and Curious Perſons. And tho' I cannot be of Dr. *Leigh*'s Opinion, who in *P.* 16. and 180 of his *Natural Hiſtory of* Lancaſhire, *&c.* ſaith, Mr. *Patrick*'s Experiments demonſtrate, that the Suſpenſion of the Mercury in the Tube is not cauſed by the Weight of the Incumbent Atmoſphere, ſince on a very careful Examination of all Mr. *Patrick*'s Experiments, I find them all accountable by the Doctrine of the Gravitation of Fluids; yet do I really believe the making and conſidering thoſe Experiments, hath given Mr. *Patrick* many uſeful Hints for the Improvement of this Inſtrument, and will continue to do ſo daily. His *Pendent Barometer* is very curious and nice, the Scale being graduated for it by an Air-Pump; it hath no Ciſtern of Stagnant Mercury at the Bottom of the Tube, as in the common Torricellian Experiment; and the Mercury riſes and falls about 12 Inches inſtead of 3, as in the ordinary Barometer: And in a *Diagonal* one (which he very handſomly fits about the Frame of a large Looking-Glaſs, with a Thermometer alſo by it the Mercury riſes and falls near 30 Inches; and) conſequently, the changes of the Weather will be much ſooner perceptable in theſe Inſtruments, than in the *Barometers* of the common Form.

BARON *and Feme*; the Term in Heraldry, when the Coats of Arms of a Man and his Wife are born *per* Pale in the ſame Eſcutcheon, the Man's always on the *Dexter* Side, and the Woman's on the *Siniſter* or Left. But here the Wife is not an Heireſs, for then her Coat muſt be born by the Husband on an Ineſcutcheon or Eſcutcheon of Pretence.

At Common Law theſe words ſignify only a Man and his Wife.

BAROSCOPE, the ſame with *Barometer*: Which ſee.

BARR *of the Port*: See *Shackles*.

BARR, in Heraldry, is a ſmaller *Feſſe*, containing but the fifth Part of the *Field*, whereas the *Feſſe* contains the *Third*.

BARR (in Law) is when the Defendant in any Action pleads a Plea which is a ſufficient Anſwer, and deſtroys the Action of the Plaintiff for ever.

BARR FEE, is a Fee of twenty Pence, which every Priſoner acquitted of Felony pays to the Sheriff or Goaler.

BARREL, is a pretty large Cavity behind the *Tympanum* of the Ear; it is about three or four Lines deep, and five or ſix wide. It is Lined with a fine Membrane, on which there are ſeveral Veins and Arteries. In this Cavity there are four ſmall ſolid Bones, not covered with a *Perioſteum* as the reſt of the Bones of the Body are.

BARREL: See in *Fuſey*.

BARRELS *of Earth*, uſed in Fortification, are as it were half *Hogſheads*, which being fill'd with *Earth*, ſerve for Parapets; as alſo to break the *Galleries* made in the Ditch, and to roll into the *Breaches*.

BARRETOR (in Law) ſignifies a common Wrangler, ſtirrer up, or maintainer of Suits and Quarrels, either in Courts or in Country.

BARRETRY, a Word uſed in Policies of Inſurance for Ships, and ſignifies Diſſentions and Quarrels among the Officers and Seamen.

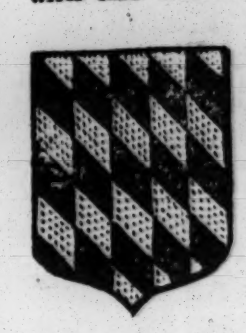
BARRIERS, in Fortification are great Stakes, about four or five Foot high, placed at the diſtance of eight or ten Foot one from another, with their Tranſoms or overthwart Rafters, to ſtop either Horſe or Foot that would enter or ruſh in with Violence. Theſe *Barriers* are commonly ſet up in the void Space between the Cittadel and the Town in Half-moons, *&c.*

BARRICADO, a Warlike Defence of empty Barrels and ſuch-like Veſſels fill'd with Earth, Carts, Trees cut down, againſt an Enemy's Shot or Aſſault; but generally are Trees cut with ſix Faces, which are croſs'd with Battoons as long as a Half-Pike, bound about with Iron at the Feet. Theſe are uſually ſet up in Paſſages or Breaches to keep back as well the Horſe as Foot.

BARRISTERS, in Common Law, are of two ſorts; 1. The Outward or *Utter Barriſters*, who by their long Study in, and Knowledge of the Law (which muſt be for a Term of ſeven Years at leaſt) are called to publick Practice, and undertake the Defence of their Clients Cauſes: Theſe always plead without the Barr. 2. The *Inner Barriſters*, who becauſe they are either *Attorney*, *Sollicitor*, *Serjeant*, or Council to the King, are allowed, out of Reſpect, the Privilege of Pleading within the Barr. But at the Rolls and ſome other inferiour Courts, all *Barriſters* are admitted within the Barr. *Blunt*.

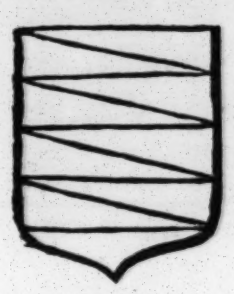
BARRULET, in Heraldry, is the Half of the *Closet*, and the Quarter of the *Barr*.

BARRY, when an Escutcheon is divided *Barr-ways* into an *even Number* of Partitions; 'tis to be expressed in Blazon by the Word *Barry*, and the number of Pieces is to be specified. But if the Divisions be odd, then the Field must be first nam'd, and the number of Bars expres's'd. See *Paly*.



BARRY-BENDY, is when an Esutcheon is divided evenly, both Barr and Bend-ways; as thus.

Barry, Bendy, Argent, and *Sable.*



BARRY-PILY, is when a Coat is thus divided; and 'tis to be Blazoned, *Barry-Pily*, of eight Pieces.
Vid. Guillim, P. 279.

BARTER, a Word used for the Exchange of Wares for Wares.

BARYPHONY, is a Difficulty in Speaking.

BASE, in Fortification, is the exterior Side of the Polygon, *viz.* the Imaginary Line which is drawn from the *Flank'd Angle* of a *Bastion* to that which is opposite thereto.

BASE or *Basis*, in Architecture, is the Foot of a Pillar that sustaineth it, or that Part which is under the Body, and lies upon the Pedestal or Zocle when there is any: Therefore 'tis not used for the lowest Part of a Column, but for all the several Ornaments or Mouldings which reach from *Apophyges* or the rising of the Shafts of Pillars to the *Plinth*..

BASE FEE, or *Base Estate*, is a holding at the Will of the Lord.

BASE COURT (in Law) is any Court that is not of Record.

BASE *of a Triangle*, any one Side of a *Triangle* may be called the *Base*, but usually, and most properly that Side which lies parallel to the *Horizon* is taken for the *Base*. 'Tis also the same as to any other Right lin'd Figure.

BASE *of any Solid Figure*, is its lowermost Side, or that on which it stands.

BASE, *of a Conick Section* (if it have one) is a Right Line in the *Hyperbola* and *Parabola*, arising from the common Intersection of the *Secant Plane* and the *Base* of the *Cone*.

BASE, the least sort of Ordnance, the Diameter of whose Bore is $1\frac{1}{4}$ Inch, Weight 200 Pound, Length 4 Foot, Load 50 Pound, Shot $\frac{1}{2}$ Pound Weight, and $1\frac{1}{8}$ Inch Diameter.

BASE RING, of a Cannon, is the great Ring next behind the Touch-hole.

BASE POINT, in an Escutcheon: See *Escutcheon*.

BASE TENURE, or holding by Villanage or other customary Service, as distinguish'd from the Higher Tenure, *in Capite*, or by Military Service.

BASILARE OS, the same with *Sphænoides*.

BASILICA, is the inner Vein of the Arm, called *Hepatica*, the Liver Vein, it being the inferior Branch of the *Axillaris*, divided into 3 Branches under the Tendon of the *Musculus Pectoralis*.

BASILICA, in the Ancient Architecture, was a great Hall which had two Ranges of Pillars, and two Isles and Wings with Galleries over them. These great Halls were at first made for the Palaces of Princes, afterwards they were turned into Courts of Justice, and at last into Churches.

BASILICK CONSTITUTIONS, were an Abridgment and Reform of the Laws of *Justinian*, made in the Reigns of *Basilius* and *Leo* (whence they had their Name) and were in force in the Eastern Empire till its Dissolution.

BASILICUS, *Cor. Leonis*, a fixed Star of the first Magnitude in the Constellation *Leo*; it *Longitude* is 145°. 21'. *Latitude* 00, 26'. Right Ascension 147 *Deg.* 47. *Min.*

BASIOGLOSSUM (see *Hypsiloglossum*) is a Pair of Muscles that depress the Tongue: It arises Fleshy from the Basis of the *Os Hyoides*.

BASIS, in Anatomy is the upper and broader Part of the Heart, opposite to the *Mucro* or Point: Also the Foundation of the Bone *Hyoides*.

BASKETS *of Earth*: See *Corbeills*.

BASIS, in Musick, is the lowest of all the Parts thereof, which serves as a Foundation to the others.

BAS-RELIEF: See *Relief*.

BASS ENCEINT, or *Bas's Enclosure*, the same with the *Fausse Bray* in Fortification, which see.

BASTON, in Fortification, is now what was anciently called a *Bulwark*: It consists of two *Faces*, as many *Flanks*, formerly a *Gorge*. It is usually made at the Angles or Forts, of a large heap of Earth, sometimes lined with Stone, but usually faced with Sods. The Lines terminating it are *two Faces*, *two Flanks*, and *two Demigorges*. The Union of the two Faces makes the outmost Angle, called the *Angle of the Bastion*. The Union of the two Faces to the two Flanks, makes the Side Angles called the *Shoulders* or *Epaules*; and the Union of the two other Ends of the Flanks to the two Curtains, forms the Angles of the Flanks.

BASTIONS *Solid*, are those that have their Earth equal to the Height of the *Rampart*, without any void Space toward the Centre.

BASTIONS *Void* or *Hollow*, are those that have a *Rampart* and *Parapet* ranging only round about their Flanks and Faces, so that a void Space is left toward the Centre, and the Ground is there so low, that if the *Rampart* be taken, no Retrenchment can be made in the Centre, but what will lie under the Fire of the Besieged.

FLAT BASTION, is that which is built on a Right Line.

CUT BASTION, is that which makes a Reentring Angle at the Point; and is sometimes called,

BASTION *with a Tenaille*, whose Point is cut off, and makes an Angle inwards, and two Points outwards: This is done when Water, *&c.* hinders carrying the Bastion to its full extent, or when it should be too sharp.

BASTION *Composed*, is when the two Sides of the interior Polygon are very unequal, which makes the *Gorges* also unequal.

BASTION *Deformed*, is that which wants one of its *Demi-Gorges*, because one Side of the Interior Polygon is so very short.

BASTION *Demi*, hath but one Face and Flank, and is uſually before a Horn-work or Crown-work. This is alſo called an *Epaulment*.

BASTION *Double*, is that which on the Plain of the great Baſtion hath another Baſtion built higher, leaving 12 or 18 Feet between the Parapet of the lower and the Foot of the higher.

BASTION *Flat*, if the Diſtance between the Angles of the Interior Polygon be double the uſual length, then a Baſtion is made in the middle before the Curtain; but it generally hath this diſadvantage, that unleſs there be an extraordinary Breadth allowed to the Moat, the turning Angle of the Counterſcarp runs back too far into the Ditch, and hinders the Sight and Defence of the 2 oppoſite Flanks.

BASTION *Regular*, is that which hath its due proportion of Faces, Flanks and Gorges.

BASTON, a *French* word in Architecture, the ſame with the *Tore*; in Heraldry the ſame with *Abutton*: Which ſee.

BATHMIS, is a Cavity in the Bone of the Arm or Shoulder, on each ſide one; whereinto, when the whole Hand is ſtretched forth and bended, the Proceſs of the undermoſt and leſſer of the long Bones of the Cubit enters. This is alſo called *Trochlea*.

BATRACHUS, is a Tumour under the Tongue, which makes Men croak like a Toad, when they ſpeak. *Blanchard*.

BATTAILE, is an ancient Trial in our Law, which the Defendant in Appeal of Murder, Robbery, or Felony, might chuſe, that is to fight with the Appellant, for proof whether guilty or not; grown obſolete and wholly diſuſed.

BATTALION, is a Body of Infantry of about 6, 7, or 800 Men, of which uſually $\frac{1}{3}$ are Pikes in the middle, and the other $\frac{2}{3}$ are Muskets poſted on the Wings; But the Number of Men is by no means certain. *Battalions* are uſually drawn up ſix deep, or with ſix Men in File, or one before another; thoſe in length or ſide by ſide being called *Ranks*. Some Regiments conſiſts of but one Battallion; but when they are Numerous they are divided into ſeveral Battalions according to their Strength; and ſo that every one may be about 7 or 800.

The Battalions of *French* Guards have commonly but 5 Companies, becauſe each Company conſiſts of 150 Men. But of other *French* Regiments there go 16 Companies to a Battalion, becauſe they are but 50 Men in a Company. Of the *Swiſs* Guards 4 Companies make a Battalion, becauſe each Company hath 180 Men.

When a Battalion is to be formed out of the Companies of ſeveral Regiments in a Garriſon, *&c.* then thoſe of the Eldeſt Regiments poſt themſelves on the Right; thoſe of the Second on the Left, and ſo all other ſucceſſively on the Right and Left, till the youngeſt fall into the Centre. The Subalteran Officers take their Poſt before their Companies, the Captains on the Right and Left according to their Degree.

Battalions are divided into 3 Diviſions, the Muſqueteers in the Right and Left, and the Pikes in the middle. In Marching, when there is not Room for ſo great a Front, they break into Subdiviſions as the Way and Ground will allow.

The great Art of drawing up a Battalion is to diſpoſe it ſo as that it may beſt reſiſt a Party of Horſe in an open Field, and that it may with advantage engage with either Horſe or Foot.

BATTERY (in Law) is an Act that tends to the breach of the Peace of the Realm.

BATTERY, in Fortification, is a place raiſed on purpoſe where Cannon are planted, from thence to play upon the Enemy; the Platform on which they are fix'd being made of Planks that ſupport the Wheels of Carriages, ſo as to hinder the Weight of the Cannon from ſinking them into the Ground, and incline ſomewhat towards the *Parapet* to check the Recoiling of the Pieces.

BATTERIES *of a Camp*, are Places to plant great Guns on, and are uſually ſurrounded with a *Trench* and *Palliſadoes* at the Bottom, as alſo with a *Parapet* on the top, having as many Holes as there are *Pieces of Artillery*; and with two *Redouts* on the Wings, or certain Places of Arms capable of covering the Troops that are appointed for their Defence.

In all *Batteries* the open Spaces left to put the Muzzles of the great Guns out, are called *Embrazures*, and the Diſtances between the *Embrazures Merlons*. The Guns are generally about 12 Foot diſtant one from another, that the Parapet may be ſtrong, and the Gunners have room to work.

BATTERY *Sunk or Buried*, is when its Platform is ſunk or let down into the Ground ſo that there muſt be Trenches cut in the Earth againſt the Muzzles of the Guns, for them to fire out at, and to ſerve for *Embraſures*. This ſort of Battery which the *French* call *En Terre*, and *Ruinate*, is generally uſed on the firſt making of Approaches, to beat down the Parapet of any Place.

BATTERIES *Croſs*, are two Batteries which play athwart one another upon the ſame thing, forming there an Angle, and beating with more Violence and Deſtruction, becauſe what one Bullet ſhakes, the other beats down.

BATTERY *d' Enfilade*, is one which ſcoures or ſweeps the whole Length of a Strait Line.

BATTERY *en Echarp*, is that which plays obliquely.

BATTERY *d' Revers*, or *Murdering Battery*, is one that bears upon the Back of any Place.

BATTERY *Joint*, or *par Camerade*, is when ſeveral Guns play at the ſame time upon one Place.

BATTEURS *d' Eſtrade*, or Scours, are Horſemen ſent out before, and on the Wings of an Army, a Mile, or two, or three, to make Diſcoveries; which they give an account to the General.

BATTLEMENTS, are the Tops of the Walls of Buildings made in the Form of *Embraſures* and *Merlons*, as in Fortified Places.

BATTOLOGY, is a vain and fooliſh Repetion of the ſame Words over and over again in any Diſcourſe; like the trifling Poet *Battus* mentioned by *Ovid*, who introduces him ſaying, *Montibus (inquit) erant & erant ſub montibus illis.*

BATTOONE, a Term in Heraldry, ſignifying a 4th Part of a *Bend ſiniſter*: It is the uſual Mark of Illegitimacy, and is always born couped, or cut off after this manner.

It alſo ſignifies the Earl Marſhall's Staff.

BAY. is a Term uſed by Geographers and Seafaring Men, for an Arm of the Sea coming up into the Land, and terminated in a Nook. It is a kind of Leſſer Gulph, bigger than a Creek, and

is

larger in the Middle within, than 'tis at the Entrance into it; which Entrance is called the *Mouth of the Bay*.

BEACONS, are Fires maintained on the Sea-Coasts, to prevent Ship-wracks, and to give notice of Invasions, *&c.*

BEADLE (in Law) signifies a Messenger or an Apparitor of a Court, that cites Men to the Court to appear and answer.

BEAK, or *Beak-head*, of a Ship, is that Part of it which is fastened to the *Stem*, and is supported by a *Knee*; and is the becoming Part or Grace of a Ship.

BEAM COMPASSES, is an Instrument made in Wood or Brass, with sliding Sockets to carry several shifting Points, in order to draw Circles with very long *Radii*: They are of good use in large Projections for drawing the Furniture on Wall Dyals, *&c.*

BEAMS *of a Ship*, are the great main cross Timbers which hold the Sides of a Ship from falling together, and which also support the *Decks* and *Orlops*. The *Main Beam* is next the Main Mast, and from it they are reckoned by First, Second, or Third Beam. The great Beam of all is called the *Midship Beam*.

BEAR, a Word used by Seamen in several Senses. They say a Ship *Bears Ordnance*, when she carries any great Guns: She *Bears a good Sail*, they say, when a Ship having her Sails abroad in a Gale of Wind, sails upright in the Water. When a Ship sails toward the Shore, she is said to *bear in with the Land*: When a Ship that was to Windward comes under another Ship's Stern, and so gives her the Wind, she is said to *Bear under her Lee*. If a Ship sails into an Harbour with the Wind large, or before the Wind, she is then said to *Bear in with the Harbour*; and when a Ship keeps off from any Land, she is to *Bear off from it*. When a Seaman would express how any Cape or Place lieth from another, he saith it *beareth off so*, or *so*. In Conding also, they say, *Bear up the Helm*, *i. e.* let the Ship go more large before the Wind; and *Bear up Round*, that is, let the Ship go between her two *Sheats*, directly before the Wind. Lastly, There is another Sense of this Word in reference to the *Burthen* of a Ship (which Word is derived from hence) for they say a Ship *Bears*, when having too slender or *Lean* a Quarter she will sink too deep into the Water, with an overlight Freight, and thereby can carry but a small Quantity of Goods.

BEAR, is also used in Heraldry: He that hath a Coat of Arms is said to *Bear* in it the several Charges or Ordinaries that are in his Escutcheon; as if there are 3 Lions Rampant in it, he is said to *Bear 3 Lions Rampant*.

BEAR; there are two Constellations of the Stars called by this Name, the *Greater* and *Lesser Bear*, or *Ursa Major* and *Minor*. The *Pole Star* is said to be in the Tail of the *Lesser*, because that Star is never above 2 Degrees distant from the *N. Pole* of the World.

BEARING, in Navigation, signifies the Point of the Compass that one Place *bears* or stands off from another.

BEASANTS: See *Balls*.

BEATS, in a Watch or Clock, are the Strokes made by the *Fangs* or *Pallets* of the Spindle of the Ballance; or of the *Pads* in a Royal Pendulum.

To find the *Beats* of the Ballance in all Watches going, or in one turn of any *Wheel*.

Having first found out the number of Turns which the *Crown-wheel* hath in one turn of the *Wheel* you seek for (by the Direction given under the Word *Turn*) and then those turns of the *Crown-wheel* multiply'd by its Notches, will give you half the number of *Beats* in that one turn of the *Wheel*: because the *Ballance* or Swing hath two Strokes to every Tooth of the *Crown-wheel*: For each of the two *Pallets* hath its Blow against each Tooth of the *Crown-wheel*: Wherefore it is, that a Pendulum that strikes Seconds, hath its *Crown-wheel* only 30 Teeth. To explain what hath been said, take this Example (being the Numbers of a Sixteen Hour Watch) wherein the Pinion of Report is 4, the *Dial-wheel* 32, the *Great-wheel* 55, the Pinion of the *Second-wheel* 5, *&c.* The Number of Notches in the *Crown-wheel* 17, being multiplied into 6336 (the Product arising from the continual Multiplication of the Quotients 8, 11, 9, 8) gives 107712 for half the number of *Beats* in one turn of the *Dial-wheel*; for 8 times 17 is 136, which is half the number of *Beats* in one turn of the *Centrate-wheel* 40; and 9 times 136 is 1224, the half *Beats* in one turn of the *Second-wheel*; and 11 times 1224 is 13464, the half *Beats* in one turn of the *Great-wheel* 55; and 8 times 13464 makes 107712, before found. Which, if multiplied by the two Pallets, that is, double it, it gives 215424, which is the number of *Beats* in one turn of the *Dial-wheel*, or 12 Hours. If you would know how many *Beats* this Watch hath in an Hour, 'tis but dividing the *Beats* of 12 Hours into 12 Parts, and it gives 17952, the Train of the Watch, or *Beats* in an Hour. If this be divided into 60 Parts, it gives 299, and a little more, for the *Beats* in a Minute. And so you may proceed to Seconds and Thirds if you will.

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4) 32 (8
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5) 55 (11.
5) 45 (9.
5) 40 (8.
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  17.
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By the Beats *and Turns of the* Fusy, *the Hours that any Watch will go, may be found thus*;

As the *Beats* of the Ballance in one Hour: Are to the *Beats* in one Turn of the *Fusy* :: So is the number of the Turns of the *Fusy*: To the continuance of the Watches going:

Thus, 20196 : 26928 :: 12 : 16.

To find the Beats *of the Ballance in an Hour*; the Proportion is,

As the Hours of the Watches going: To the number of Turns of the *Fusy* :: So are the *Beats* in one Turn of the *Fusy*: To the *Beats* in an Hour:

Thus, 16 : 12 :: 26928 : 20196.

To find the Beats *of a Ballance in one Turn of the* Fusy; you have this Proportion;

As the number of the Turns of the *Fusy*: Is to the continuance of the Watches going in Hours :: So are the *Beats* in one Hour: To the *Beats* of the Ballance in one Turn of the *Fusy*:

That is, 12 : 16 :: 20196 : 26928.

BECHICKS, are Medicines good against a Cough. They are called also *Bechical Medicines*. *Blanchard*.

BED, of the Carriage of a Great Gun, is that thick Plank which lies immediately under the Piece, being as it were the Body of the Carriage.

BELANDRE, is a ſort of little Veſſel with Sails and Tackle like an Hoy, but Broader and Flatter: The covering of the Deck is raiſed up half a Foot higher then the Gunwale, Gunnel, or *Plat-board*, as the *French* call it, and between the Gunnel and the Deck there is a Paſſage left free, for the Seamen to walk upon: They are chiefly uſed to carry Merchant's Goods, and are ſeldom above 24 Tun.

Some will have them called *Fy-landers*, becauſe they ſeldom go out of ſight but Sail *by the Land*.

BELAY, aboard a Ship, ſignifies the ſame as *Eaſtern*: Thus they ſay *belay the Sheat*, or *Tack*, that is, *faſten* it to the *Kennel*, &c.

BELENOIDES, is the proceſs or ſhooting forth of the Bone called *Aliformis*, which is fixed in the Baſis of the Skull. *Blanchard.*

BELLANDER: See *Belandre.*

BEND; at Sea they ſay *Bend the Cable*, when 'tis to be ſeized and made faſt to the Ring of the Anchor; and to *Bend two Cables*, is all one with them as to tye them together. To *unbend the Cable* is to looſen it from the Ring of the Anchor, which is done when a Ship deſigns to be long at Sea. To *bend a Main-Saile*, is to make it faſt to the Yard in its proper place.

BEND, one of the eight Honourable Ordinaries in Heraldry, containing a 5th when uncharged, but when charged a 3d part of the Eſcutcheon. It's made by 2 Lines drawn thwartways from the *Dexter Chief* to the *Siniſter Baſe* Point; thus. He beareth *Or*, a *Bend Sable.*

A *Bend* is ſubdivided into a

BENLET, which is the 6th part of the *Shield*; a *Garter*, which is the Moiety of a *Bend*; a *Coſt*, which is the 4th part of a *Bend*; and a *Ribbon*, which is the Moiety of a *Coſt*.

There is alſo a *Bend Siniſter*, which is drawn from the *Siniſter chief* Point to the *Dexter baſe*, and this is ſubdivided into the *Scrape or Scarp*, and the *Battoone*, which latter is the 4th part of the *Bend*.

This *Battoone* is the moſt uſual Mark of Illegitimacy, but then it never extends it ſelf quite athwart the *Shield*, but is cut off a little at each End.

When 2 ſtreight Lines drawn within the *Bend* run nearly parallel to the outward *Edges* of it, that is called *Voiding*, and he that bears it is ſaid to bear a *Bend voided* thus

He beareth *Ermine*, a *Bend voided Gules*.

BENDY, the Term in Blazonary for an Eſcutcheons being divided *Bendways* into an *even* Number of Partitions; but if they are *odd* the Field muſt firſt be named, and then the Number of the *Bends*.

BENIGN *Diſeaſes*, are thoſe which are not attended with *Anomalous*, and extremely Violent Symptoms.

BERME, in Fortification, is a little Space of Ground three, four, or five Foot wide, left without, between the Foot of the *Rampart* and the ſide of the *Moat*, to receive the Earth that rolls down from thence, and to prevent its falling into the *Moat*. Sometimes for more Security the *Berme* is *Palliſadoed*.

BERTYING *a Ship*, by ſome is meant the raiſing of the Ship's Sides.

BESAILE (in Law) is a Writ that lies for the Heir, where his Great Grand-father was ſeized the Day that he died, or died ſeized of Land in Fee-ſimple, and a Stranger enters the Day of the Death of the Great Grand-father, or abates after his Death, his Heir ſhall have a Writ againſt ſuch a Diſſeiſor or Abater.

BEVEL, an Inſtrument well known to Builders, Carpenters, and Bricklayers, and uſed adjuſting of Angles.

BEVILE, a Term in Heraldry, ſignifying Broken, or opening like a Carpenter's Rule. Thus he beareth *Argent* a *chief Bevile vert.* by the Name of *Beverlis.*

BEWPLEADER, is a Writ that lies where the Sheriff, or other Bailiff in his Court will take a Fine of the Party, Plaintiff or Defendant, to the end that he ſhall not plead fairly, *&c.*

BEZANTS or *Beſants*, a Term in Heraldry for Round Plates of Gold without any Stamp, which are born frequently in Coats of Arms: *Guillim* ſays, a *Beaſant* or *Beaſaunt* is taken for a Maſſy-Plate of Gold of 101 *lb.* and 2 *Ounces* weight; tho' ſome think they were ſmaller Pieces ſtampt at *Bizantium* or *Conſtantinople*; whence the Name.

BEZOAR *Animale*, according to ſome, is the Liver and Heart of Vipers dried and powdered.

BEZOAR *Minerale*, is an Evaporation of the Solution of Butter of Antimony in Spirit of Nitre, till a white Maſs remain at the bottom: On this new Spirit of Nitre is poured, and the Liquor evaporated again; and this is a third time repeated; then the Matter is Calcin'd for about half an Hour, which will turn it into a white Powder fit for uſe.

Mr. *Boyle* calls it *Bezoardicum Minerale.*

BEZOARDICUM or *Bezoartick Remedies*, or *Cordial*, are ſuch as are endued with a Vertue to reſiſt and expel Poiſon and Malignity.

BEZOARDICUM *Joviale*, is a *Regule* made by melting 3 *Ounces* of Regule of Antimony with 2 *Ounces* of Block-Tin, which being powdered is mixed with 6 *Ounces* of Sublimate Corroſive, and then is diſtilled off in a kind of Butter; which Butter is afterwards diſſolved in Spirit of Nitre (of thrice its weight) and then the Solution is diſtill'd three times. The *Bezoar* will remain at the bottom; which muſt be powdered and waſht, and then mingled with Spirit of Wine, and digeſted till it grow inſipid.

BEZOARDICUM *Lunale*, is made by mixing 8 *Ounces* of Rectify'd Butter of Antimony, with an *Ounce* of fine Silver, and then diſſolved in Spirit of Nitre, which muſt be poured on gently freſh and freſh till all the Ebullitions are over, then the Spirit is drawn off from the Matter with a gentle Heat (with three Rectifications) and then the *Bezoar* is managed like the *Jovial Bezoar*: Which ſee.

BEZOARDICUM *Martiale*, is a Diſſolution of *Crocus Martis* made by Reverberation (or at leaſt as much of it as can be effected) in Butter of Antimony; and then Spirit of Nitre is poured on it, and they proceed as in the other *Bezoardick Preparations.*

BIBITORY *Muſcle*, is by ſome ſaid to be that *Muſcle* that draws down the Eye towards the Cup when we drink.

BICEPS,

BICEPS, is a Muſcle of the Cubit, ſo called becauſe it hath two Heads or Beginnings; the firſt, or outmoſt, ariſes with a long round Tendon from the upper part of the Brink of the *Acetabulum Scapulæ*, and runs under the Ligament of the Articulation in a *Sulcus* or Channel on the Head of the Shoulder-bone, where it is incloſed by a proper Ligament. In its deſcent it begins to grow fleſhy as it marcheth under the Termination of the Pectoral Muſcle, where dilating it ſelf into a large fleſhy Body, in-joyns with its other Head or Beginning. The latter ariſeth with a ſomewhat board, flat and long Tendon at the extremity of the *Proceſſus Caracoides Scapulæ*; in its deſcent it ſtrictly adheres to the *Coracobrachialis*, (wherefore ſome Authors not rightly deſcribing that Muſcle amongſt thoſe of the Arm, have miſtaken it for a fleſhy beginning of this.) But then parting from it, both theſe Heads compoſe a large fleſhy Belly, which becoming Tendinous near the *Cubit*, is commonly ſaid to be inſerted by a ſtrong round Tendon to the Tubercle at the upper Head of the *Radius*. But we (ſays *Cowper*) have obſerved this Tendon to be double, the External of which being thin, paſſeth obliquely over the *Muſculus Pronator Radii Teres*, and Membrane-like expanding it ſelf, joins with the *Membrana Communis Muſculorum*, which embraceth all the External Muſcles of the *Carpus* and Fingers: when this Muſcle acteth the *Cubit* is bended.

BICEPS, a Muſcle of the Leg, called ſometimes *Biceps Femoris*, to diſtinguiſh it from the *Biceps Cubiti*. It hath two Heads, the ſuperior and longeſt of which ariſeth with a round Tendon from the Protuberance of the *Iſchium*; in its deſcent it becomes large and fleſhy, and in above half its Progreſs leſſens it ſelf again, where it is joined with its other Head, having a broad, partly Tendinous and partly Fleſhy beginning from the *Linea Aſpera* of the *Os Femoris*, immediately below the Termination of the *Glutæus Maximus*; it being thus united, grows Tendinous, as it marcheth in a Channel on the External *Appendix* of the *Os Femoirs*, becoming perfectly Tendinous at its Implantation to the Superiour *Epiphyſis* of the *Fibula*. Its uſe is to help bend the *Tibia*; it is likewiſe employed in turning the Leg, together with the Foot and Toes, outwards, when we ſit with the Knees bended.

BIGAMY, ſignifies, either, as formerly, thoſe that were married more than once, which was then an Impediment that hindered a Man from being a Clerk; or as uſed in Common-Law, to have more than one Wife at the ſame time.

BIGHT or *Bite*, is any turn or part of a Rope that lies compaſſing; and therefore when they cannot take the End of a Rope in Hand, the Seamen ſay, *give me a Bite*.

BILANCIIS *Deferendis*, is a Writ directed to a Corporation, for the carrying of Weights to ſuch a Haven, there to weigh the Wools that ſuch a Man is Licenſed to Tranſport.

BILANDER, ſee *Belandre*.

BILDGE, of a Ship, is the Bottom of her Floor, *Bildge Water* therefore is that which by reaſon of the Flatneſs of a Ship's Bottom lies on her Floor, and cannot go to the Well of the Pump; and conſequently the *Dutch*, whoſe Ships are often of this Form, do much uſe a ſort of Pumps called *Bildge Pumps*, or as we call them *Burr-Pumps*, to carry off this *Bildge Water*: Alſo when a Ship ſtrikes on a Rock, they ſay, *She is Bildged*. And *Billage* is the Breadth of her Floor when ſhe lies aground.

BILE, or the *Gall*, is a Liquor partly Sulphureous, and partly Saline, which is ſeparated from the Blood of Animals in the Liver; for the receiving and evacuating of which there have been reckoned only two Veſſels or Paſſages, that is, the *Gall-bladder* and the *Porus Bilarius*. By this latter there flows a thicker but milder; by the former a thinner, and more Acrimonious and Fermentative Choler into the Inteſtine. But beſides theſe, there have been lately found out a Third, which we ſhall deſcribe by and by.

The *Gall-bladder*, called in Greek κύστις χοληδόχο, in Latin *Veſica bilaria*, or *Folliculus fellis*, is a hollow Bag placed in the under or hollow Side of the Liver, and in Figure repreſenteth a Pear. It is about two Inches in length, and one in breadth, where broadeſt.

By its upper Part it adheres to the Liver, which doth afford it a Hollowneſs to lodge in; but the lower Part, which hangeth without the Liver, reſteth upon the Right Side of the Stomach and the *Colon*, and doth often dye them both Yellow.

It hath three *Membranes*, one *Common*, which is thin and outmoſt. This ſpringing from the Membrane of the Liver, only covereth that Part which hangeth without the Liver. The two other Membranes are *proper*. The middle is thick and ſtrong, and muſcular, and hath three Ranks of *Fibres*; the outermoſt are tranſverſe, the middle oblique, and the innermoſt ſtreight. But ſome will allow only two Ranks, *viz.* the Streight, which run lengthways of it, and are outer; and the Tranſverſe or Annular, which are the inner.

The inmoſt Coat is Nervous, or Tendinous as it were; and to the inſide of this there adhereth a kind of Glandulous Coat. The Glands herein do ſeparate from the Arteries a kind of Mucous Humour, which ſerves to defend the *Veſica* from being irritated by the Acrimony of the Choler contained in it.

Beſides theſe two *proper* ones, *Verheyen* affirms there is a Third, betwixt that I called *common*, and the middle, and ſays, it is ſo evident, that he wonders this quick-ſighted Age has not yet diſcover'd it. It is interwoven with whitiſh *Fibres* drawn diverſly and irregularly, and has abundance of Nerves and Sanguiferous Veſſels running thro' it, whoſe chief Branches run moſtly from its Neck towards its Bottom; and upon this Account this Coat may be termed *Vaſcular*. In fat People it contains much Fat, and with a little Labour is ſeparated into divers Flakes (or Plates.)

It hath two *Parts*, the *Bottom* and the *Neck*.

The *Bottom* is its larger or wider Part that contains the Choler, and is of the ſame Colour with the Bile that is in it; whence it commonly looks Yellow, but ſometimes Greeniſh, Blackiſh, *&c.*

The *Neck* (otherwiſe called *Meatus Cyſticus*) is its narrower Part, being but about as wide as a Gooſe-quill, and about two Inches long. Betwixt this and the *Veſica* there is a certain Fibrous Ring, which much ſtraitens the Paſſage, and ſo hinders the two haſty Repletion of the *Veſica*. The other End of the Neck is joined to the *Porus Bilarius*, and they both make the *Ductus Communis* or common Paſſage of the Choler, which is inſerted into the Beginning of the *Jejunum*, or the End of the *Duodenum*. *Peucerus* has obſerved, that in ma-

ny Birds, and ſome Fiſhes, this *Meatus* does not join the *Porus bilarius*, but is inſerted ſeparately into the Guts.

The Ancients (whoſe Opinion is of late ſtifly defended by Dr. *Cole*) thought that the Choler in the *Gall-bladder* was received in by its Neck from the *Porus bilarius*, and that it paſſed out into the common Duct the ſame way. And to obviate the Objection, that there uſes not to be a Reciprocation of Humours in the ſame Veſſel (at the ſame time eſpecially.) Dr. *Cole* ſuppoſes, that the Gall paſſes out of the *Gall-bladder* only in the time of the diſtribution of the Chyle, but at all other times it is received into it from the *Porus*, and is ſtored up in it againſt the next Occaſion. But not to enter into this Diſpute, I think Dr. *Gliſſon*'s Account of it the more probable, which is this: The ordinary way of filling the *Gall-bladder*, is by its Fibrous Roots that are diſperſed thro' the Liver. The whole Trunk of theſe Roots enters that Part of the Bladder where 'tis ſtraitned by a Fibrous Ring. This Trunk indeed hardly equals the Hundredth Part of the Roots of the *Porus Bilarius*; yet it diſtributes ſome Twigs and Capillary Veſſels into the hollow Side of the Liver. But if you open the *Gall-bladder* with a Deſign to underſtand the Manner of the Inſertion of this Trunk into it, truly you will not eaſily find it. For tho' this Duct do penetrate the ſaid Bladder, and the Humour contained in it be diſcharged thereinto; yet there is hardly any Print or Sign of this Hole in the Inſide of the Bladder: Which ought not to ſeem hard to be believed by any one, if he remember the Inſertion of the Ureters into the *Veſica*; for tho' theſe do far exceed this Trunk in Width, yet one can hardly find their Inſertion if he cut open the Bladder and look for it. The beſt way (that I could yet find) to diſcover the Inſertion of this Trunk (if you will open the *Gall-bladder*, and ſearch for its Entrance into it) is thus; look carefully for a certain little and ſpongy Protuberance near the Orifice of the Bladder hard by the *Meatus-Cyſticus*; for the aforeſaid Trunk, I think, is pretty plainly inſerted into that Protuberance.

This Protuberance is called a Valve by *Spigelius*.

Beſides this Mr. *Perault* has found out another *new Conduit* for the Bile, which he calls *Ductus cyſt-hepaticus*, becauſe it is common both to the *Veſicula* and the *Porus Hepaticus* (or *Bilarius.*) This Duct has three Roots, which being ſubdivided into numerous Twigs, are diſperſed thro' the *Parenchyma* of the Liver, amongſt the Branches of the *Vena Cava* and *Portæ*: Theſe Roots grow into one Trunk, which creeping along the Surface of the hollow Side of the Liver, has a double Implantation; one into the *Porus Bilarius*, two Inches and an half before the ſaid *Porus*'s, uniting with the *Meatus Cyſticus*; and another into the middle of the *Veſica* (on that Side of it which adheres to the Liver) with a Valve. This Valve ſeems to be formed of the inner Membrane of the *Veſica*, and alſo a proper one, and may be ſaid to be a kind of middle Valve, between the Nature of the *Sigmoides* and *Triglottis* (or *Triſcupis*) of the *Vena Arterioſa* and *Arteria Venoſa* in the Heart. Betwixt its Inſertion into the *Porus Bilarius*, and this into the *Veſica*, there is about ſix Inches length. It contains a thinner Choler in it than the *Porus Bilarius*.

Jo. Alph. Borallus (Profeſſor of the Mathematicks at *Naples*) from the continual and ſpeedy Efflux of the Bile by the *Ductus Communis* into the *Duodenum*, believes, that there is a particular Circulation of it: For he affirms, That in a Day's time, from a Perſon faſting, there paſs thirty four Pound of Bilious Juice into the *Duodenum* by the common *Duct*, whereas the whole Maſs of Gall is not two Pound: Whence he concludes, that ſo great a quantity of Gall cannot be produced in the Liver by way of Fermentation, but that it is ſeparated Mechanically, without the help of any Ferment, only by *Cibration*, from the Minute Veſſels of the *Porta* thro' the Pores of the Glandules of the Liver, as the Urine is ſeparated in the Kidneys; ſo he infers, that there is a particular Circulation of the *Bilis* thro' the *Abdomen*, performed by the *Venæ Meſaricæ* into the Trunk of the *Porta*, thence to the Liver, thence thro' the Bilious Veſſels into the *Duodenum*, to return again by the Meſaraick Veins. He that would enquire more into this Novel, and (to me) improbable Opinion, may conſult his *Opus Poſthumum (pars altera) de motu Animalium.*

It has been taught by ſeveral Anatomiſts, That its Neck or *Meatus* has ſometimes two, ſometimes three *Valves*, to hinder the Recourſe of the Choler; but *Diemerbroeck* profeſſes he could never find any, but only that the Egreſs of the *Veſica* was very ſtrait, and its Neck wrinkled. Dr. *Gliſſon* declares alſo, That he has open'd very many Veſſels of this kind, and never yet ſaw a *Valve* in any of them: But he thinks that the Fibrous Ring (above-mention'd) did impoſe upon thoſe who have thought there was a *Valve*. Beſides, upon tryal he has often found, that the Bile by a light Compreſſion of the Fingers, has fluctuated to and again out of the *Cyſtis* into the *Meatus*, and on the contrary; as alſo out of the *Meatus* into the *Ductus Communis* and back again: Which certainly could not be, if there were any *Valve* in the way, for that would hinder the one or other of theſe Motions.

The *Veſica Fellea* hath two *Veins* called *Cyſticæ Gemellæ*, which ſpring from the *Porta*. It hath Twigs of *Arteries* proceeding from the right Branch of the *Cœliaca*; and it hath a ſmall thread-like Sprig of a *Nerve* from the Meſenterical Branch of the *Intercoſtal*.

Many times Stones are found in it, which are lighter and more ſpongy than thoſe of the Urinary Bladder, and will ſwim above Water, which theſe latter will not do.

The other Paſſage which carrieth the thicker ſort of Choler, is called *Porus Bilarius*, or *Meatus Hepaticus*, becauſe it paſſes directly from the Liver to the *Ductus Communis*.

Within the Liver, its Trunk and Branches are inveſted with a double Coat; its *proper* one which it retains without the Liver alſo, and another that is *common* to it with the *Porta*, called *Capſula Communis*, which it has from the Membrane of the Liver. In this common Coat this *Porus* and the *Porta* are ſo cloſely enwrapped, that you would take them but for one Veſſel, till you hold it either up to the Light (which will diſcover Veſſels of two Colours in it) or very dexterouſly rip up the *Capſula*, and ſo lay them open. Its Roots within the Liver are equally divided with thoſe of the *Porta* every where, ſaving that little Space where the Roots of the *Veſica* are ſpread in the

Sinuous

Sinuous and Right-ſide of the Liver. So that having ſpoken above of the Diviſions of the Roots of the *Porta*, I ſhall only obſerve, that they are far larger and more numerous than thoſe of the *Veſica*, drwaing Choler from all the Parts of the Liver (ſaving whither the Roots of the Bladder reach) and that more thick and viſcous, yet leſs Acrimonious.

This *Porus* ſeems to be a more neceſſary Part than the *Veſica*; for many Creatures, as Harts, Fallow Deer, the Sea-Calf, *&c.* and thoſe which have a whole Hoof, as an Horſe, *&c.* have no Gall-Bladder, but there is none that is deſtitute of this.

Without the Liver it is as wide again as the *Meatus Cyſticus*, with which it is joined at two Inches diſtance from the Liver, and both make the *Ductus Communis Choledochus*.

It has no *Valve* in its whole Progreſs; only the *Ductus Communis*, where it enters the Inteſtine, having pierc'd the outer Coat, paſſes betwixt that and the Middlemoſt about the twelfth Part of an Inch, and at laſt opens with a round Mouth into the Inteſtine. So that this oblique Inſertion (as that of Ureter into the Urinary Bladder) ſerves inſtead of *a Valve* to hinder any thing from regurgitating out out of the Gut into this Duct, eſpecially the inmoſt Tunicle of the Inteſtine hanging ſo flaggy before its Mouth, that when any thing would enter in, it claps cloſe upon it and ſtops it.

As to any *Anaſtomoſes* of the Roots of any of theſe Biliary Veſſels, with thoſe of the *Vena Porta*, ſuch indeed have been much talk'd of, but without truth, for their exreme Twigs or Capillaries terminate in the *Parenchyma* of the Liver, out of whoſe Grape-ſtone-like Glandules they imbibe the Choler there ſeparated from the Blood; as is the Caſe of the Capillaries of the *Cava*, for they receive the Blood it ſelf imported by the *Porta*, in like manner, without any Inoſculations.

The *Uſe* of all theſe *Veſſels* may ſufficiently be learned by what has already been ſaid of them; though ſome are of Opinion, that not only Choler, but other ſuperfluous Humours are evacuated by them, eſpecially upon taking a Purge.

The Ancients lookt upon the *Bile* as a meer Excrement, or at leaſt, to be of no other uſe than by its Acrimony to promote the Excretion of the Guts: Which Opinion continued as long as the Liver was thought to be the *Vas Sanguificans*. But when once that *Viſcus* was diſcovered to have ſcarce any other Office, then to ſeparate the Choler from the Blood, it hath ſeemed unreaſonable to ſuppoſe ſo large a Bowel was made only for the ſeparation of a meer Excrement; and therefore its now generally believed, that the *Bile* is the proper *Ferment* for both the Chile and the Blood. A very good Account of the manner of which *Diembroeck* gives us, as follows: The Blood flowing into the Liver by the *Porta*, out of the Gaſtrick and Meſaraick Veins (and, it may be, a little by the Hepatick Artery) is mixed with an Acrimonious, Saltiſh, and Subacid Juice (made in the Spleen, of the Arterious Blood flowing thither by the Arteries, and of the Animal Spirits by the Nerves) which is brought into the *Porta* by the *Ramus Splenicus*. Now both theſe being entred the Liver by the Branches of the *Porta*, by means of this ſaid Acrimonious and Acid Juice, and the Specifick Vertue or Coction of the Liver, the Spirituous Particles, both Sulphureous and Salt, lying hid in the ſaid Venous Blood, are diſſolved, attenuated, and become alſo a little Acrimonious and Fermenting; a certain thinneſt part whereof like moſt clear Water, being ſeparated from the thicker Maſs of Blood, by means of the conglomerated Glands placed moſtly in the hollow Side of the Liver, is carrid from thence by many Lympheducts, as has been ſaid. But the Fermentaceous Spirits of greater Acrimony, mixed with the thicker and more viſcid ſulphureous Juices (for Sulphur is viſaid) and more ſtrongly boiled, when as through the Clammineſs of the Juices in which they inhere, they cannot enter the conglobated Glands, nor from them the Lympheducts, and yet through their fierce Ebullition are ſeparated from the Blood (as Yeſt from Beer) theſe Fermentaceous Spirits, I ſay, being ſever'd with the Juice in which they inhere, become bitter, and are called *Bile*; which *Bile* being tranſcolated through the Grepe-ſtone like Glandules in the Roots of the *Porus Bilarius*, and of the Call-bladder, paſſes through them by the *Ductus Communis* into the *Duodenum* or *Jejunum*, where it is preſently mixed with the Pancreatick Juice, and both of them with the Alimentary Maſs, concocted in the Stomach, and now paſſing down this way, which it cauſes to ferment. And becauſe at its firſt Entrance it is more Acrimonious, and has its Vertue entire, and ſo cauſes the greateſt Ebullition with the Pancreatick Juice; hence the Milky Juice contained in the Maſs concocted in the Stomach is more readily, and in greateſt quantity ſeparated in the *Jejunum*, and by innumerable Lacteal Veſſels (which are more numerous in this than the other Guts) it is more quickly driven on towards the *Receptaculum Chyli*, and this is the Reaſon that this Gut is always ſo empty. But in the following Guts, becauſe the Fermentaceous Spirits are a little pall'd, the Effervеſcency becomes ſlower and leſs efficacious, and the Chyle is more ſlowly ſeparated from the thicker Maſs, and therefore they have fewer *Vena Lacteæ*. At length what remains of this fermenting Matter, is mixed with the thicker *Fæces* in the great Guts, where by its Acrimony it irritates them to Excretion.

BILINGUIS (in Law) is that Jury which paſſes between an *Engliſhman* and an *Alien*; whereof part ought to be *Engliſhmen*, and part *Strangers*; this is vulgarly called *Party-Jury*.

BILL, is all one with an *Obligation*, only when it is in Engliſh it is commonly called a *Bill*, in Latin an *Obligation*. Or a *Bill* is a ſingle Bond without a Condition; and *Obligation* is a Bond with a Penalty and Condition. Alſo a Declaration in Writing, that expreſſes the Grievance and Wrong which the Complainant has ſuffered by the Party complained of; or elſe ſome Fault committed by him againſt ſome Law or Statute of the Realm.

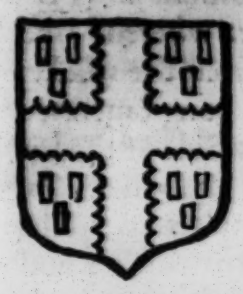
BILL *of Store*, is a kind of Licence granted at the Cuſtom-houſe to Merchants, to carry ſuch Stores and Proviſions as are neceſſary for their Voyages Cuſtom-free.

BILL *of Sufferance*, is a Licence granted at the Cuſtom-houſe to a Merchant, to ſuffer him to Trade from one *Engliſh* Port to another, without paying Cuſtom.

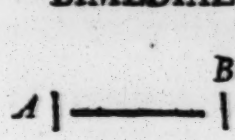
BILLA VERA (a Law Term) ſignifying the Indorſment of the Grand Inqueſt upon any Preſentment or Indictment which they find to be probably true.

BIL-

BILLET, a Bearing very common in Heraldry of this Form. *Argent Billette* a Croſs engrailed Gules, by the Name of Heath. 'Tis called here *Billette*, becauſe the Billets are ſuppoſed to be all over the Field, but ſometimes they are not above ſix, *&c.* and then they are numbred. *Guillim* ſaith, it repreſents a Letter folded up, and not a Billet of Wood. *Bloom* ſaith Billets muſt be numbred, if not above 10.



BIMEDIAL, a Term in Mathematicks, if two *Medial Lines*, as *A B* and *B C* commenſurable only in Power, containing a Rational Rectangle, are compounded, the whole *A C* ſhall be irrational, and is called a *firſt Bimedial Line*, 38. *e.* 10. *Eucl.*



BINOCLE, is a kind of Dioptrick Teleſcope fitted ſo with two Tubes joining together in one, as that you may ſee a diſtant Object with both Eyes together.

BINOMIAL ROOT, in Mathematicks, is a Root compoſed of two Parts or Members, and no more, connected together by the Sign +: Thus *a*+*e*, or 5+3 is a *Binomial Root*, conſiſting of the Sum of thoſe two Quantities: If it have three Parts, as *a*+*b*+*c*, 'tis called a *Trinomial*, *&c.* if it have four Members, 'tis called a *Quadrinomial*, *&c.*

BIOLYCHNIUM, is what ſome call the *Vital Flame*, or Life of Animals. See *Flamma Vitalis.*

BIOVAC, in War, is a Guard at Night performed by the whole Army; which either at a Siege or lying before an Enemy, every Evening draws out from its Tents or Hutts, and continues all Night in Arms before its Lines or Camp to prevent any Surpriſe. When the Troops are much haraſſed, or there is no great dread of the Enemy, the *Biovac* is allowed to be ſufficient if the two Front Ranks by turns ſtand under Arms, while the Rear Ranks reſt on the Ground. To raiſe the *Biovac*, is to return the Army to their Tents or Hutts at break of Day.

BIPARTITION, the ſame with *Biſſection*, or dividing a thing into two equal Parts.

BIQUINTILE, an Aſpect of the Planets, when they are 144 Degrees diſtant from each other.

BIRTH or *Birthing*; the Seamen call a due or proper diſtance obſerved between Ships lying at an Anchor or under Sail a *Birth*; and ſo alſo they do the raiſing or bringing up the Sides of a Ship. Alſo the proper Place aboard for a Meſs to put their Cheſts, *&c.* is called the Birth of that Meſs. Alſo a convenient Place to Moor a Ship in, is called a *Birth.*

BISUTH, or *Tin Glaſs*, by the Ancients was thought to be a natural *Marcaſite* or Mineral; but *Lemmery* ſaith, 'tis a kind of Regulus or Tin, and aſſures us, that good Biſmuth may be made with *Tin*, *Tartar* and *Salt Peter*; and ſome mix *Arſenick* alſo with it, for which Reaſon it ought not to be taken inwardly. Its Flowers and Magiſtery are uſed as Coſmeticks; and the *Pewterers* alſo do uſe Biſmuth to render their Work more Beautiful, and to make the Metal ring the better.

BISSECTION, a Term in Geometry, ſignifying the Diviſion of any Quantity into two equal Parts or Halves; the ſame with *Bi-partition*: Thus to biſſect any Line, is to divide it into two equal Parts.

BISSEXTILE, the ſame in *Chronology* as our Leap-Year; and the Reaſon of the Name is becauſe in every 4th Year they accounted the 6th Day of the Kalends of *March* twice; for once in four Years, the odd Hours (above 365 Days) made up juſt an whole Day, which was inſerted into the *Calender* next after the 24th of *February.*

BITE, in the Sea-Phraſe, is the compaſſing or bringing about of a Rope or Cable; the Seamen call holding by that Part of a Rope which is quoiled or rowled up, *holding by the Bite.*

BITTACLE, is a Fram of Timber ſtanding in the Steerage of a Ship juſt before him that Steereth, and in it is placed the *Compaſs*, by which the Ship is kept in her Courſe, and finds her way.

BITTER, any Turn of a Cable about the Bitts is called a *Bitter*; and 'tis uſed that the Cable may be let out by little and little. And when a Ships is ſo ſtop'd by a Cable, they ſay ſhe is *brought up to a Bitter.* Alſo that End of the Cable which is uſed to be wound or belayed about the Bitts, they call the *Bitter End of the Cable.*

BITTS (aboard a Ship) are two great Pieces of Timber, on, or through whom goeth the *Croſs Piece*, placed uſually abaft the *Manger* in the *Loof* of the Ship, to *belay* (or faſten) the Cable thereto when ſhe is at Anchor: Their lower Ends are faſtened into the *Riders*; and in great Ships their middle Parts are bolted to two great Beams croſs the *Bows*; and yet in great Storms they are fain to faſten the Cable to the Main Maſt, to ſtrengthen the Bitts, and to ſecure the Bows, which are ſometimes elſe torn from the Ships.

There are *Fore Top-ſail Sheat Bitts*, whoſe uſe is to belay or faſten the Fore Top-ſail Sheats.

And there are alſo the *Fore-jeer Bitts*, which ſerve to belay or faſten the *Fore-jeer.*

BIVALVE, is a Word uſed by the Writers of Natural Hiſtory for both ſuch Shell-Fiſhes as have two Shells, as Cockels, Muſcles, Oyſters, *&c.* which are ſaid to be of the *Bivalve kind*; and alſo for the *Siliqua* or Seed-Pods of ſuch Plants as open all their whole Length to diſcharge their Seeds, ſuch as Beans, Peaſe, *&c.* for thoſe the Botaniſts ſay have a *Bivalve Siliqua.*

BIVENTER: See *Digaſtricus.*

BLACKMAIL, ſignifies a certain Sum of Money, (or rather only of) Corn, Cattel, *&c.* given by the Poor People in the *North* of *England*, to the moſt powerful Perſons in thoſe Parts, or in the Hundreds, for a Protection againſt Thieves and Robbers.

BLAKNESS, the Colour ſo called, ſeems to ariſe from ſuch a peculiar Texture and Scituation of the Superficial Parts of any black Body, that it doth as it were dead the Light falling upon it, and reflect none, or very little of it, outwards to the Eye. *See* Colour, *and* Vol. II.

BLACK-ROD, is the *Huiſhier* or Uſher belonging to the moſt Noble Order of the Garter; ſo called from his *Black-Rod* which he carries in his Hand: He is alſo of the King's Chamber, and *Uſher* of the Lord's Houſe in Parliament.

BLADDER, ſee *Veſica.*

BLASS, a Word uſed by *Van Helmont*, as *Blanchard* ſaith, to ſignify the Motion of the Stars, *&c.*

BLAZONING, in Heraldry, is diſplaying or expreſſing the Parts of a Coat of Arms in their proper

proper Colours and Metals; for to lay *Colour* on *Colour*, or *Metal* on *Metal* is falſe *Heraldry*.

In Blazoning a Coat of Arms, you muſt always begin with the *Field*, and then next proceed to the *Charge*; and if there are many things born in the *Field*, you muſt name firſt that which is immediately lying upon the Field. Your Words muſt be very ſhort, and truly proper and expreſſive, without any Expletives, needleſs Particles, or Repetitions. In the Blazon of a Coat of Arms, ſuch Terms for the Colours muſt be uſed as are agreeable to the Station and Quality of the Bearer: All Perſons beneath the Degree of a Noble, muſt have their Coats blazoned by Colours and Metals; Noblemen by precious Stones; and Kings and Princes by Planets.

BLENCH, (in Law) is the Title of a kind of Tenure of Land; as to hold Land in *Blench*, is by Payment of a Sugar-Loaf, a Bever Hat, a couple of Capons, and ſuch like; if it be demanded in the Name of *Blench*, *i. e. nominæ Albæ firmæ*. See *Alba firma*.

BLINDS, in Fortification, are certain Pieces of Wood, Branches of Trees laid acroſs from one Side of the Trench to the other, to ſuſtain the *Fa-vins* or Hurdles laden with Earth; and ſerve to cover the Pioneers from above, and are commonly uſed when the Works are carried on towards the *Glacis*, and when the Trench is extended in Front toward the Place.

BLISTERING *Plaiſterers*, ſee *Veſicatoria*.

BLOCCADE, in the Art Military, is the encompaſſing any Town or Place ſo all round with Armed Troops, that 'tis impoſſible any kind of Supplies can be brought to it, and ſo it muſt be ſtarved or ſurrender; but there is no Deſign of taking it by Attack, *&c.* And when any Place is in this Condition, 'tis ſaid to be *Bloccaded*.

BLOCCADING, is when the Beſiegers take Care to ſtop all Ways and Paſſages, and all Intelligence that may be ſent into or out of the *Town* or *Fort* that is block'd up, but the Place is not regularly beſieg'd, nor attack'd in Form.

BLOCKS, are the Pieces of Wood aboard a Ship in which the Shivers are placed, and wherein go the running Ropes. Of theſe Blocks ſome are ſingle, ſome double, and ſome have 3, 4 or 5 Shivers in them. They are diſtinguiſhed and named by the Ropes they carry, and the Uſes they ſerve for. When in the Haling of any Tackle or Halliard to which there do belong two Blocks, they happen to meet, then they cry *Block and Block*.

BLOOD: *In Phil. Tranſact. N.* 191, is an Eſtimate of the Quantity of the Blood in a Human Body, and of the Celerity of its Motion by Dr. *Allen Moulin*.

Dr. *Lower* was probably miſtaken when he computed the Quantity of Blood in an Ordinary Man to be about 20 Pounds; and the Computation of Dr. *Moulin*, That the Blood is about $\frac{1}{25}$ of the Weight of the whole Animal, ſeems much rather to the Truth; for then an ordinary Man may be ſuppoſed to have about 8 or 10 Pounds of Blood in him.

Of the Circulation of the Blood, Dr. *Gibſon* gives this Account.

Seeing by a continual Reciprocation of the Pulſe there is a conſtant Expulſion of Blood from the Heart into the Arteries, and as continual an Influx of Blood *into* it out of the *Cava*; and ſeeing the *Cava* from whence the Supply is, is never dry; nor, on the other Hand, the Arteries that receive the Blood continually from the Heart, unduly ſwell'd with it; it neceſſarily follows, that this Motion proceeds *circularly*, *viz.* that the Blood is continually driven out of the Heart into the Arteries out of theſe into the Parts to be nouriſhed; from whence it is reſorbed by the Capillary Veins, which conduct it back through the larger into the *Cava*, and ſo at length it returns to the Heart again. The Invention of which Circulation is owing to our Country-man Dr. *Harvey*, and may be proved undeniably by theſe Reaſons.

1. From the great quantity of Blood that is driven out of the Heart into the Arteries at every Pulſe. For though the Ancients who knew not this Circulation, imagined that only a drop or two was expelled by every *Syſtole*, which they were neceſſitated to ſuppoſe, to avoid the great Diſtention that the Arteries muſt be liable to, if any conſiderable Quantity iſſued into them; yet it is certain and demonſtrable, that there muſt needs an Ounce or more be driven into them each time. For (taking it for granted that there is no other way for any Liquor to paſs from the Stomach to the Kidneys, but through the Heart along with the Blood) ſeeing, if ſome Men at ſome times drink three Pints of Drink, they ſhall piſs it out again in half a Hour, yea more of *Tunbridge* Waters in that ſpace; and ſeeing, ſecondly, that there is commonly as much Blood as *Serum* that flows to the Kidneys (the Blood returning back by the emulgent Veins) it is clear, that by the two Emulgents (which are none of the largeſt Arteries) there muſt paſs in Half an Hour's time ſix Pound of Liquor, all which muſt come from the Heart; and how much more then may we conceive to be driven through all the other Arteries that run through the whole Body? This is more accurately evinced by Dr. *Lower*'s Experiment, which is this: I cut aſunder (ſays he) both the *Cervical* Arteries in a large Dog, and at the ſame time through an Hole made in the Left Side of his Breaſt over-againſt the Heart, I compreſs'd the Trunk of the *Aorta* below the Heart, with my Finger, to hinder any Blood from deſcending by it; and laſtly, I took Care alſo to ſtraiten the *Brachial Arteries* under the *Axillæ*, by which Means almoſt all the Blood was driven out of the Heart through the *Cervicals*, (beſides that which was ſent into the *Vertebrals*) and which is wonderful to be related, within the 20th Part of an Hour the whole Maſs iſſued out; ſo that it is not to be denied but that it all paſs through the Heart in that ſpace. And though it may be granted, that amidſt ſuch Wounds and Tortures the Heart does beat ſomewhat quicker than at other times; yet the ſame thing is partly evident from the Wounds in the Limbs when ſome notable Artery is cut aſunder; for it is ſtrange in how ſmall a time a Man will bleed to death, even at that one Artery. Yea, we may give a great gueſs how much Blood is ſent out at every Pulſe, even from the ordinary opening of one *Vein* in the Arm, from whence a notable quaintity of Blood will iſſue in a ſhort time; how much may we then ſuppoſe will flow out of all the Veins, if they were opened at one time? Seeing then 'tis evident, that ſo great a quantity of Blood is expelled out of the Heart at every *Syſtole*, and that for all that the Arteries are not unduly diſtended, nor any Part ſwell'd by it neither, and yet the *Cava* and other *Veins* emptied, 'tis certain that the Blood that's driven

driven into the Arteries flows back to the Heart by the Veins in a conſtant Circulation.

2. A ſecond Argument to prove it, may be taken from the Valves in the Veins, which are ſo framed that Blood may freely flow through them out of the leſſer Veins into the greater (and ſo into the *Cava*) but not, on the contrary, out of the greater into the leſs. Yea, if one blow into the *Cava* through a Pipe, there will no Wind paſs into the ſmaller Veins; but on the contrary, if you blow up the leſſer Viens, the Wind will readily paſs to the larger, and ſo to the *Cava*.

3. And laſtly, the ſame thing is more clear by the Ligature in Blood-letting: For whether you let Blood in the Arm or Foot, you always tie the Fillet above where you intend to make the Orifice, and then the Vein below the Ligature will preſently fill and grow tumid, but above it will fall and almoſt diſappear. Which muſt needs be from hence, for that the Blood being driven along the Arteries towards the extream Parts, returns by the Veins and aſcends upwards, which coming to the Ligature, and being ſtop'd there, ſwells the Vein below the Ligature, and ſpurts out as ſoon as the Orifice is made; but when the Fillet is looſed again, the Blood flows no longer out thereat, but holds on its wonted Chanel in the Vein, and the Orifice cloſes up again.

Having ſufficiently demonſtrated the Circulation of the Blood, we will ſhew two things farther; *Firſt*, How the Blood paſſes out of the Arreries into the Viens; and *Secondly*, in how long time the whole Maſs of Blood may be ſuppoſed to paſs through the Heart in its ordinary Circulation.

As to the *Firſt*, it was the Opinions of *Riolanus*, That the Blood circulated only through the larger Veſſels by Anaſtomoſis or Inoſculation of the Veins with the Arteries; and that that which run into the ſmaller, was all ſpent on the Nutrition of the Parts. But it is clear, that there muſt be a Circulation even in the ſmalleſt, from the great Quantity of Blood that will flow out of the leaſt Artery in the Hand or Foot when it is cut, which is very abſurd to imagine to be all ſpent on the Nouriſhment of the reſpective Part. Now there are but two Ways whereby the Blood can be ſuppoſed to paſs out of the Arteries into the Veins, *viz. either* by the Former's being continued to or opening into the latter by Inoſculation, *or elſe* by the Capillary Arteries letting out their Blood into the Pores of the Subſtance of the Parts, on whoſe Nutrition part is ſpent, and the remainder imbibed by the gaping Mouths of the Capillary Veins. That it is neceſſary to admit of this *latter* Way, is evident, becauſe if part of the Arterial Blood did not iſſue into the Subſtance of the Parts, they could not be nouriſhed by it; for while it is in the Veſſels, it may and Warmth iudeed to the Parts through which it flows, but cannot nouriſh them, ſeeing even the Veſſels themſelves are not nouriſhed by that Stream of Blood that glides along their Cavity, but by Capillaries running through their Coats; and if the Blood be driven into the Subſtance of the Parts, and that in a greater Quantity than ſuffices for their Nouriſhment (as was juſt now ſhewn that it is) what is ſuperfluous muſt needs enter the Mouths of the Capillary Veins, from whence it goes forward to the larger, and ſo to the Heart: But ſeeing this way of transfuſing the Blood thro' the Subſtance of the Parts, has ſeemed to ſome not to anſwer to that haſty Circulation of it we have demonſtrated; they have thought it neceſſary alſo to admit of the *former* way, namely, Anaſtomeſes, by which the Veins are continued to the Arteries, and that not only in their larger Branches (as that notable one of the Splenick Artery with the Splenick Vien) but alſo in their ſmaller Twigs in the extream Parts. But we muſt conſider, that in a living Body the ſolid Parts are infinitely more porous and permeable than in a dead; ſo that tho' the Anatomiſts find their Subſtance ſo denſe and cloſe as to make it ſeem almoſt impoſſible they ſhould permit ſo quick a Paſſage to the Blood through them; yet he ſhould rather believe it, than ſuppoſe ſuch Anaſtomeſes as he cannot diſcover (though it were not difficult to find them out if they had any exiſtence.) For abating that ſingle one of the Splenick Artery with the *Ramus Splenicus* of the *Porta*, and perhaps ſome of the *Arteria* with the *Vena Pulmonarie* is the Lungs, none of the lateſt moſt accurate Anatomiſts have been able to find out any. And as for that mentioned, it ſeems rather to be of an Artery with an Artery (ſuch as are frequent in ſeveral Parts of the Body, as are alſo of one Vein with another) than of an Artery with a Vein.

And *Secondly*, as to the Space of Time in which the whole Maſs of Blood may ordinarily circulate through the Heart, it is probably much ſhorter than many have imagined; for ſuppoſing that the Heart makes two thouſand Pulſes an Hour (which is the leaſt Number any ſpeak of, and ſome have told twice as many) and that at every Pulſe there is expelled an Ounce of Blood (which we may well ſuppoſe, ſeeing the Ventricles are wide enough to contain two Ounces, and that it is probable both that they are filled near full in the *Diaſtole*, and that they are near, if not quite emptied by the ſtrong Conſtriction of the Heart in the *Syſtole*) ſeeing the whole Maſs uſually exceeds not four and twenty Pound, it will be circulated ſix or ſeven times over through the Heart in the ſpace of an Hour. And by ſo much the oftner, by how much the Blood come ſhort of the ſuppoſed Quantity, or the Pulſe either naturally, or by a Fever, Spirituous Liquors, or violent Motion, is rendred more frequent; by which quick Motion the Blood it ſelf is kept from Coagulation and Putrefaction, and the Parts are cheriſhed with vital Heat, which Heat of the Parts is much according to the Slowneſs or Rapidneſs of the Circulation, So when we ſit ſtill, and the Pulſe is ſlow or rare, we grow cold; but when upon running or any violent Exerciſe, the Pulſe becomes more frequent and quick, we become hot.

As to the manner how Blood is made of Chyle, and of its Heat and Colour, and whether the Body be nouriſhed by it, the aforeſaid Dr. gives the following Account.

According to Dr. *Harvey*'s Obſervations, there appears in an *Embryo* a *punctum ſaliens*, or red beating ſpeek, which is Blood, before any the leaſt Lineament of the Heart; ſo that whatever Inſtrument of Sanguification the Heart may appear to be afterwards, it, contribute nothing to the making of the firſt Blood; but it ſeems rather to be made for the Blood's ſake, to tranſmit it to all the Parts of the *Embryo* or *Fœtus*, then the Blood to be made by it. But it muſt be confeſt, that things proceed in the grown *Fœtus* far otherwiſe than they do in the firſt formation: For the Parts of an *Embryo* are nouriſhed and increaſed before it hath a Stomach to concoct any thing, and yet in a perfect *Fœtus*, none

none can deny, that the Stomach does concoct and prepare Nouriſhment for it: So it moves before the Brain is formed ſo perfectly as to be able to elaborate Animal Spirits; and yet after it is perfected, every one knows that the Brain does elaborate ſuch Spirits, as being ſent into all the Parts of the Body by the Nerves, enables them to move. In like manner, though there be Blood in the *Embryo* before the Heart be formed, yet after it be perfected, nothing will hinder but it may at leaſt contribute to Sanguination.

We will ſuppoſe then, that as all the other Parts are formed by the *Vis Plaſtica* or generative faculty of the (firſt) Vegetative and (then) Animal Soul, ſeated in the *Ovum*, and receive their firſt encreaſe by the Aſſimilation of the *Colliquamentum*; but as ſoon as they are perfected, and the *Fœtus* excluded, are nouriſhed by the Blood; ſo the Blood it ſelf as being at firſt made in like manner, as ſoon as the Veins, Heart and Arteries are compleated ſo as it cannot circulate by them, may not improperly be ſaid to be nouriſhed by the Chyle or Nutritious Juice, the Heart aſſiſting the Aſſimulation of the one into the other. And this is done in this manner: The Chyle aſcending by the *Ductus Thoracicus*, and flowing into the Subclavian Vein together with the returning Venal Blood, is poured by the *Vena Cava* into the right Auricle, and ſo into the right Ventricle of the Heart in its *Diaſtole* or Relaxation; then by its *Syſtole* or Contraction it is driven out from thence into the Lungs, from whence it aſcends again into the left Auricle firſt, and then into the left Ventricle of the Heart, out of which it is expelled through the *Aorta*, and paſſing along with the Blood through the Arteries of the whole Body, returns again with it by the Veins to the Heart. For it undergoes many Circulations before it can be aſſimilated to the Blood: Which is evident, both becauſe it is the Chyle (but little altered) that is ſeparated in the *Placenta Uteri* for the nouriſhment of the *Fœtus*, and in the Breaſts for the Infant to ſuck, in the form of milk; and alſo from hence, that if one be let Blood four or five Hours (or later) after a full Meal, there will a great quantity of the milky Chyle it ſelf ſwim a top of the coagulated Blood. But every time the new infuſed Chyle paſſes through the Heart with the Blood, the Particles of the one or more intimately mixed with thoſe of the other in its Ventricles, and the Vital Spirit and other active Principles of the Blood work upon the Chyle; which being full of Salt, Sulphur and Spirit, as ſoon as its *Compages* is looſen'd by its Fermentation with the Blood in the Ventricle of the Heart (eſpecially, but alſo in the Arteries) the Principles having obtained the liberty of Motion do readily aſſociate themſelves, and are aſſimilated with ſuch parts of the Blood as are of a like and ſuitable nature; ſo that at length all the Maſs of Chyle that is capable of being turned into Blood is ſanguified; and what is not, is evacuted by Urine or Stool, or other proper Emunctory.

It is a very difficult Queſtion, by what means the Blood acquires its *Heat*: In order to the Reſolution whereof, it will be neceſſary to conſider how many ways a *Liquid Body* is capable of being heated, and thoſe (according to Dr. *Willis*) are three: *Firſt*, by ſetting it to ſomething that is hot; ſo Water is made hot by being ſet on the Fire, or in the Sun, or a Stove, or by diſſolving Lime in it. *Secondly*, When Saline Corroſives, which are of a contrary nature, being mixt with one another, or with Sulphureous, act one upon another, and by the great ſtruggling, and agitation of their Particles do often excite heat, yea ſometime Smoke and Burning; as when Spirit and Butter of Antimony, or when *Aquæ Stigia* and Oyl of Turpentine are mixt together; as alſo when Corroſive Liquors eat into Metallick Bodies, they often grow hot. *Thirdly*, (which is the only way beſides that a Liquid grows hot) when ſome Humour abounding with Sulphur or much Spirit; is ſet on Fire by holding a Flame to it, and ſo grows hot by Deflagration, as Brandy, *&c.* There are other ways indeed of Calefaction, as *Fermentation*, *Putrefaction* and *Attrition*, whereby *thicker* or *ſolid Bodies* often grow hot, but in *Liquid* they produce no ſuch effect. Thus Leven becomes (ſomewhat) hot by *Fermentation*, and Dung or wet Hay by *Putrefaction*; but neither way will a *Liquid Body* wax hot: For though Wine, Cyder, *&c.* ferment ſo much as to burſt the Sides of the Hogſhead, yet they are not actually hot; nor will Blood become ſo, when it is let out of the Body, diſpoſe it how you will in fit Glaſſes to ferment or putrifie. Indeed the Blood within the Body is fermented, and is thereby deparated, but it is not heated by ſuch Fermentation, as neither is any other Liquid. Neither does the heating by *Attrition* agree to it; for though ſolid Bodies are heated by being rubb'd one againſt another; yet ſhake and agitate Liquids as much as you will, they ſhall be never the warmer for it. Therefore there are only thoſe three ways firſt mentioned whereby actual Heat can be produced in any Liquid, let us ſee to which of them the Incaleſcence of the Blood ought to be aſcribed.

Firſt, Both the Ancients and moſt Moderns are of Opinion, that the Blood is heated the firſt way, *viz.* by the admotion of ſomething that is hot. Thus the former hath taught that the *Innate Heat* and the latter, that the *Vital Flame* is lodged in the Heart, and heats the Blood as it paſſes through it: But both theſe Opinions fall to the Ground, ſince it is clear, that the Heart is a *clear Muſcle*, and contains no fit Fewel for perpetuating a Flame, or I know not what implanted Heat: For though it muſt be acknowledged, that the Circulation of the Blood depends on the continual Motion of this Bowel, yet the *Heart* derives it Heat wholly from the *Blood*, and not the *Blood* its Heat from the *Heart*.

Secondly, This Heat cannot be cauſed in the Blood the ſecond way, becauſe its Liquor in a Natural State is always Homogeneous; and tho' it abound with Salt, yet that is only Volatile, Mild, and Benign. Nor can any one diſcover either in the *Heart*, or in any other Place, a Saline or otherwiſe Heterogeneous Mineral, by acting whereupon, or corroding whereof, the Sanguineous Liquor ſhould conceive Heat.

Thirdly, As to the third way, whereby Liquids grow hot, though it ſeem an hard ſaying, *that the Blood is accended*; yet ſeeing we can attribute its Incaleſcence to no other cauſe, why ſhould we not impute it to this? eſpecially ſeeing the *proper paſſions of Fire and Flame* agree to the *Life of the Blood*.

For the chief and moſt eſſential requiſites to continue a Flame, are theſe three; *Firſt*, That a free and continual acceſs of Air be granted to it as ſoon as it is kindled; *Secondly*, That it enjoy a conſtant Sulphureous Pabulum or Fewel; and *Thirdly*, that it be ventilated, whereby as well its fuliginous, as thicker Recrements may be continually amended

from it; And seeing these agree to the *Vital Flame* as well as to the Elementary, it seems very rational to affirm, *that Life it self is a kind of Flame.*

Thus far that Learned Author, whom the Latin Reader will do well to consult, discoursing farther on this Subject, in his *Exercit. Medicophysica de Sang. incalescentia sive accensione.*

Dr. *Henshaw* thinks that the dissimilitude of Parts between the Chyle and Blood is so great, that it becomes immediately the cause of an extraordinary Ebullition upon their mixture together; which is very much encreased by the Reciprocal Motion of the Lungs, whereby the Blood is wrought almost into a Froth or Foam by that time it gets into the left Ventricle of the Heart. Which sudden excess of Heat, is not unlike what happens upon the mingling several Chymical Liquors together, as Spirit of *Wine*, and Spirit of *Turpentine*, and other such like, where the Heat becomes so great, that it often endangers the Vessels they are contained in. He affirms (contrary to Dr. *Willis*, and I think to the Truth) that new Wine or Must, while it ferments, is hot, and that if the Juice newly pressed out of the Grapes were added to it as it begins to cool, it would again renew its Ebullition, and its Warmth would be continued so long, as one should persist to do so: In like manner he thinks it is the Warmth in the Blood continued by the new Affusion of Chyle, which renews its Fermentation, and consequently invigorates its Heat.

Diemerbroeck is of Opinion, That the *Vital Spirit* (by which he understands the most subtile part of the Blood) while through its great Volatility it always endeavours to fly away, does continually agitate the other thicker Particles of the Blood, with which it is intangled and detained from flight, and is diversly vibrated by them, and beat back; and so the whole Mass being kept in a continual fermentative Motion, there is produced in it an Heat, which in a great Agitation is great, and in a mean, mean; and in a small, small.

I might cite other Opinions concerning the reason of this *Heat*, but they generally fall it with some of those mention'd; of which I shall not make my self an Umpire, but think that Dr. *Willis* has said enough in his above-cited *Exercitation*, to evince that it is not caused either of these latter ways, *viz.* by Fermentation, or by Agitation of the Particles of the Blood in the manner *Diemerbroeck* describes it; and whether the accension of the Blood be the more probable reason of it, let the Reader Judge.

Why the Blood should be of a *red Colour* rather than any other, no satisfactory reason (I think can be given, but the Will of the Creator, though some attribute it to the Heart, others to the mixture of Salt and Subacid Juices with Sulphureous, because from such a Mixture there results a Red Colour, as appears in the Distillation of *Sal Nitre*, (which contains many Sulphureous Particles in it,) or by the pouring Oyl of Vitrol upon Conserve of Roses, or other thing that is of a palish Red (if it contain any thing of Sulphur) for it will be thereby made of a most *deep Red*. We will not spend time to shew in how many Respects these Instances differ from the *Phænomenon* under Consideration, but shall content our selves with inquiring from whence the Difference of Colour arises between the Venal and Arterial Blood. Every one knows that when Blood is let out of a Vein into a Porringer, the *Coagulum* is of a florid Scarlet Colour in its Surface, but of a dark Red from the Superficies to the Bottom, and of such a Colour it appears as it streams out of the Orifice of the Vein. But if an Artery be cut, the Stream then looks of a far brighter Colour, like the Superficies of the Venal Blood when it is coagulated in a Porringer. Now the Arterial Blood receives not this florid Colour in the Heart, but in the Lungs. For if it received it in the Heart then might the Right Ventricle be supposed to give it as well as the Left; but that it does not do so, is clear by this Experiment of Dr. *Lower*'s. If you open the *Vena Arteriosa* which receives the Blood out of the Right Ventricle, the Blood differs nothing in Colour from the Venal, but its crudled part looks every whit as black. But if one open the *Arteria Venosa* as it is entring into the Left Ventricle, it has the perfect Colour of Arterial Blood, which shews, that as it owes not that Colour to the Left Ventricle any more than to the Right (being not yet arrived at it) so it must receive that Alteration of Colour in the Lungs, in which the Nitrous Air being diffused through all the Particles of the Blood, is intimately mix'd with it, and (if you will) accends it. For if there be any such thing as a *Flamma Vitalis* (properly so called) in Animals, though the Blood (or Chyle rather) be to it instead of the Oil or other Matter whereon it feeds, yet it oweth the continuance of its burning to the Air, without the continued Inspiration of which the Animal cannot live, but instantly dies, even as a Candle is presently extinquished, if you put it in a close Place where the Air cannot come to it, or by some Engine be suck'd from it. But this by the bye; for I must confess, that (how plausible soever this Opinion may seem on other Accounts) this Alteration of the Colour of the Blood by the Air in the Lungs, is no sufficient Argument to prove any such Vital Flame, seeing the Arterial Blood being extravasated, retains its florid Colour, when no doubt if ever there was any accension the Flame is extinguished. But this Scarlet Colour is owing meerly to the Mixture of the Particles of the Air with the Blood in the Lungs, from which it transpires in a great measure through the Pores of the Skin, while the Blood circulates in the Habit of the Body, out of the Arteries into the Veins, whence the Venous Blood it self, when extravasated, appears of a Scarlet Dye in its Surface, which is meerly from its being exposed to the Air; for if one turn the congealed Blood in a Porringer upside down, the Bottom, which at the turning is blackish, will in a little while turn to a lighter Red.

Though we have confessed, that the Chyle does circulate through the Body several times before it be perfectly assimilated to the Blood; yet we do not think that it passes into the Nourishment of the Parts in the Form of Chyle. And therefore when speaking of the Nutrition of the *Fœtus* in the Womb, we often mention'd a *Nutricious Juice* (which was Chyle a little alter'd;) we did nor call it so with respect to the solid Parts of the *Fœtus*, but to the Blood it self, whose *Pabulum* or Nourishment it is, as soon as tbe Umbilical Vein is formed, as the Blood is of the Body. For as to the encrease of the first delineated Parts of an imperfect *Embryo*, that is far different from ordinary Nutrition.

The Blood then consisting of Particles of a different Nature, each particle passes into the Nourishment of that Part which is of the same Nature with it:

it: So the Salt and Sulphureous Particles being equally mix'd, are agglutinated and aſſimilated to the Fleſhy or Muſculous Parts; the Oily and Sulphureous to the Fat; the Salt and Tartareous to the Bones, *&c.* Now this is not done by any Election or Attraction of the Parts, as if they pick'd and chus'd (with a kind of Diſcretion) ſuch Particles of the Blood as are ſuitable to their own Nature, for the Maſs of Blood is equally and indifferently carried to all the Parts: But there is that diverſity of Figure both in the ſeveral Particles of the Blood, and in the Pores of each Part, that in the Circulation thro' the Habit of the Body, ſome ſtick in theſe, and others in thoſe, where they are faſten'd and united to the Subſtance of the reſpective Parts; and thoſe which thro' their peculiar Figure are unapt to adhere to one or other, return again to the Veins, and ſo to the Heart, where they receive ſome new Alteration: So that as *the Life of the Fleſh is in the Blood* (according to *Levit.* 17. 11.) ſo has it its vital Heat and Nouriſhment from it alſo.

BLOOD-WIT, is a Word uſed in Ancient Charters of Liberties, and ſignifies an Amerciament for ſhedding Blood; ſo that whoſoever had it given him in his Charter, had the Penalty due for ſhedding Blood granted him.

BLOODY-HAND, is the Apprehenſion of a Treſpaſſer in the Foreſt againſt Veniſon, with his Hands or other Part Bloody, tho' he be not found Chaſing or Hunting. *Manwood*, Part 2. C. 18.

BLUFF-HEADED; a Ship is ſaid to be ſo, when ſhe hath but a *ſmall Rake forward on*, and that her Stern is ſet too ſtrait up.

BOCEHET, is a Decoction of any thing boiled over again. *Blanchard.*

BOARD, a Word variouſly uſed at Sea: To go into a Ship is called *going a-board*; to be within the Ship, is ſaid to be *within Board*, and to be without the Ship, is ſaid to be *without Board*; when a thing is thrown into the Sea, they ſay it is *heaved over Board*; when it ſlips down by the Ship's Side, they ſay it *ſlips by the Board*; when two Ships touch one another, they ſay they are *Board and Board*; that Side of the Ship that is to Windward, they call the *Weather Board*; when a Ship lies up to Windward, ſometimes upon one Tack, and ſometimes upon another, they ſay *She makes a Board*, or *Boards it up*; and if ſhe advances much at one Turning or Tack, they ſay *She makes a good Board*; when they leave Land behind the Ship, they ſay they leave the Land on *Back-board*; to enter a Ship in a Fight, is called *Boarding of her.*

BOAT-ROPE, in a Ship, is that Rope by which the Ship tows her Boat at the Stern.

BOAT-SWAIN, or (as the Seamen call him) *Boorſon*, is an Officer a-board a Ship who hath Charge of all her Rigging, Ropes, Cables, Anchors, Sails, Flaggs, Colours, Pendants, *&c.* He alſo takes Care of the Long-Boat and its Furniture, and ſteers her either by himſelf or his Mate. He calls out the ſeveral Gangs and Companies a-board to the due Execution of their Watches, Works and Spells; and he is alſo a kind of Provoſt Marſhal, ſees and puniſhes all Offenders that are ſentenced by the Captain or Court Marſhal of the whole Fleet.

BOCARDO, the fifth Mood of the third Figure in Logick, in which the Middlemoſt Propoſition is an univerſal Affirmative, the firſt and laſt particular Negatives.

BLOCKLAND, was formerly that which we now call Free-hold Land, or Land held by Charters; and it was by that Name diſtinguiſhed from *Folk-land*, which was Copy-hold Land.

BODY; the Chymiſts uſually call that Veſſel which holds the Matter in Diſtillation of the Spirit of Vegetables a *Body*. 'Tis called alſo a *Cucurbite*, where ſee its Figure.

BODY, in Geometry, is that which hath three Dimenſions, Length, Breadth and Thickneſs; as a Line is formed by the Motion of a Point, and a Superficies by the Motion of a Line, ſo a Body is formed by the Motion of a Superficies.

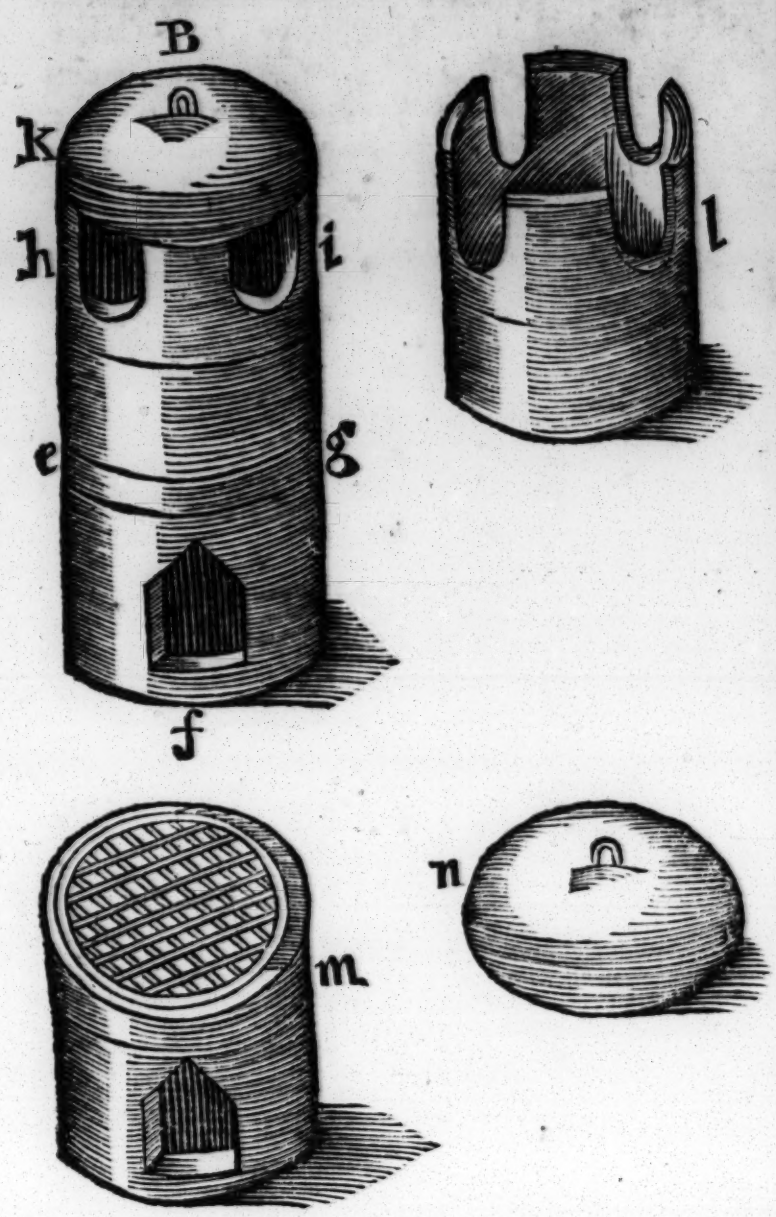
BODY, in Natural Philoſophy, is uſually defined to be a Subſtance impenetrably extended; or which having *Partes extra Partes*, cannot be in the ſame Place with, or penetrate the Dimenſions of any other Body. And this Property Sir *Iſaac Newton* expreſſes by the Word *Solidity*; and according to his excellent Philoſophy, the Idea of a Body is that which is *extended*, *ſolid* and *moveable.*

BODIES *Regular*, ſee *Regular Body.*

BOLONIAN *Stone*, is a ſmall, grey, weighty, ſoft, ſulphureous Stone, about the bigneſs of a large Walnut, and being broken, hath a kind of Chryſtal or Sparry Talk within it. It is found about *Bolonia* in *Italy* (whence its Name) and in many other Parts of the ſame Country, and in great quantity at the Foot of Mount *Paleruo*; where a Shoomaker, one *Vimenzo Coſciarolo*, gathering up theſe Stones, carried ſome of them home and calcined them, hoping to extract ſome Silver out of them; but inſtead of his Aim, he diſcovered this ſtrange *Phænomenon*, that the Stone, when expoſed to Light, would retain it, and afterwards ſhine in the Dark. After this, tho' the Stone was much celebrated for its ſhining Quality, yet the Manner of preparing it, to exhibit this *Phænomenon* was not truly and fully known or diſcovered to the World, till one Mr. *Homberg* a *German* Phyſician, living at *Paris*, took the Matter into freſh Conſideration, and made a Journey into *Italy* to enquire about the Stone, and its manner of Calcination; and 'tis he that hath given us the following Proceſs to prepare it; which *Lemery* in the laſt Edition of his *Chymiſtry*, P. 707. puts down to this Effect.

Take ſeven or eight *Bolonian Stones*, and raſp off all their Coat or Heterogeneous Earth about them till the Stone begins to gliſter and ſhine; then powder one of them in a Brazen Mortar, (which Circumference is of abſolute neceſſity, for elſe the Stone will not ſhine) and ſift the Powder finely, and moiſtening the other ſeven with clear Brandy very well, roll them up and down in the Powder till their Surface be all covered with it. Then having provided a ſmall Furnace of Earth, round, and about a Foot high, beſides the Dome, and near a Foot and half in Diameter; the Aſh-room muſt have two Doors to give the Fire the more Air, one of them right againſt the other; the Hearth need have none, but only three or four hollow Cuts or Notches (as in the Figure) the Dome ſet on it for Reverberating the Fire on the Matter; the Grate ought to be of fine Braſs or yellow Copper, which helps to render the Stone Luminous, and the Holes in it muſt be ſmall.

B, the Furnace all together, *l*, the Hearth of the Furnace ſeparated from the Dome and Aſh-room, that the Hollows or Notches may appear.



m, the Aſh-room with the Braſs Grate. *n*, the Dome by it ſelf, with its Ring to take it on and off.

All things being thus ready, put into the Furnace five or ſix kindled Coals to heat it, and when they are half waſted, fill the Furnace up to the Holes or Notches with ſmall Cinders, and then lay your Stones covered with the Powder upon them; then cover them with other Cinders that the Furnace may be full: Laſtly, fix on the Dome, and without touching it any more, let the Coals and Cinders burn to Aſhes. When the Furnace is half cold, ſeparate the Dome, the Hearth, and Aſh-room, and you will find on the Grate the Stones calcined: Lay the Grate ſoftly on white Paper, and gathering up the Stones carefully keep them in a Box with Cotton.

If theſe Stones be expoſed to the Light in the open Air, as in one's Hand out of a Window, *&c.* (but not to the Sun-beams) for about a Minute, and then carried into a dark Place, they will for ſome time appear like kindled Coals, tho' without any ſenſible Heat; the Light will abate by little and little, but may be recovered anew, by the Stones being again expoſed to the Light of the Day, as before. This ſurpriſing Quality, if well uſed, they will retain for 2, 3, or 4 Years; and when 'tis loſt, it may in part be recovered again by a new Calcination after the ſame manner.

If you draw any Figures on Paper with the White of an Egg, and while they are wet, ſtrew on them the Cruſt of this calcined Stone powdered; then dry them in the Shade, put them in a Frame, and cover them with a Glaſs: They being expoſed to the Light with the Glaſs Cover on, will at any time ſhine if removed into a dark Place.

BOLT-HEAD, *vid. Matraſs.*

BOLT-ROPE, is that Rope into which the Sail of a Ship is fixed or made faſt.

BOLTS, in a Ship, are Iron Pins, of which there are theſe ſeveral ſorts; 1. *Ring-Bolts*, which ſerve for the bringing to of the Planks, and thoſe Parts whereto are faſtned the Breeches and Tackles of the Ordnance. 2. *Drive-Bolts*, and theſe are uſed to drive out other Bolts. 3. *Set-Bolts*, which are employed for the forcing of the Planks and the other Works, and bringing them cloſe one unto another. 4. *Rag-Bolts*, which are on each Side full of Jaggs or Barbs to keep them from flying out of the Holes wherein they are driven. 5. *Clench-Bolts*, which for the ſame End are clenched, that is, made faſt at the Ends where they come thro'. 6. *Fore-Bolts*, which are made like Locks, with an Eye at each End, whereinto a Fore-lock of Iron is driven to prevent ſtarting out. 7. *Fender-Bolts*, made with long and thick Heads, and are ſtruck into the uttermoſt *Bends* or *Wales* of a Ship to ſave her Sides from Bruiſes and Hurts; and thence take their Name.

BOLUS, in a Mineral Senſe, is a kind of Earth, and which Dr. *Grew* ſuppoſes to be a Bed, as it were, the *Materia Prima* of Opacous Stones and Metals; into which he thinks thoſe of the ſaid *Bolus* are tranſmuted by being concerted with divers Salts and Sulphurs, which fly in upon them ſucceſſively.

BOLUS, is a Medicine taken inwardly, of a Conſiſtence ſomething thicker than Honey, and the Quantity for one Doſe is as much as may be conveniently taken at a Mouth-full.

BOMB-CHEST, is a kind of Cheſt, which being filled with Gun-powder and *Bombs* (according to the intended Execution) is placed under Ground to blow it up into the Air, together with thoſe that ſtand upon it. Theſe *Bomb-Cheſts* are frequently uſed to drive Enemies from a Poſt they lately ſeized, or whereof they are about to take Poſſeſſion; and are ſet on fire by the Means of a Sandidge faſtened at one End.

BOMBS or *Granada-Shells*, are hollow Balls of Caſt Iron, which are filled with whole Powder, and ſometimes with Nails, Pieces of Iron, *&c.* along with it. Their uſe is to be ſhot (out of Mortar-pieces) into beſieged Towns, to annoy the Garriſon, fire Magazines, *&c.* The largeſt are about 15, and ſome 18 Inches in Diameter. From theſe Bombs, being uſed in the beſieging of Towns, we ſay ſuch a Place was *Bombarded.*

BON-GRACE (in a Ship) is a kind of Frame made of old Ropes or Junks of Cables, which, in thoſe who ſail into Cold Latitudes, are laid out at the Bows, Sterns and Sides of the Ships, to preſerve them from being injured by the great Flakes of Ice.

BONA *Notabilia*, (in Law) is where a Man dies, having Goods to the Value of 5 Pounds, in divers Dioceſſes, then the Archbiſhop ought to grant Adminiſtration; and if any inferiour Biſhop do grant it, it is void.

BONA *Patria*, a Term in Law, ſignifying an Aſſize of Country-Men, or good Neighbours; ſometimes called *Aſſiſa bona Patria*, when twelve, or more, are choſen out of the Country to paſs upon an Aſſiſe; and they are called *Juratores*, becauſe

cauſe they ſwear judicially in preſence of the Party.

BONES, of an Animal Body. A Bone is by Anatomiſts defined to be a ſimilar Part, moſt dry, cold, hard, inflexible, void of Senſe, and affording Stabiliment and Form to the whole Body.

The Integral or Conſtituent Parts of Bones are their *Perioſteum* or inveſting Membrane, their *Subſtance*, *Pores*, *Marrow*, *Glands*, *Veſſels*, *&c.* of which take the following ſhort Account from Dr. *Haver*'s *Oſteologia*.

The *Perioſteum* hath two Sorts or Series of Fibres, the under deriv'd from the *Dura Mater*, the upper from the Membrane of the Muſcles that lies upon it; which Fibres lie one upon the other, but are not interwoven one with another.

The under Fibres run all parallel directly from one End of the Bone to the other, and are continued from one Bone to another by Means of the Ligaments that join them together in their Articulations, upon which they paſs.

The outer hold the ſame Courſe with the Fibres of the Muſcle from whence they are derived, ſometimes ſtreight, ſometimes oblique, ſometimes tranſverſe, and when they have run ſo far as to make up their Part of the *Perioſteum*, he thinks they are inſerted into the Bone, and are ſucceeded by others from ſome other Muſcles. Some of the Tendons of the Muſcles alſo propagate Fibres to make ſome Part of the *Perioſteum*; but others penetrating it, are immediately inſerted into the Bone.

The inner Superficies of the *Perioſteum* ſticks as cloſe to the Bone as if it were glued to it; and beſides, the *Perioſteum* has little *Fibrellæ* or Threads continued from it, that enter into the Subſtance of the Bone, which gives them (probably) ſome i nternal Senſe.

The *Uſes* he aſcribes to it, are, 1. To be a Tegument to the Bones. 2. To convey Spirits into the Subſtance of the Bones for maintaining their Heat, for preſerving their Senſibility, and to aſſiſt in the Work of their Accretion and Nutrition, by means of the Minute Fibres it emits into them. 3. To help to ſet Limits to the Growth and Extenſion of the Bones, as the Bark is ſometimes obſerved ſo to bind young Trees, that it is neceſſary to open it before they can have the Liberty of thriving. 4. It is ſerviceable in the Conjunction of the Bones and their Epithyſes (while theſe are Cartilaginous) alſo of the Bones which are joyned by Sutures or Harmony, and in the Connexion of the Bones and their Cartilages. 5. To join the Heads and Tendons of the Muſcles faſt to the Bones; namely, of ſuch Tendons as do not penetrate it (as ſome do not.)

Having done with the *Perioſteum*, he comes to the *Subſtance* of the Bones, which he deſcribes after this manner. He ſays, they conſiſt of *Lamellæ* or Plates lying one upon another, and theſe of ſmall Strings or Fibres running lengthways of the Bones (like as we ſee in Whale-bone;) which Strings, though ſome of them run to the very Extremities of the Bones, and others approach near to them, do not terminate there, ſo as to have diſtinct Ends, but they are, where they may be thought to terminate, ſtill continued, and run tranſverſly, and as it were arched, that the Strings of one Side of the Bone proceed as to meet and be united to thoſe that are propagated from the oppoſite; and this at both Extremities, that they are a Continuation, though not in the Figure, yet in the Manner of a Ring; therefore they are not all of a length, but in every Plate they fall one ſhorter than another.

In ſeveral Bones the *Lamellæ* are diſpoſed diverſly: In thoſe Bones which have a large Cavity, they are on every Side contiguous and cloſely united; but in thoſe which have not any great Cavity, but are altogether ſpongious within: Many of the internal *Laminæ* are placed at ſome Diſtance from one another in all their Length, having betwixt them a Cavernous Subſtance or ſmall bony Cells; and ſo have alſo thoſe Bones, which have a large Cavity, ſome of thoſe leſſer Cells at both their Extremities.

Next he comes to their *Pores*, and ſays, That in the Bones, whoſe Plates are Contiguous, there are *Pores* through and between the Plates, beſides thoſe which are made for the Paſſage of the Blood-Veſſels; and theſe are of two ſorts: The one penetrate the *Laminæ*, and are tranſverſe, looking from the Cavity to the external Superficies of the Bone. The ſecond ſort are formed between the Plates, which are Longitudinal and Streight, tending from one end of the Bone towards the other, and obſerving the Courſe of the Bony Strings. The firſt kind are formed not only in the firſt internal *Laminæ*, but in every one, even to the outermoſt, though the nearer they are to the Cavity, the greater is the number of the Pores. And as they paſs, they do not obſerve any ſuch order as to lie directly one under another, to form any continued Paſſage from the Cavity to the external Plate. The ſecond kind, *viz.* the Longitudinal, are not to be obſerved, but by good Glaſſes, unleſs it be now and then in ſome particular Bones. By theſe it is that the Medullary Oil diffuſes it ſelf, and is immediately beneficial to the Plates. The other (*viz.* the Tranſverſe) and but ſubordinate to theſe, and rather deſigned for the Paſſage of the Marrow into them, than for the immediate Communication of it to the Subſtance of the Bone.

The *Medulla* contained in the Bones; conſiſts (beſides the Blood-Veſſels) of an inveſting Membrane, in which are included Membraneous Lobules and Bags, and in theſe Bags *Veſiculæ* or Glandulous Bladders, very much like the Veſicular Subſtance of the Lungs. And theſe Glandular Bladders ſerve both for the Separation of the Medullary Oil from the Maſs of Blood, and for the Reception and Conſervation of it. In an Human Bone which he had preſerved till the Medullary Oil was wholly evaporated, he found theſe *Veſiculæ* remaining dry, but entire, and their Subſtance repreſenting, in a manner, a Sponge. They ſeem to have Pores or immediate Paſſages out of one into another (as have alſo the Bags) by which the Oil has a freer Courſe to the Joints and Subſtance of the Bone, for whoſe Benefit it was deſigned. By the Strict eſt Enquiry he could never find any thing like Ducts (as paſs from other Glandules) and indeed theſe are not here neceſſary, becauſe the Oil is not carried from the Glandular Veſſels to any large Receptacle, but flows out of the Superficies of the Marrow in as many Places as there are tranſverſe Pores in the internal Lamel. The *Medulla* ſerves to oil the Subſtance of every Bone, which the drier it were, the brittler it would be: It lubricates alſo their Articulations, and hinders their Ends from being worn or over-heated with Motion; and it moiſtens likewiſe the Ligaments, by which they are tied one to another. But in theſe two laſt Uſes it

is

is assisted by the Mucilage which is separated by the *Glandulæ Mucilaginosæ* (as he calls them) which he has observed in all the Articulations of the Bones, and are of the Conglomerate Kind, of which he speaks more in the next Chapter.

Now the manner of the Medullary Oyls insinuating it self through a Bone, and its being dispensed to all the Parts of it, is this: It first passes, being Liquid (as it all is while the Animal is alive) out of the Cavity, through the transverse Pores of the first Internal *Laminæ*, and not having Pores of the same kind directly subjacent in the next Place to transmit it towards the outside of the Bone, it flows into the Longitudinal ones formed between these two (the first and seoond) Plates, and being carried along in them till it find some transverse Pores in the second Plate, it passes through these, which when it has done, it is obliged again to alter its course, to run into and flow along the streight Pores between the second and third *Lamina*. Thus it passes through and between the Places successively, till it has made its way to the External Plate.

Thus the Medullary Oyl is dispensed in all the Bones to those Plates which are contiguous, and have no intermediate Cavities to entertain any Medullary Glands of their own: But where the Plates stand at some distance (as they do in such Bones as have not any great Cavity) there are the small Caverns (above-mention'd) which are capable of containing some Medullary Glands, from whence the Plates have more immediately, and without the former method of Conveyance, the benefit of the Marrow.

He divides the *Blood-Vessels* of the Bones into *Nutritious* and *Medullary*. The most considerable of the Nutritious enter at the ends of the Bone, *viz.* the Artery at one end, and the Veins at the other. The *Medullary* commonly enter the Sides of the Bones (and that obliquely, as the Ureters do the Bladder) both by one *Foramen*.

There are no *Nerves* that are inserted into them (except into the Teeth) but these only run through the *Periosteum* that invests them.

Some Bones have large *Cavities* in them, as *Os Humeri*, and *Femoris*, the *Ulna* and *Radius*, *Tibia* and *Fibula*, the Bones of the *Metacarpus* and *Metatarsus*, of the Fingers and Toes, and of the *Os Hyoides*; to which may be added, the lower Jaws; though the Cavity compared with the magnitude of the Bone, hardly deserves to be stiled large: Besides these large Cavities which are in the inside of the Bones, there are lesser Cells or Caverns in their Substance, which are found in all the Bones, even those which have a large Cavity. But of these before, when we spoke of the Distribution of the Marrow.

Besides the large Cavities and Cavarns in the Inside or Substance of the Bones, most have *Superficial Cavities* or Sinus's which Dr. *Havers* distinguishes into *Sulci* or Forrows (which are the long ones) and *Pits*, as he calls the shorter ones. And they have besides, *Holes* for the Nutritious and Medullary Vessels, as was but just now observed.

On the outside of the Bones there are also to be observed, their *Prominences* or *Protuberances*, of which there be two kinds; for it is either a continued part of the Bone jetting manifestly above its plain Superficies, for the more commodious insertion of the Muscles, *&c.* and is called *Apothysis*, a *Process*; or else it is like an additional Bone growing to another by simple and immediate Contiguity, (and generally softer and more porous than it) and is called *Epithysis*, an *Appendage*. If the Protuberance of the Bone be round, it is called its *Caput*; under which is the *Cervix*, as in the upper-end of the Thigh-bone: If it be flat, it is called *Condylus*; if sharpe, *Corone*, from the similitude they have to other things, as *Styloides*, *Coracoides*.

Their *Uses* are many; for they serve, 1. For the Firmitude and Sustentation of the Body, like Beams and Pillars in Houses. 2. For a Defence to some Parts; so the Skull defends the Brain, the Ribs the Parts contained in the Breast. 3. For Progression or Walking, of which they with the Muscles are the only Instruments. 4. They give Shape to the Parts of the Body. These are their *general* Uses; as to their *particular* Uses, those will be shewn as we describe them severally.

BONIS *non amovendis*, is the Writ to the Sheriff of *London*, &c. to charge him, that one concondemned by Judgment in a Nation, and prosecuting Writ of Error, be not suffered to remove his Goods until the Error be try'd.

BONNET, in Fortification, is a certain Work raised beyond the *Counterscarp*, having two Faces which form a Saliant Angle, and as it were a small *Ravelin* without any Trench. The Height of this Fortification is three Foot, and it is environ'd with a double Row of Pallisadoes, ten or twelve Paces distant from each other. It hath a Parapet three Foot high; and is like a little advanc'd *Corps du Guard*.

BONNET *a Prestre*, or *the Priest's Cap*, in Fortification, is an Out-work having at the Head three Saliant Angles, and two Inwards: It differs from the double Tenaille only in this, that its Sides instead of being Parallel are made like a Swallow's Tail, that is, narrowing or drawing close at the Gorge, and opening at the Head.

BONNETS, in a Ship are small Sails set on upon the Courses, or her Main-Sail and Fore-Sail; when they are too narrow or shallow to cloath the Mast. The words are, *Lace on the Bonner*, that is, fasten it to the Course; *Shake off the Bonnet*, that is, take it off the *Course*.

BOOM: That long piece of Timber with which the Clew of the Studding Sail is spread out, is called, the *Studding Sail-Boom*. A Boom is also used sometimes to spread or Boom out the *Clew* of the *Main* or *Fore-Sail*. The Seamen say *a Ship comes Booming* when she makes all the Sail she can. Also those Poles with Bushes or Baskets on the Top, which are placed to direct how to steer into a Channel, are called *Booms*, and by some *Beacons*.

BOOTES, the Name of a *Northern* Constellation of the fixed Stars; of which one in the Skirt of his Coat is called *Arcturus*, and is of the first Light on Magnitude. This Constellation is also called *Arctophylax*, and consists of 34 Stars.

BORBORYGM, a rumbling Noise in the Guts. *Blanchard.*

BORDLANDS, is the Demesns which Lords keep in their own Hands, for the maintainance of their Board or Table.

BORDURE, a Term in Heraldry, for an Ancient Difference in a Coat of Arms, whereby several Families of the same Name, or Persons bearing the same Coat are distinguished one from another. 'Tis a cutting off from within the Escutcheon all round it, about $\frac{1}{5}$ of the Field; and if the Line that constitutes the *Bordure* be strait, and

and the *Bordure* be plain, as they call it, then in Blazoning you muſt only name the Colour of the *Bordure*, as here, he beareth *Gules* a *Bordure Or*; without ſaying a *Plain Bordure*.

BORDURES, are ſometimes *Engrailed*, *Gobonated*, *Invected*, *Indented*, *Counter Compony*, *Vairy*, *Checky*: Which ſee under thoſe Words. If a *Bordure* be charged with any Parts of Plants or Flowers, they ſay *Verdoy of Trefoiles*, or whatever Flower it be. If the *Bordure* conſiſt of *Ermins*, *Vairy* or any of the Furs, the Term is *Purflew of Ermins*. If the *Bordure* be charged with *Martlets*, the Word is, charged with an *Enaly ron of Martlets*, &c.

BOREAL or *Northern Signs*, are the ſix firſt Signs of the *Zodiack* or thoſe on the *Northern* ſide of the *Equinoctial*.

BOROUGH *Engliſh* (a Term in Law) is a cuſtomary deſcent of Lands or Tenements in ſome Places, whereby they come to the youngeſt Son; or if the Owner have no Iſſue, to his youngeſt Brother.

BOROW or *Borough*, ſignifies with us a Corporate Town, that is not a City.

BOROG-HEAD or *Head-borough*, is the chief Man of the *Decury* or Hundred.

BOSPHORUS (in Geography is a long narrow Sea running in between two Lands, by which two Continents are ſeparated; and by which way a Gulf and a Sea, or two Seas have a Communication one with another, as the *Thracian Boſphorus*, now called the *Straits of Conſtantinople*.

BOTANICKS or *Botany*, is that part of the Art of *Medicine* which deſcribes and enumerates the ſeveral Virtues of Plants; and that part of *Natural Hiſtory* which teaches rightly to diſtinguiſh the ſeveral Kinds and ſubordinate Species of Plants, Trees, Shurbs, *&c.* one from another, and which gives juſt Deſcriptions of them. And he that is accurate in this Art is called a good

BOTANIST: See Schemes of the ſeveral kinds of Plants under the word *Plant*.

BOTHRION, the Name of a kind of hollow, narrow, and hard Ulcer in the Eyes. *Blanchard.*

BOTTONY, a Term in Heraldry for one of their Croſſes of this Figure, *Argent* a *Croſs Bottony Sable*, by the Name of *Winwood*.

BOW, of a Ship, is that part of her which begins at the *Loof* and *compaſſing* Ends of the *Stem*, and ends at the Sternmoſt part of the *Fore-Caſtle*. If a ſhip hath a Broad Bow, they call it a *Bold Bow*: If ſhe hath a *narrow thin Bow*, they ſay ſhe hath a *Lean Bow*. The Piece of Ordnance that lies in this place is called the *Bow Piece of Ordnance*; and the Anchors that hang here are called her *Great* or *Little Bower*.

BOW, a Mathematical Inſtrument made in Wood, formerly uſed by Seamen to take the Altitude of the Sun.

BOW, alſo, is a Beam of Wood or Braſs with three long Screws, that govern or direct a Lath of Wood or Steel to any Arch; uſed commonly to draw Draughts of Ships, Projection of the Sphere, or where-ever 'tis requiſite to draw large Arches.

BOW-SPRIT, is a kind of Maſt, reſting ſlopeways on the Head of the main Stem, and having its lower End faſtned to the *Partners* of the Fore-Maſt, and farther ſupported by the *Fore Stay*: It carries the *Sprit-ſail*, *Top-ſail*, and *Jack-ſtaff*; and its Length is the ſame with the Foremaſt.

BOWER, any Anchor carried at the Bow of a Ship is called her *Bower*: There are uſually carried 2 there, the firſt and ſecond *Bower*; but the greateſt Anchor is carried in the Hold.

BOWLING, or rather *Bow-Line*, is a Rope faſtned to the *Leach*, or middle part of the outſide of the Sail; it is faſtned in three or four parts of the Sail, which is called the *Bowling Bridle*; but the *Mizen Bowling* is faſtned to the lower end of the Yard. All Sails have it except Sprit-ſail, and Sprit-ſail Top-ſail, and therefore thoſe Sails cannot be uſed cloſe by a Wind; for the uſe of the Bowling is to make the Sails ſtand ſharp, or cloſe, or by a Wind: The Words belonging to it are theſe, *Sharp the Bowling*, *Hawl up the Bolwing*, *Set faſt the Bowling*, that is, pull it up hard, or hale it more, forward on; but when they ſay, *Eaſe the Bowling*, *check* or *run up the Bowling*; they mean, let it more ſlack.

BOWLING KNOT, is a Knot that will not ſlip, by which the *Bowling Bridle* is faſtned to the *Crengles*.

BOWSE, a Sea Term, ſignifying as much as *Hale* or *Pull*. Thus haling upon a Tack, is called *Bowſing upon the Tack*. And when they would have the Men pull all together they cry, *Bowſe away*.

BOX *and Needle*, is the application of a ſmall Compaſs to a Theodelite, and is uſed in *Surveying*, *&c.* to find out the Situation of Places, by the pointing of one end of the Magnetical Needle towards the *North*.

BOY, of an Anchor: See *Buoy*.

BOYAU, or *Branch of the Trenches*, in Fortification, is a particular Ditch ſeparated from the main Trench, which in winding about encloſeth different Spaces of Ground, and runs parallel with the Works and Fences of the Body of the Place; ſo that when two Attacks are made near one to another, the *Boyau* ſometimes makes a communication between the *Trenches*, and ſerves as a Line of Contravallation not only to hinder the Sallies of the Beſieged, but alſo to ſecure the Miners. But when 'tis a particular Cut that runs from the Trenches to cover ſome Spot of Ground, it is then drawn parallel to the Works of the Place, that it may not be *Enfiladed*; that is, that the Shot from the Town may not ſcoure along it.

BRACED, the Term in Heraldy for the intermingling of three *Chevronells*, thus;

Azure, a *Chief Or*, and three *Chevronells* Braced in the Baſe of the *Eſcutcheon*, by the Name of *Fitz-hugh*.

BRACES, are Ropes belonging to all the Yards of a Ship except the Mizen, two to each Yard; there is a Pendant ſeized to the Yard Arms, at whoſe other end there is a Block, through which the Brace is reeved, and their uſe is to *Square the Yard*, that is, to ſet it Square; to *Brace the Yard*, that is, to bring it to either ſide; to *Traverſe the Yard* that is,

is, to ſet it any way overthwart; and to *Right the Yard*, that is, to bring it ſo that it ſhall ſtand at Right Angles with the Length of the Ship. All *Braces* come afterward on, the *Main Brace* comes to the *Poop*, the *Main Top-ſail Brace* to the *Mizen top*, and thence to the *Main Shrouds*; the *Fore* and *Fore-top-ſail Braces* come down by the *Main* and *Main-top-ſail Stays*; and ſo of all the reſt. But the *Mizen Bowling* ſerves for a *Brace* to that Yard, and the *Croſs-Jack Braces* are brought forwards to the *Main Shrouds* whenever a Ship ſails cloſe by a Wind.

BRACHIÆUS *Externus*, is a Muſcle of the Cubit, which ſeems to be the third beginning of the *Gemellus*; its Origination is continued from above the middle of the inferiour and back part of the *Os Humeri* to its Cavity, which receives the *Olecranium* Extenſion of the Cubit, where joining with the Tendinous Outſide of the *Gemellus*, it is inſerted with it as aboveſaid.

BRACHIÆUS *Internus*, is a Muſcle of the Cubit, which derives its Name from its Situation, lying partly under the *Biceps*: It ariſeth fleſhy from the Internal Part of the *Os Humeri*, at the Inſertion of the *Deltoides* and *Coracobrachialis* Muſcles, and deſcending over the Juncture of the *Cubit* with the Arm-bone, it's inſerted partly Fleſhy and partly Tendinous to the Superior and Forepart of the *Ulna*: Its uſe is to help bend the *Cubit*.

BRACHIOLUM, is a kind of Index or Label put upon Aſtrolabes and other Projections of the Sphere; and by ſome *Engliſh* Writers is called a *Creeping Index*.

BRACHYCATALECTICK *Verſe*: See *Depoſition*.

BRACHYGRAPHY, is the Art of Short-hand.

BRACKETS (in a Ship) are ſmall Knees ſerving to ſupport the Galleries; and ſo thoſe Timbers are called that ſupport the *Gratings* in the Head.

BRADYPEPSY, is ſlow Digeſtion, proceeding from a depraved Diſpoſition of the Acid Ferment in the Stomach. *Blanchard*.

BRAILS, are ſmall Ropes reeved thro' Blocks which are ſeized on either ſide the Ties, a little diſtance off, upon the Yard; ſo that they come down before the Sails of a Ship, and are faſtned at the Skirt of the Sail to the Crengles. Their uſe is, when the Sail is furled a-croſs, to hale up its Bunt, that it may the more readily be taken up or let fall. Theſe Brails belong only to the two Courſes and to the Mizen Sail. The word is, *Hale up the Brails*, or which is all one, *Brail up the Sails*; for the meaning is, that the Sail ſhould be haled up, in order to be furled, or bound cloſe to the Yard.

BRAIN (ſee *Cerebrum* and *Cerebellum*) in the general Senſe of the Word, is taken for all the ſoft Subſtance which is contained within the whole Skull, and which the *Greeks* comprehended under the Word ἐγκέφαλος. It is the general Organ of Senſe, in which the Soul, the Governour of the Body, perceives and judgeth of the Senſations of all the Sentient Parts; and *out of which*, as out of a Fountain, it communicateth the Animal Spirits (bred in the Brain) by the Ducts and Rivulets of the Nerves to all the Sentient Parts of the Body; and thereby endows them with the Faculty of performing Animal Actions.

The Brain being of ſo looſe a Subſtance, and the Skull wherein it is incloſed ſo hard that the Saw or Chizel are neceſſary to break through it, the Brain muſt needs be very much ſhattred or concuſſed thereby; and after the Skull is divided, in the very pulling of it off, the vaſcular Connection or the *Dura Mater*, and it with the *Pia Mater* and *Brain* (and that alſo of the one with the other) being torn in ſunder, the Parts into which Veſſels are inſerted, are neceſſarily much violated: And laſtly, after the Covers are removed, ſeveral parts of the Brain being of ſuch difficult acceſs, that others muſt be quite ſpoiled, before one can come to a view of them, and theſe alſo thereby in part violated: Upon all theſe accounts a true Anatomy of the Brain, as to its Contiguities, Connections, Cavities or Venticles, *&c.* muſt be very difficult; ſo that 'tis no wonder the Obſervation of Anatomiſts are ſo different, and ſo oppoſite to one another. But this by the bye, let us next diſcourſe of the Brain more generally.

If by *Brain* we underſtand the whole Ἐγκέφαλος (or all that which is contained within the Skull) it is not of one *Subſtance*, but divers; and is diſtinguiſhed by the particular Names of the *Cerebrum*, (in ſpecial) the *Cerebellum* and the *Medulla oblongata*. Nor is the *Cerebrum* (*properly* ſo called) it ſelf of a like Subſtance, but conſiſting of a Cortical and Medullar Part (called *Corpus Calloſum* and theſe differ in their Nature, Colour and Conſiſtence. Which difference *Malpighius* thus deſcribes: The *Cortex* (being of an Aſh-colour) he ſays, is Glandulous: The outſide of the Glands is covered with the *Pia Mater*, and its Blood-Veſſels, which penetrate deep into their Subſtance; (each Gland having a Twig of both an Artery and a Vein:) Their inner ſide ſends forth a white Nervous Fibre, like a proper Veſſel, as it were, ſo far as their Brightneſs and Whiteneſs permit one to diſcover. Theſe Fibres make up all the *Pith* (or *Corpus Calloſum*) which is of a more cloſe and ſolid Subſtance than the *Cortex*. They are flattiſhly round, and are not unlike thoſe white Bodies, or *Inteſtinula*, which the Teſticles are made up of; and in the Venticles of the Brains of Fiſh they are ſo apparent, that if you hold them betwixt you and the Light, they repreſent the ſmall Teeth of an Ivory Comb. He ſaith, they are inſerted by their Ends into (or rather ariſe out of) the *Cortex* or Aſh-coloured outer part of the Brain, and ſeem all of them to have their egreſs out of (or rather ingreſs into) the Trunk of the Spinal Marrow within the Skull.

Whether they be hollow or not, or whether as they are collected into a Bundle, they have not Pores and Interſtices ariſing therefrom, which tranſmit a peculiar Juice into the Nerves continued to them, he leaves undetermined; becauſe they neither admit of Ligature, nor can Senſe make any diſcovery thereof. Dr. *Ridley* (from *Lewenhoeck*) offers at a yet finer Deſcription of theſe two Parts of the Brain, which the curious Reader may find in his *Anatomy of the Brain*, P. 89, *&c.* For the other Parts of the *Encephales*, viz. the *Cerebel* and *Medulla oblongata*. See theſe words.

The *Brain* receives Blood by *Arteries* derived from the *Carotides* and *Cervical*, whoſe Capillaries are diſperſed chiefly through its Cortical Part. Theſe Arteries are ſo large and numerous, that a third part, at leaſt, of the whole Maſs of Blood is conveyed hither by them; which ſeeing through the ſmallneſs of the Brain it cannot be conſumed in its Nutrition, *Malpighius* thinks it probable, that the Coagulative (or Concreſcible) *Serum* is filtred as it were in the *Cortex*, (or Glandulous Part) of the Brain from the Arterial Blood, and that the Fibres of the *Cortex Calloſum*, as ſo many Roots implanted into the ſaid *Cortex*, imbibe this *Serum* and convey it to the *Medulla Oblongata* as the Trunk from

from whence it is derived into the Nerves as the Branches, and is derived and is there the *Succus Nervo*, if not the Animal Spirit it ſelf. Part nouriſhes the Brain it ſelf, and what is ſuperfluous to both theſe uſes, is partly reſumed by the *Veins* of the *Meninges* (whoſe Twigs reach all the ſeveral Glands of the *Cortex*) and partly repoſited in the *Sinu's* of the *Dura Mater*, by the Arteries themſelves, out of which it is reſorbed by the Internal Branches of the Jugulars, and thereby conveyed back to the Heart. The Arteries inoſculate one with another (*i. e.* the Right *Carotides* with the Left) and ſo do the Veins alſo; but not the Arteries with the Veins. It is from the Pulſe of the Arteries altogether, that the beating (or *Syſtole* and *Diaſtole* as it were) of the Brain proceedeth.

A Man of all living Creatures hath the *biggeſt Brain*; for it weigheth four or five Pound in ſome, and is as big again as an Ox's Brain.

The outer Surface is full of Windings, like thoſe of the Guts, which are ſeverally inveſted with the *Pia Mater*, as alſo tied together by it. The whole Brain is much of the ſame *Shape* with the Head, *viz.* roundiſh, but with bunchings out towards the Forehead.

BRANCH *of the Trenches*: See *Boyan*.

BREACH, in Fortification, is the Ruins which are made in any part of the Works of a Town, *&c.* either by playing Cannon, or ſpringing Mines, in order to ſtorm the Place, or take it by Aſſaults. They ſay, Make good the Breach, Fortifie the Breach with *Chevaux de Friſe*, Make a Lodgment on the Breach; Clear the Breach, or move away the Rubbiſh of it, *&c.*

BREAK *Ground*, in Fortification, ſignifies to begin the Works for carrying on the Siege about a Town or Fort.

BREAMING, of a Ship: See *Erooming*.

BREAST-FAST, a Rope in a Ship made faſt to ſome part of her forward-on, to hold faſt her Head to a Warp, or the like.

BREAST-HOOKS, in a Ship, are the *Compaſſing Timbers* before, which help to ſtrengthen her *Stem*, and all her *Fore-part*.

BREAST-ROPES, in a Ship, are thoſe which faſten the Parrels to the Yards.

BREAST-WORKS, the ſame with *Parapet*.

BREDWITE (in Law) ſeems to have been that Impoſition of Fines or Amerciaments for Defaults in the Aſſize of Bread.

BREECHINGS; ſo the Seamen call thoſe Ropes with which they *laſh faſt*, or faſten their great Guns to the Ship-ſides.

BREEZE, a ſhifting Wind, blowing from the Sea or Land for ſome certain Hours of the Day or Night.

BREGMA or *Pregma*, is the Fore-head Bone, according to ſome Writers, but its rather the *Sinciput*.

BREVE, the ſame with *Brief*.

BREVE *Perquirere*, to purchaſe a Writ or Licence of Trial in the King's-Court, by the Plaintiff, *qui* breve *perquiſivit*. Hence the preſent uſage of paying 6 *s.* and 1 *d.* where the Debt is 40 *l.* and 18 *s.* where the Debt is 100 *l.* and ſo upward in Suits of Money due upon Bond.

BREVE *Recto*, a Writ of Right, or Licence for a Perſon ejected, to Sue for the Poſſeſſion of an Eſtate detained from him.

BREVE-VAS, a ſhort Vein paſſing from the Stomach to the Veiny Branch of the Spleen. 'Tis commonly called the *Vas Breve*.

BREVIBUS *& Rotulis liberandis*, is a Writ or Mandate to a Sheriff, to deliver unto the new Sheriff, choſen in his room, the County with the appurtenances, *una cum Rotulis Brevibus*; and all other things belonging to that Office.

BREVIS, alſo is the Name for one of the Muſcles of the *Radius*, ſerving to turn the Palm of the Hand upwards.

BRIBORS (a *French* Law term) ſignifying one that pilfereth another Man's Goods.

BRICOLS, are by ſome ſaid to be Engines, formerly uſed to batter the Walls of the Towns or Caſtles.

BRIDGE *Flying*, a Term in Fortification: See *Pont Volant*.

BRIEF (or *Breve*) a Term in Law, ſignifying Proceſs that Iſſues out of the Chancery or other Courts, commanding the Sheirff to ſummon or attack *A*, to anſwer to the Suit of *B*, *&c.* But more largely it is taken for any precept of the King in Writing under Seal, iſſuing out of any Court, whereby he commands any thing to be done for the furtherance of Juſtice and good Order.

BRIGADE, is a Party or Diviſion of a Body of Soldiers, whether Horſe or Foot. There are two ſorts of *Brigades* according to the *French* way of accounting. (1.) A *Brigade* of an Army, which is a Body of Horſe conſiſting of 10 or 12 Squadrons, or a Body of Foot of 5 or 6 Battalions: And this way an Army is ſometimes divided into eight Brigades, four of Horſe, and four of Foot. 2. A *Brigade* of a Company of Cavalry, is its third Part, when it conſiſts only of 50 Officers; but its ſixth Part when of 100. *Grand Dictionarie Francoiſe*.

BRIGADIER, is he that commands any *Brigade*.

BRIGANTINE, is a ſmall light Veſſel which can both Row and Sail well, and is either for Fighting or giving Chaſe: It hath about 12 or 15 Benches for the Rowers, one Man to a Bench; all the Hands aboard are Soldiers, and each one hath his Musket lying ready under his Oar. *Great Fr. Dict. of Arts and Sciences*.

BRISURE, a Term by ſome Writers of Fortification, for a Line extended in Length from four to five Fathom, which is allowed to the *Curtain* and *Orillon* to make a hollow Tower, or to cover the concealed *Flank*.

BRODE *Halpeny*, or *Broad Half-peny*, or *Boardhal-penny* (a Term in Law) ſignifying, to be quit of certain Cuſtoms exacted for ſetting up of Tables or Boards in Fairs or Markets; and thoſe that were freed by the King's Charter of this Cuſtom, had this Word put in their Letters Patents; by reaſon whereof, at this Day, the Freedom it ſelf, for brevity of Speech, is called *Broad Hal-peny*.

BROKEN *Ray*, or *Ray of Refraction*, in *Dioptricks*, is a Right Line, whereby the *Ray of Incidence* changeth its Rectitude, or is broken in traverſing the ſecond *Medium*, whether it be thicker or thinner.

BRONCHOCELE, is a Tumour in the Top or the middle Fiſtulous Part of the Wind-Pipe. *Blanchard*.

BRONCHOTOMY, is the Section of the Wind-Pipe in a Membraneous Part betwixt two of the Rings. It is uſed to prevent Suffocation in People troubled with a *Squinancy* or *Quinſy*.

BRONCHUS, is the Middle Fiſtulous Part of the Wind-Pipe, whoſe Fore Part is made up of ſo many little Rings; the upper Part is called *Larynx*,

and the under *Veſicularis*. It ſerves for the Modulation of the Voice, and in Reſpiration.

The Ramifications of the *Aſpera Arteria* or Wind-Pipe all over the Lungs, are called the *Bronchia* of the Lungs.

BROOMING, or *Breaming of a Ship*, is burning off the Filth ſhe hath contracted on her Sides, with Straw, Reeds, *&c.* when ſhe is on a Careen, or on the Ground; ſo that this is a kind of *Graving*.

BRUDGBOTE, or *Bridgebote*, a Law Term, ſignifying to be quit of giving Aid to the Repair of Bridges.

BRUMAL, is that which comes in Winter; as the *Brumal Solſtice*, as ſome call the Winter one.

BRUSK: See *Tenny*.

BUBO, is the Groin, or Place from the Bending of the Thigh to the Privy-Parts; alſo a Tumour in the Groins, proceeding from the Pox or Peſtilence. *Blanchard*.

BUBONOCELE, is a Rupture, when the Inteſtines fall into the Groin, or the outmoſt Skin of the *Scrotum*: Sometimes its taken for a Bubo or Swelling. *Blanchard*.

BUCCELLATION, by ſome Chymiſts, ſignifies a dividing into Gobbets.

BUCCINATOR, is the round circular Muſcle of the Cheeks, thin and membranous, interwoven with various Fibres, and inſeparably girt about with the Tunick of the Mouth. *Caſſerius* has obſerved a certain ſtrong Band that grows outwardly in the Center of this Muſcle, which ſpreading it ſelf about the Cheek-bone, is terminated in a little ſlender Muſcle directly oppoſite to that Part of the Face called *Bucca*: It ariſes from the Upper-Jaw-bone, and is faſtned in the Lower, at the Roots of the Gums. Its Uſe is to move the Cheeks with the Lips; and ſerves as a Hand to the Teeth, whilſt it toſſes the Meat too and fro, and throws it upon the Teeth, that it may be more exactly chewed. This Muſcle hath the Name of *Buccinator* from its forcing out the Breath of Trumpeters. Mr. *Cowper* ſaith, it ſprings not from the Ends of the Upper, nor Ends in that of the Under Jaw, nor is it of that Figure which vulgar Anatomiſts pretend, nor intermix'd with various Orders of Fibres; but that it ariſes broad and fleſhy from the Fore Part of the *Proceſſus Coronæ* of the lower Jaw, and from hence proceeding with direct Fibres, it adheres to the Gums of both the Jaws, and is ſo inſerted to the Angle of the Lips. Beſides its uſe in blowing the Trumpet, Horn, *&c.* it pulls the Mouth to one Side.

BUCOLICKS, are Paſtoral Songs or Poems, ſuch as the *Eclogues* of *Virgil*, and the *Idyls* of *Theocritus*.

BUDGE *Barrels*, are ſmall Barrels filled with Gun-powder, having a Purſe or Caſe of Leather made faſt over their Head to prevent the Powder's taking Fire; they are uſed to carry the Powder in a-board a Ship.

BULBOUS *Roots*, are ſuch as are deſcribed in the Word *Bulbus*.

BULBUS, in Botany, ſignifies the round Root of a Plant encompaſſed about with many Coats (like an Onion) one within another; or elſe ſet round thick with many ſmall Scales; and which ſends out many Strings or Fibres from the Bottom of the *Bulb*, or Baſe of the Root.

BULIMOS, or an Ox-like Appetite, that is, when the Hunger is ſomewhat greater than that which is called *Fames Canina*, or when the Stomach craves, but cannot receive, whereas in the other Caſe, the Eating is anſwerable to the Appetite. *Blanchard*.

BULK *of a Ship*, is her whole Content in the Hold for the Stowage of Goods.

BULK-HEADS, are Partitions made a-croſs a Ship with Boards of Timber, whereby one Part is divided from another. The *Bulk-head* afore is the Partition between the Fore-Caſtle and Grating in the Head, and in which are the *Chaſe Ports*.

BULLION, is taken for Gold or Silver in the Maſs or Billet; it is alſo the Place where Gold or Silver is brought to be tried and exchanged.

BULRUSH-BRIDGE, in Fortification, is a *Bridge* made of many Bundles of Bul-ruſhes bound together and covered with Planks, to ſecure a Paſſage over the Boggs, Marſhes, and Fenny Places.

BULWARK, much the ſame (anciently) with a *Baſtion* in Fortification: Which ſee.

BUNT *of a Sail*, is the middle Part of it, which is purpoſely formed into a kind of Bag or Cavity, that the Sail may receive the more Wind: It is chiefly uſed in Top-ſails; for Courſes are for the moſt part cut Square, or at leaſt with a ſmall Allowance for *Bunt* or Compaſs. They ſay the *Bunt holds much Leeward-Wind*, *i. e.* the *Bunt* hangs too much to Leeward.

BUNT-LINES, are ſmall Lines made faſt to the Bottom of the Sails in the middle Part of the *Bolt-Rope* to the Crengle, and ſo are reaved thro' a ſmall Block ſeized to the Yard; their uſe is to trice up the Bunt of the Sail for the better furling of it up.

BUOY: A *Buoy* at Sea is a Piece of Wood or a Barrel faſtned ſo as to float directly over the Anchor, that ſo the Men that go in the Boat to weigh the Anchor may certainly know where it lies. The Term of Art is, *Stream the Buoy*, that is, let the Anchor fall while the Ship has *way*. From hence the word *Bouyant* ſignifies any thing that is floating or floatable.

To buoy up a Cable, is to faſten ſome Piece of Wood or Barrel, *&c.* to the Cable near the Anchor, that the Cable may not touch the Ground when they ſuſpect the Ground to be foul (that is, Rocky) leaſt the Cable ſhould be fretted and cut off.

BUOYS, are alſo uſed at Sea to diſcover Rocks and Shelves, by being faſtned over them.

BURBREACH (a Term in Law) is to be quit of Treſpaſſes committed againſt the Peace in City or Borough.

BURGAGE, is a Tenure proper to Cities, Boroughs and Towns, whereby the Burghers, Citizens or Townſmen, hold their Lands or Tenements of the King, or other Lords, for a certain Rent.

BURGMOTE, is a Court of a Borough or City.

BURGHBOTE, is a Contribution towards the Building or Repairing of ſome Caſtles or Walls of Defence, or towards the Building of a Borough or City: From which Duty ſeveral Perſons had obtained an Exemption by the Ancient Charters of our *Saxon* Kings; whence the Word is often taken for the Liberty or Exemption from ſuch Cuſtomary Service.

BURGLARY, naturally ſignifies the Robbing of a Houſe, but in a Legal Senſe is a Felonious entring

tring into another Man's Dwelling; wherein ſome Perſon is, or into a Church in the Night-time, to the End to commit ſome Felony, or to Kill ſome Man, or to Steal ſomewhat thence, or do ſome other Felonious Act, albeit he executes not the ſame.

BURNING-GLASS. One M. *Villete* made a Metalline Burning Conclave at *Lyons* in *France*, of a round Figure, 30 Inches Diameter, and of about 100 *lb.* weight. The *Focus* or burning Point being diſtant from the Conclave about 3 Foot; and its Bigneſs, that of ½ of a *Louis D'Or*: It would melt Iron in 40 Seconds, Silver in 24, Copper in 42; and turn'd Quarry Stone into Glaſs in 45, and Mortar in 53 Seconds: It melted a piece of Watch Spring of Steel in 9 Seconds. *Phil. Tranſ.* N. 6.

After that *Villette* made another of 34 Inches Diameter, which would melt all ſorts of Metals of the thickneſs of a Crown Piece in leſs than a Minute, and vitrifie Brick in the ſame time. *Phil. Tranſact.* N. 49.

Francis Smithwick, Eſq; F. R. S. produced before the Royal Society, *Feb.* 27. 166⅔, 2 Burning Concave Glaſſes, of a Figure not Spherical; one of 6 Inches Diameter, and its *Focus* 3 Inches diſtant from the Center; the other of the ſame Diameter but leſs Concave, and its *Focus* 10 Inches diſtant. Thoſe when approached to a large Candle lighted, did ſomewhat warm the Faces of ſuch as were 4 or 5 Foot diſtant at leaſt; and when held to the Fire, burned Gloves and Garments at 3 Foot diſtance from the Fire: He did alſo with the deeper of them, in the preſence of Biſhop *Ward*, turn a Piece of Wood into Flame in 10 Seconds of Time, and with the ſhallower in 5 Seconds, in *Autumn*, about 9 in the Morning, and the Weather gloomy. *Phil. Tranſact. N.* 33.

BURNING-ZONE: See *Zone*.

BURSALIS: *Vid. Marſupialis*.

BURTON, on Board a Ship, is a ſmall Tackle to be faſtned any where at pleaſure, conſiſting of two ſingle Pulleys: Its uſe is to hoiſt ſmall things in or out: and this will purchaſe more than a ſingle Tackle with two Blocks.

BUST, is a Term in Sculpture, ſignifying a *Figure* or *Statue* of but one half of a Human Body; the Head, Shoulders and Breaſts appear, but no Arms, and it is made tapering from the Breaſt downwards.

BUSTROPE, *i. e. Boum Verſatio*, the turning of Oxen when they Plow the Ground: This (as *Marius Victorinus* tells us) was the Antient manner of Writing among the *Romans*, who at firſt writ as it were in Furrows, the firſt Line beginning at the Left-hand went to the Right, and then the ſecond beginning at the Right-hand was continued back to the Left; and ſo it lookt like the Furrows of Land Plowed by Oxen.

BUTT, in the Sea Language, is the End of any Plank which joins to another on the outſide of a Ship under Water; and therefore when a Plank is looſe at one end, they call it *Springing a Butt*; to prevent which, Ships are uſually bolted at the *Butt Heads*, that is, at the Planks End.

BUTTER *of Antimony*, or as ſome call it, *the Ice Oyl* of that Mineral is a great *Cauſtick* made by uniting the Acid Spirits of Sublimate Corroſive with Regulus of Antimony, thus,

Six Ounces of Regulus is mix'd with a Pound of Sublimate, both powdered, and then the matter is put into a Glaſs Retort, whoſe half muſt be empty; Diſtill in Sand with a ſmall Fire at firſt, a little clear Oyl; then encreaſe the Fire, and a white thick Liquor like Butter will come forth; which if a Pan of Coals be not applyed to melt it, will choak up, and it may be, break the Neck of the Receiver; continue the Fire till the Red Vapours come. Then unlute the Receiver, and if you have a mind to recover the Mercury, apply another filled with Water in its room, the Quickſilver will run over into the Water. This *Butter of Antimony* is uſed to eat Proud Fleſh, and to cleanſe Ulcers.

BUTTER *of Tin*, is made after the ſame manner, of one part of Tin in Powder and three parts of Sublimate Corroſive; and what is very ſtrange of this Jovial Butter, it is continually emitting Fumes, or Smoaking.

BUTTOCK *of a Ship*, is that part of her which is her Breadth right a Stern from the Tack upwards; according as a Ship is built broad or narrow at the Tranſom, ſhe is ſaid to have a broad or a narrow *Buttock*.

BUTTRESS, is an Arch or Maſs of Stone ſerving to ſupport the ſides of a Building, Wall, *&c.* on the outſide: They are chiefly uſed in ſuch Buildings as are of the *Gothick* manner.

BY-LANDER, See *Belandre*.

BY-LAWS, are Orders made in Court-Leets or Court-Barons by common conſent, for the good of thoſe that exact them, and which extends farther than the Publick Law binds. *Blunt*.

BYQUARTILE, the ſame with *Biquartile*.

CABALLINE *Alloes*, is a courſer ſort, which being generally uſed by Farriers to purge Horſes, is called by this Name of *Caballine Alloes*.

CABLE *of a Ship*, is (as is well known) a great Rope of 3 *Strands*, which being faſtened to the Anchor holdeth the Ship faſt when ſhe rides. The Sea Terms about it are, 1. *The Cable is well laid*, that is, is well wrought or made. 2. *Serve the Cable*, or *Plat the Cable*, that is, bind it about with Ropes, Clouts, *&c.* to keep it from galling in the Hawſe. 3. *To ſplice a Cable*, is to make two Pieces faſt together, by working the ſeveral Strands of the Rope one into another. 4. *To Quoile the Cable*, is to roll it up round in a Ring, of which the ſeveral Rolls one upon another are called *Cable Tire*. 5. They ſay, *Pay more Cable*, that is, let it more out from the Ship, that the Boat which carries the Anchor may the more eaſily drop it into the Sea; and ſometimes they ſay *Pay cheap the Cable* (*i. e.*) put or hand it out apace. In the ſame Senſe, as *Pay more Cable*, they ſay alſo *Veer more Cable*, that is, hand or let more out. When two Cables are ſpliced together, 'tis called *A Shott of a Cable*.

CABOSED (*Spaniſh*) the Term in Heraldry for the Head of any Beaſts, being cut off-juſt behind the Ears by a Section parallel to the Face, or by a perpendicular Section; whereas *Couping* is uſually expreſſed by an Horizontal one, and is never ſo cloſe to the Ears as *Caboſing*.

CABURNS (in a Ship) are Lines uſed to bind Cables withal; they are uſually made of *Rope Yarn* or *Spun Yarn*.

CACATORIA *Febris*, is an intermittent Fever (ſo called by the famous *Sylvius*) accompanied with a violent Purging, which is ſometimes griping and very painful, extreamly afflicting and weakning to the Patient.

CACHECTICUS, is one that has an ill Habit of Body.

CACHEXY, is an ill Habit of Body, proceeding from a bad Diſpoſition of the Fluids and Humours; whence lingring Fevers, Conſumptions and Dropſies are contracted: In this Diſeaſe the Face is often Pale and Diſcoloured, and the Body big and ſwoln. *Cachexia*, taken alſo in a large Senſe, is oppoſite to *Δεξία*, and as a good Habit of Body is common to all ſound Parts, ſo an ill one is propagated by all the ill Parts. Strictly, *Cachexy* is only taken for an ill Diſpoſition of the Habit of the Body; and *Euexia*, on the contrary, for a good Diſpoſition of the Humours, or Blood, and Body. *Blanchard*.

CACOCHYMY, is the abundance of ill Humours in the Blood; and it is either Ulcerous, Bilious, Pituitous, Melancholick, Acid, Salt or Sharp. *Blanchard*.

CACOETHES, *Chironium Ulcus*, or *Telephium*; is a Diſeaſe or Ulcer beyond Cure, which is called *a Malignant Ulcer*; this happens when an Ulcer is Callous or Sinuous, under which there ſometimes lie little putrified Bones that have fallen down. *Blanchard*.

CADENCE, or *Cloſe*, in Muſick, is a kinds of Concluſion of the Tune, which is made of all the Parts together in divers Places of any Key.

CADUCUS *Morbus*, or the *Epilepſy*, is a Convulſive Motion of all the Parts of the Body, more eſpecially in the Hands and Feet, accompanied with a Deprivation of the Inward and Outward Senſes.

CÆCUM *Inteſtinum*, the Blind Gut, ſo called becauſe one End of it is ſhut up inſomuch that *Fæces* and *Chyle* both come in and go out at the ſame Orifice. Its Uſe in Man is obſcure, as being very ſmall and commonly empty.

CÆSAREAN *Section*, the cutting open of a Woman's Belly or Womb, to make way for the Child to be taken out.

CÆSURA, in Grammar, is when in a Latin or Greek Verſe there remains a Syllable after a Foot, and that Syllable ends the Word. Of this they reckon four ſorts, *Triemimeris*, *Penthemiris*, *Hepthemimeris* and *Ennemimeris*: Which ſee.

If it were not for this *Cæſura*, few Verſes could be made to run well; as is plain in theſe two, where there is no *Cæſura* at all,

Aurea Carmina, Juli, ſcribis, maxime vatum
Urbem fortem cæpit nuper fortitor Hoſtis.

CAISSON, or Superficial *Fourneau*, is a Wooden Caſe or Cheſt, into which 3, 4, 5, or 6 Bombs, according to the Execution they are to do, or as the Ground is firmer or looſer (ſometimes the Cheſt is, only filled with Powder) when the Beſiged diſpute every Foot of Ground, this *Caiſſon* is buried under ſome Work the Enemy intends to poſſeſs himſelf of, and when he is Maſter of it, they fire it by a Train conveyed in a Pipe, and ſo blow them up. Thus they ſay after the Mine had deſtroyed the Bonnet, *A* Caiſſon *was buried under the Ground thrown up, and the Enemy advancing to make a Lodgment on the Ruins of the Bonnet, the* Caiſſon *was fired, and blew up the Poſt the ſecond time*.

CAISSON, is alſo a covered Waggon to carry Bread or Ammunition.

CALAMUS *Scriptorius*, is a certain Delatation in or about the 4th Venticle of the Brain, whoſe lower Part is inſerted into the *Medulla Oblongata*, making there a Cavity in Shape of a Pen; whence it was anciently called *Calamus Scriptorius*.

CALCANEUS, or *Os Calcis*, the *Heel Bone*, is a Bone of the *Tarſus*; it lies under the *Aſtragalius*, to which it is articulated by the *Ginglymus*. Behind it has a large Protuberance which makes the Heel, and into which the *Tendo Achillis* is inſerted; and before it has a Cavity which receives a Part of the *Os Cubiforme*.

CALHOIDEA, are three little Bones in the Foot, which, with others, make up that Part of the Foot ſucceeding the Ankle; and *Fallopius* calls them *Cuneiformia*, becauſe they are made like Wedges.

CALCINATION, is the Solution of a mix'd Body into Powder by Fire, or any corroding things, as *Mercury*, *Aquafortis*, *&c.* and when Horns, Bones, Hoofs, *&c.* are hanged over boiling Water (or other Liquor) till they have loſt their Mulcilage and will eaſily be powdered, this by ſome Chymiſts, is called *Calcination Phyloſophical*.

CAL-

CALCINATION *of Copper*: See *Æs Uſtum.*

CALCINATION *of Flints*, or of *Chryſtal*, *Pebbles*, *&c.* is made by heating them red hot, and then caſting them, whilſt ſo, into cold Water or Vinegar; for after this is done 4 or 5 times, they will be very friable, and eaſily powdered, for which end they are calcined.

CALCINATION *of Lead*, melt the Mettle in an Earthern Pan unglazed, keep it ſtirred over the Fire with a *Spatula*, till it be reduced into a Powder. This is what they call *Calx of Lead*, and by this Means the Metal is made more open and fit to be wrought upon by Acids. *Lead*, as well as *Tin*, ſenſibly encreaſes its Weight in Calcination.

CALCINATION *of Tin*. Put *Engliſh* Tin into a large Earthen Pan unglazed in a great Fire, and then the *Tin* will melt; continue the Fire very ſtrong for 36 Hours, ſtirring the Matter with an Iron *Spatula* from time to time; then take it off the Fire and let it cool, and you will have the *Calx of Tin*. The *Tin* will encreaſe its Weight in this Operation, for 32 *Ounces* of Metal will yield 34 *Ounces* of *Calx*.

CALCINATION *of Vitriol*, is uſually of the Green ſort; 'tis put over the Fire in an Earthen unglazed Pan; the *Vitriol* will diſſolve into a kind of Water; then 'tis boiled till the Moiſture be conſumed, or till it return into a greyiſh Maſs. This is called *Vitriol Calcined to Whiteneſs*. Then if it were kept long over a ſtrong Fire, it would turn *Red*, and is then called *Colcothar*.

CALCIS: See *Calcaneus*.

CALCULATION *of Clock and Watch-work*: See *Clock* and *Watch-work*.

CALCULUS *Differentialis*, is the Arithmetick of the infinitely ſmall Differences between variable Quantities: This, in *England*, we call the *Arithmetick of Fluxions*: See *Fluxions*.

CALCULUS *Integralis*, is the Method of finding the proper flowing Quantity of any given *Fluxion*; and is the Reverſe of the *Calculus Differentialis*, which finds the Fluxion from the flowing Quantity.

CALENDAR, or *Almanack*, is a Political Diſtribution of Time accommodated to Uſe, and taken from the Motions of the Heavenly Bodies: Of this kind are thoſe Annual Books wherein the Days of the Month, the Feſtivals, the Sign the Sun is in, the Sun's Riſing and Setting, the Changes of the Moon, *&c.* are exhibited; which we alſo call *Almanacks*. But the Word *Calender* ſeems to come from the *Calendæ*, which, amongſt the *Romans*, were the firſt Days of every Month.

There have been many Corrections and Reformations of the *Calendar*. The firſt was made by *Numa Pompilius*; and this afterwards was much improved by *Julius Cæſar*, and was by him called the *Julian Account*, which, in our Nation, and ſome other Places, is ſtill retained, and is called *Old Style*.

Pope *Gregory* the XIIIth pretended to reform it again, and ordered his Account to be currant, as it ſtill is in all the *Roman Catholick Countries*, where 'tis called the *Gregorian Calendar*; and with us *New Stile*: It now begins eleven Days before ours.

A particular Account of the Nature of the *Julian* and *Gregorian Account*, ſee in a Book called, *The* Julian *and* Gregorian *Year*: And how both are pretended to be reform'd, ſee in a ſtitcht Pamphlet called, *The Reformed Calendar*: *Printed for* Sam. Manſhip, *at the Ship near the* Royal-Exchange Cornhill, 1701.

CALENDAR *Aſtronomical*: See *Aſtronomical Calendar*.

CALENDS; ſo the *Romans* call'd the firſt Days of every Month, from the Greek Word καλέω, *voco*, *to call*; becauſe anciently counting their Months by the Motion of the Moon, there was a Prieſt appointed to obſerve the Times of the New Moon; who having ſeen it, gave Notice to the Preſident over the Sacrifices, and he called the People together, and declared unto them how they muſt reckon the Days until the *Nones*, pronouncing 5 times the Word καλέω, if the *Nones* happened on the 5th Day, or 7 times if they happened on the 7th Day of the Month.

CALIBRE, or *Caliper*, is the Bigneſs, or rather Diameter of a Piece of Cannon, or any Fire Arms, at the Mouth.

CALIPERS, is an Inſtrument made like a Sliding-Rule, to embrace the two Heads of any Cask, to find the Length. There is alſo the Gunners *Calipers* or *Compaſſes* for finding the Diameter of the Ball, and Bore of the Gun.

CALIPER *Compaſſes*, are Compaſſes uſed by Gunners, with crooked or bowing Legs, to meaſure the Diameters of Bullets and Cylinders of Guns.

CALKING or *Cauking of a Ship*, is driving in Oakam, or ſomething of that kind, into the Seams of the Planks, to prevent the Ship's Leaking.

CALLICREAS: See *Pancreas*.

CALLIPICK *Period*, was an Improvement of the *Cycle of Meton* of 19 Years, which *Callipus*, a famous *Grecian* Aſtronomer, finding in reality to contain 19 of *Nabonaſſor*'s Years, 4 Days and $\frac{331}{499}$ he, to avoid Fractions, quadrupled the *Golden Number*, and by that Means made a new *Cycle* or *Period* of 76 Years; which time being expired, he ſuppoſed the Lunations or Changes of the Moon would all happen on the ſame Day of the Month, and Hour of the Day, that they were on 76 Years before.

CALLOUS: A Swelling is ſaid to grow *Callous*, when 'tis hardened, as ſometimes the Lips of a Wound. This is derived from

CALLUS, which is a kind of Swelling without Pain, like Skin contracted by too much Labour. *Blanchard*.

CALTHROPS: See *Chauſe-trapps* or *Cows-feet*.

CALVA, the Hairy Scalp, or upper Part of the Head, which either by Diſeaſe or Old Age grows Bald firſt.

CALX, in Chymiſtry, is that which is produced by Burning or Calcination (which ſee) of any Metal or Mineral in a Crucible, *&c.*

CALX, is the ſecond Bone in that Part of the Foot which ſucceeds the Ancle, bigger and ſtronger than the reſt; oblong and grows backward, that a Man may ſtand more ſtrongly upon it, and not fall ſo eaſily backward.

CALX alſo is that which by *Calcining* is either turned into *Alcoal*, as *Calx Saturni*, or at leaſt is made friable, as *Hart's-Horn* burnt.

CALX *of Antimony*: See *Antimonium Diaphoreticum*.

CALX *of Gold*: Though it hath been look'd upon as a thing of great Difficulty, yet the Noble Mr. *Boyle* tells us, that if you grind well together a thick *Amalgama* of Gold and Mercury, with at leaſt

leaſt an equal Weight of finely powdered Sulphur, and then put the Mixture to ſublime in a proper Glaſs, there will riſe, by Degrees of Fire, a Cinnabar; and this will leave behind it a finer *Calx of Gold* than is to be had by ſome far more difficult Proceſſes. See the *Mechan. Product of Volatility.*

CALYX, in Botany, ſignifies the Cup which contains or encloſes the Flower in any Plant; and ſometimes 'tis uſed for the Flower it ſelf when its Figure is like that of a Roſe, and not yet having its Leaves Expanded.

CAMBRING, the Sea-man ſay a Deck lies *Cambring* when it doth not lie Level, but higher in the Middle than at either End. Alſo if her Keel is bent in the Middle upwards (which may happen from her lying a-ground on a place where neither her Aft nor Fore-part do touch it, and from many other Reaſons taken from her make) they ſay ſhe is *Chamber-keel'd.*

CAMERA *Obſcura*: See *Obſcura Camera.*

CAMPAIGN, is a Military Term, ſignifying the Space of Time during which Armies are maintain'd every Year in the Field. So a Man is ſaid to have made twenty Campaigns, when he hath ſpent ſo many Years in War-like Service in the Field.

CAMP *Flying*, is a ſtrong Body of Horſe and Foot commanded uſually by a Lieutenant General, which is always in Motion, both to cover our own Garriſons, and to keep the Adverſe Army in continual Alarm.

CANAL, is a Word frequently uſed by Anatomical Writers, to ſignify a Channel or Paſſage, thro' which any Juices or Fluids of the Body do flow.

CANALICULUS *Arterioſus*, is a Veſſel betwixt the Arterious Vein in the Lungs, and the great Artery in the *Fœtus*; for its obliterated in Adult Perſons: It's Uſe in *Fœtus*'s is, that the Blood may be diſcharged by this *Ductus* out of the Arterious Vein, into the great Artery, becauſe that the Blood is not accended in the Lungs, for want of Reſpiration in the Womb.

CANCER, one of the 12 Signs of the *Zodaick*, drawn on the Globe in the form of a Crab, and thus marked ♋. Thro' the beginning of this Sign paſſes a Circle parallel to the Equinoctial, called the *Tropick of Cancer*, or the *Northern Tropick*; to which Circle, when the Sun comes, it makes the *Summer Solſtice*, and is turning his Courſe back again towards the Equinoctial.

CANCER, an Ulcerous Diſeaſe: See *Carcinoma.*

CANICULA, the ſame with *Canis Minor.*

CANINA *Fames*, or *Dogs-Appetite*, is an inordinate Hunger attended with a Vomiting and a Looſeneſs, which proceeds from a depraved Action of the Stomach, craving Food in a greater Meaſure than Nature requires.

CANINI, are two Teeth in each Jaw, one on each ſide of the *Inciſivi*; they are pretty thick, and round, and they end in a ſharp Point; they have each one Root which is longer than the Roots of the *Inciſivi*; their proper uſe is to pierce the harder kinds of Meat.

CANINUS, a Muſcle of the Lip, ſerving to put the Lips upwards.

CANIS *Major & Minor*, the greater and leſſer Dog, are two Conſtellations of Stars drawn upon the Globe in Figure of this Animal; and the greater of them hath in his Mouth that vaſt Star called

CANICULUS, or the *Dog-ſtar*, which riſing and ſetting with the *Sun* from about the 24th of *July* to the 28th of *Auguſt*, gives occaſion to that time which is uſually very Hot and Sultry, to be called the *Canicular* or *Dog-days.*

CANNA *Major*: See *Tibia.*

CANNA *Minor*: See *Fibula.*

CANNON *Royal*, is a Piece of Ordnance 8 Inches Diameter in the Bore, 12 Foot long, weighs 8000 *lb.* its Charge 32 *lb.* of Powder; its Ball of 48 *lb.* weight, and 7 Inches $\frac{1}{2}$ in Diameter, ſhoots point blank 185 Paces. This is the ſame with a Cannon of Eight.

CANNON, a Piece of Ordnance: See *Ordnance.*

CANON, in Mathematicks, is a Rule to ſolve all things of the ſame Nature with the preſent Enquiry: Thus every laſt ſtep of an Equation in *Algebra* is ſuch a *Canon*, and if turned into Words is a Rule to ſolve all Queſtions of the ſame Nature with that propoſed. *Canon* alſo is the Word for the Tables of *Logarithms*, *Artificial Sines*, *Tangents*, and *Secants*, which are of admirable uſe in *Trigonometry*. 'Tis alſo the Name of a Surgeon's Inſtrument, which they make uſe of when they ſew up Wounds.

CANONICAL *Equations*: See *Quadratick Equations.*

CANON-LAW, is a Collection of Eccleſiaſtical Rules, Definitions and Conſtitutions taken from the Ancient, General and Provincial Councils, the Writings and Reſolutions of the Fathers of the Church, and the Reſcrips of Popes. This Law is modelled according to the Form of the *Civil*, and is reduced into 3 Volumes. The firſt is called the *Decrees of Gratian*, and is compoſed of the Ancient Canons, and Collected from the Ancient Councils and Writings of the Fathers.

The 2d Volume is called the *Decretals*; and doth contain the *Decretal Epiſtles* or *Reſcripts* of Popes, and chiefly from *Alexander* III. to *Gregory* IX. by whoſe Authority it was compiled.

The 3d Volume is called *Sextum*; and contains the Reſcripts of the Popes from *Gregory* IX. to *Boniface* the VIII. by whoſe Authority it was Collected. To the End of this Volume are added the *Clementina*, which are the *Conſtitutions* of *Clement* V. enacted in the Council of *Vienna*, as alſo the *Extravagants*, which are ſome Reſcripts of Pope *John* XXII. and ſome other Popes. They were called *Extravagants*, becauſe not contained in the Body of the *Canon Law*; which is compoſed of the three lately mentioned Volumes.

CANTHUS or *Hircus*, is the Angle or Corner of the Eye; which is either the greater or the Internal, or the leſs, or External.

CANTON, an Ordinary in Heraldry, framed of two ſtrait Lines, one drawn perpendicularly from the *Chief*, and the other ſo from the Side of the Eſcutcheon. This is always leſs than a Quarter of the Field; and if drawn from the Left Corner of the Eſcutcheon, is called a *Canton Siniſter*. Its Form is thus; He beareth *Ermin*, a *Canton Argent* charged with a *Cheveron Gules*, by the Name of *Middleton.*

CANVAS-BAGS, or *Earth-Bags*, *Sacs a Terre*, as the *French* call them, are Bags holding about a Cubick

Cubick Foot of Earth, and are uſed to raiſe a Parapet in haſt, or to repair one that is beaten down: They are chiefly uſed when the Ground is Rocky and affords no Earth to carry on the Approaches; then are theſe Bags of Earth very neceſſary, which can be filled at another place and removed at pleaſure: Theſe Bags are ſometimes upon occaſion filled with Powder, of which they hold about 50 Pound.

CAP, *in a Ship*, is a Square Piece of Timber, put over the Head or upper End of any Maſt, having a round Hole to receive a Maſt. By theſe *Caps* the Top-Maſts and Top-Gallant-Maſts are kept ſteady and firm in the *Treſſel-Trees*, where their Feet ſtand, as thoſe of the lower Maſts do in the *Steps*. They call alſo that Piece of Lead which is put over the Touch-hole of a great Gun to keep the Prime from being waſted or ſpilt, the *Cap* of the Gun.

CAP-SQUARES, are broad Pieces of Iron on each Side of the Carriage of a great Gun, and lock'd over the Trunnions of the Piece with an Iron Pin: Their uſe is to keep the Piece from flying out of the Carriage, when 'tis ſhot off with its Mouth lying very low, or as they call it, under *Metal*.

CAPACITY (in Law) ſignifies the Ability of a Man, or Body Politick, to give or take Lands or other things, or ſue Actions.

CAPACITY, in Geometry, is the ſolid Contents of any Body: Alſo our Hollow Meaſures for Wine, Beer, Corn, Salt, *&c.* are called *Meaſures of Capacity*.

CAPE, is a Writ Judicial, touching Plea of Lands or Tenements; and divided into *Grand-Cape* and *Petit-Cape*, both which takes hold of things immoveable, and ſeem to differ in this, that the *Grand-Cape* lieth before Appearance, and *Petit-Cape* afterwards.

CAPE, or *Promontory* is any high Land running out with a Point into the Sea, as *Cape Verde*, *Cape-Horn*, the *Cape of Good Hope*, &c.

CAPE *Parvum*, is a Writ that lieth in caſe where the Tenant is ſummoned in Plea of Land, and cometh at the Summons, and his Appearance is of Record; and after he maketh Default at the Day that is given to him, then this Writ ſhall go for the King.

CAPE *ad Valentiam*, is a Writ of Execution or a *Species* of *Grand Cape*, ſo called of the End whereunto it tendeth: In the *Old Nat. Brev.* it is thus deſcribed; This Writ lieth, where any impleaded of certain Lands, and he vouches to warrant another, againſt whom the Summons *ad Warrantizandum* hath been awarded, and the Vouchee comes not at the Day given; then if the Demandant recover againſt the Tenant, he ſhall have his Writ againſt the Vouchee, and ſhall recover ſo much in Value of the Vouchee's Land, if he have ſo much; and if he have not ſo much, then the Tenant ſhall have Execution by this Writ, of ſuch Lands and Tenements as deſcend to him in Fee-ſimple; or if he purchaſe afterwards, the Tenant ſhall have againſt him a Re-ſummons, and if he can ſay nothing, he ſhall recover the Value.

Note, *This Writ lies before Appearance.*

CAPELLE, a bright fixed Star in the Left Shoulder of *Auriga*, whoſe *Longitude* is 77 *Deg.* 16 *Min.* *Latitude* 22 *Deg.* 50 *Min.* *Right Aſcenſion* 73°. 7'.

CAPIAS, is a Writ of two ſorts, one before Judgment, called *Capias ad Reſpandendum*, in an Action Perſonal, when the Sheriff upon the firſt Writ of Diſtreſs, returns *nihil habet in ballivâ noſtra*; and the other is a Writ of Execution after Judgment, which are of divers kinds, as theſe following.

CAPIAS *conductos ad proficiſcendum*, is a Writ for taking up ſuch as having received Preſt Money to ſerve the King, ſlink away, and come not in at the time: This is an Original Writ directed to the Serjeant at Arms, to arreſt and bring them in, having included a Clauſe of Aſſiſtance.

CAPIAS *pro fine*, is, where one being by Judgment fined unto the King, upon the ſame Offence committed againſt a Statute, doth not diſcharge it according to the Judgment, for by this is his Body taken and committed to Priſon, until he content the King for his Fine.

CAPIAS *ad Satisfaciendum*, is a Writ of Execution after Judgment, lying where a Man recovers in an Action Perſonal, as Debts, or Damages, or *Detinue* in the King's Court; and he againſt whom the Debt is recovered, and hath no Lands nor Tenements, nor ſufficient Goods, whereof the Debt may be levy'd: For in this Caſe he that recovereth ſhall have this Writ to the Sheriff, commanding him, that he take the Body of him againſt whom the Debt is recovered, and he ſhall be put in Priſon until Satisfaction made.

CAPIAS *utlegatum*, is a Writ of Execution which lieth againſt him that is out-law'd upon any Suit, by which the Sheriff, upon the Receipt thereof, apprehendeth the Party out-lawed for not appearing upon the *Exigent*, and keepeth him in ſafe Cuſtody till the return of the Writ, then bringeth him into Court, there further to be ordered for his Contempt.

CAPIAS *utlegatum & Inquiras de bonis & catallis*, is a Writ all one with the former, but it gives a farther Power to the Sheriff, beſides the Apprehenſion of his Body, to enquire of his Goods and Chattels.

CAPIAS *in Withernamium de homine*, is a Writ that lieth for a Servant in *Withernam*.

CAPIAS *in Withernam de Averiis*, is a Writ that lieth for Cattle in *Withernam*.

CAPILLAMENTS, *Capillamenta*, are thoſe ſmall Threads or Hairs (whence the Word) which grow up in the middle of a Flower, and are adorned with little Knops at the Top: Thoſe Knops are called the *Apices* of a Flower; and theſe *Capillaments* are called the *Stamina*.

CAPILLARY *Plants*, are ſuch as have no main Stalk or Stem, but grow to the Ground, as Hairs to one's Head, and which bear their Seeds in little Tuffs, Bunches or Protuberances on the Back-ſide of their Leaves, whence by ſome they are called *Dorſiparæ* and *Tergifætæ*. And theſe are either with an

Undivided Leaf, as the *Hæmionitis* and the *Phyllitis*; or with a

Singly divided Leaf; and theſe have the Leaf either cut or jagged in, but not divided into *Pinnæ* clear home to the main Rib; as *Polypodium*, *Lonchitis*, *Scolopendria*, *Adianthum*, *Acroſtichon Thal.*

Or elſe divided quite home to the Rib, and hanging like *Pinnæ*; as the *Chamæfelix Marina* and the *Trichomanes*. Others have the Leaf

Doubly divided, or at leaſt once ſubdivided; the firſt Diviſion being into *Branches*, and the 2d into

Pinnæ;

Pinnæ; as the *Hemionites Multifida*, the *Filix mas*, the *Filix Paluſtris*, *Filix Saxatilis*, the *Adiantum Album*, and *Nigrum*. And others have the Leaf

Trebly divided, or twice ſubdivided, *viz.* firſt into Branches, then into little Twigs, and after this into *Pinnæ*; and theſe are the *Filix Scandens* of *Braſile*, the *Filix Florida* or *Oſmunda Regalis*, the *Filix mas Ramoſa*, the *Filix Femina Vulgaris*, the *Adiantum, album Floridum*, and the *Dryopteris Nigra*. Ray's *Hiſtoria Plantarum*.

CAPILLARY *Veſſels*, ſmall Veins and Arteries, like Thread or Hairs.

CAPILLATION, according to ſome Writers, is a Fracture in the Skull, ſo ſmall that it can ſcarce be found, which yet often proves mortal.

CAPITATÆ *Plantæ*, in Botany, are ſuch Plants whoſe Flowers are compoſed of many edged and hollow little Flowers; and Mr. *Ray* calls them by this Name, becauſe their Scaly Calyx (or Cup of the Flower) moſt uſually ſwells out into a large and round Belly, containing within it the Pappous Seed; as *Carduus*, *Centaury*, *Knapweed*, *Cinara*, *Cirſium*, *Lappa maj. Cyanus*, &c.

CAPITAL *of a Baſtion*, in Fortification, is a Line drawn from the Angle of the Polygon to the Point of the Baſtion, or from the Point of the Baſtion to the Middle of the Gorge. Theſe *Capitals* are from 35 to 40 Fathom long, that is to ſay, from the Point of the Baſtion to the Place where the two Demigorges meet.

CAPITAL *Line*: See *Line*.

CAPITAL, or *Chapital*, or *Chapiter*, ſignifies in Architecture the Top of a Pillar; and this is different, according to the different Orders.

CAPITE, is a Tenure that holds immediately of the King, as of his Crown, be it by Knight-ſervice or Soccage, and not of any Honour, Caſtle or Mannor.

CAPITULUM, in Botanicks, is the Head or Flowring Top of any Plant, being compoſed of many Flowers and Threads (or *Stamina*) cloſely connected in a Globous, Circular or Diſcous Figure; as the Flowers of *Blew-bottles*, *Scabious*, *Carduus*, &c.

CAPONNIERE, in Fortification, is a covered Lodgment of about 4 or 5 Foot broad, encompaſſed with a little Parapet of above two Foot high, which ſerves to ſupport the diverſe Planks laden with Earth.

This Lodgment is large enough to contain 15 or 20 Soldiers, and is uſually placed upon the Extremity of the Counterſcarp, having ſometimes ſeveral little Embraſures made therein, commonly called *Mardreſſes*. They are generally on the Glacis, or in dry Moats.

CARPÆ *Saltantes*, is the Term for a fiery Meteor or Exhalation which ſometimes appears in the Atmoſphere, and is not fired in a ſtrait Line, but with Inflexions or Windings in and out.

CAPEOLARIA *Vaſa*, in an Animal Body, are ſuch as twine about like the *Capreoli* or Tendrils of Vines.

CAPREOLUS, in Botany, is the Claſp or Tendril, by which the Vines and ſuch like creeping Plants faſten themſelves to thoſe things which are deſigned to ſupport them.

CAPREOLATÆ *Plantæ*, are ſuch Plants as turn, wind and climb along the Surface of the Ground, by Means of their *Capreoli* or Tendrils; as *Gourds*, *Melons*, *Cucumbers*, &c.

CAPRICORN, the Goat, one of the Zodiacal Signs marked thus, ♑: Through the firſt Degree of it, the Southern Tropick, or the Tropick of *Capricorn* paſſes at 23°. 30'. Diſtance from the Equator.

CAPSTAN, or as the *French* write it *Cabeſtan*, others *Capſtand*, of a Ship, is of two kinds, the *Main Capſtan*, and the *Jeer Capſtan*.

The *Main Capſtan* is that piece of Timber which is placed next behind the Main-Maſt, its *Foot* or lower End ſtandeth in a *Step*, on the lower Deck; and its Head is between the two upper Decks. Its ſeveral Parts are thus called; the ſmalleſt Part of it the *Spindle*; the Brackets ſet unto the Body of the *Capſtan* cloſe under the *Barrs*, they call the *Whelps*. The main Subſtance or Poſt of the whole Piece is the *Barrel*, through which the Barrs go. The *Pawl* is a Piece of Iron, bolted to one End of the Beams of the Deck, cloſe to the Body of the *Capſtan*, to ſtop the *Capſtan* from turning back; and this Stoppage they call *Pawling the Capſtan*. The uſe of the *Capſtan* is to weigh the Anchors, to *hoiſe up*, or *ſtrike down* Top-Maſts, to heave any weighty thing, or to ſtrain any Rope that requireth main force.

The *Jeer Capſtan* is placed in the ſame manner as the *Main Capſtan*, between the Main-Maſt and the Fore-Maſt, and its Uſe is chiefly to heave upon the *Jeer Rope* (which ſee) or to heave upon the Viol, and to hold off by when the Anchor is weighing.

The Terms belonging to the Uſe of the *Capſtans* are, *Come up Capſtan*, that is, ſlack the Cable which you heave by; in which Senſe alſo they ſay, *Launch out the Capſtan*; *Pawl the Capſtan*, is, ſtop'd it from going back, as was above hinted.

CAPSULA *Communis*, of *Gliſſon*, is a Membrane proceeding from the *Peritonæum*, and including both the *Porus Bilarius* and the *Vena Portæ* in the Liver.

CAPSULA *Seminalis*, in Botany, is the *Caſe* or *Huſk* that holds the Seed of any Plant.

CAPSULÆ *Atrabilariæ*, the ſame with the *Renes Succentuariati*: Which ſee.

CAPSULÆ *Seminales*, in Anatomy, are the extreme Cavities of the Veſſels which convey the *Semen* in an Animal Body; they are dilated like little Coffers, which by two ſmall Holes emit the *Semen* received from the Teſticles into the little Seminary Bladders, that it may either be preſerved there againſt the time of Coition, or be reduced into Blood by the Lymphetick Veſſels. *Blanchard*: See *Teſtes* and *Teſticle*.

CAPTION, when a Commiſſion is executed, and the Commiſſioners Names ſubſcribed, and returned, that is called the *Caption*.

CAPUT *Mortuum*, is that thick dry Matter that remains after Diſtillation of any thing, but of Minerals eſpecially; and very commonly it denotes only that which remains of Vitriol in its Diſtillation, which they call *Colcothar Vitrioli*: See *Earth* and *Terra Damnata*. This *Caput Mortuum*, though in ſome Caſes there be but little, if any, Active Principle left in it, yet is never pure, and the *Colcothar Vitrioli*, if expoſed to the Air, will turn into *Vitriol* again.

CARAT: A *Carat* of Gold is properly the Weight of 24 Grains or one Scruple; ſo that 24 Carats make an Ounce.

If an Ounce of Gold be ſo pure, that in its Purification (with Antimony, or otherwiſe) it loſes nothing at all; 'tis then ſaid to be Gold of 24 *Carats*: If it loſe one Caret, 'tis then Gold of 23 *Carats*; and if it loſe two Carats in its Purification, 'tis called Gold of 22 *Carats*, *&c.* But perhaps there is no ſuch thing as Gold of 24 *Carats*, for it will retain ſome ſmall Portion of Silver or Copper, putrify it as long as you will.

A CARAT *of Diamonds, Pearls, or Precious Stones*, is the Weight of four Grains only.

CARBUNCULATION, is the blaſting of the new ſprouted *Buds* of Trees or Plants, either by exceſſive Heat, whereby the Texture of the Fibres of the Vegetable are ſo diſſolved, that its Pores become wholly changed; or elſe by exceſſive Cold, which compreſſes its Fibres ſo, that the Pores thereby are ſhut up, and leave no Paſſage for the Alimentary Juice.

CARBUNCULUS, the ſame with *Anthrax*.

CARCUS, is an Iron Caſe or hollow Capacity about the Bigneſs of a Bomb, ſometimes made all of Iron (except two or three Holes through which the Fire is to blaze) and ſometimes made only of Iron Bars or Hoops, and then covered over with Pitched Cloth, Hemp, *&c.* and filled with ſeveral kinds of Materials for firing of Houſes: They are thrown out of Mortar-Pieces, like Bombs, into Beſieged Places, *&c.*

CARCINODES, a Tumour reſembling a *Cancer*. *Blanchard*.

CARCINOMA, *Carcinus*, or *Cancer*, is a Tumour that ariſes round, hard, livid, painful; at the Beginning as big as a Pea, but afterwards its ſurrounded with great ſwelling Veins, which reſemble the Feet of a Crab (though not always) whence the Name. *Blanchard*.

CARD: See *Chard*.

CARDIACA, is a Suffocation of the Heart from a Polypus or coagulated Blood. *Blanchard*.

CARDIADICUM, a *Cordial*, is a Medicine which (as they formerly thought) corroborates the Heart; but it rather only puts the Blood into a fine gentle Fermentation, whereby the Spirits formerly decayed, are repaired and invigorated, ſo that the Blood, by conſequence, circulates more eaſily and briskly.

CARDIACUS *Plexus*, is a Branch of the eighth Pair of Nerves or the *Par Vagum*, which about the firſt or ſecond Rib, is ſent from its deſcending Trunks, and is beſtowed upon the Heart and its *Appendage*.

CARDIALGIA, is a gnawing Pain ſometimes felt in the *Scrobiculus Cordis*; or, as *Blanchard* ſaith.

CARDIALGIA and *Cardiogmos*, the Heart-burning, is a Gnawing or Contraction of the Nerve, called *Par Vagum*, and the intercoſtal implanted in the Stomach, proceeding from a pungent vellicating Matter in the Ventricle; ſo that the Heart being ſtraitned and contracted by Conſent with the Stomach, occaſions ſometimes a Swooning away.

CARDINAL *Winds* or *Points*, are the *South*, *Weſt*, *North* and *Eaſt* Points of the Compaſs; and alſo the Equinoctial and Solſtitial Points of the Ecliptick, are called the 4 *Cardinal Points*.

CARDINAL *Signs*, are thoſe Signs of the Zodiack called *Aries*, *Libra*, *Cancer* and *Capricorn*,

CARDIOGMOS, the ſame with *Cardialgia*.

CAREEN: A Ship is ſaid to be brought to a *Careen*, when the moſt Part of her Lading, *&c.* being taken out, there is laid by her Side another Ship or Veſſel lower than her, unto which ſhe is haled down as low as Occaſion requires, as to the 4th or 5th Strake, and there kept by the Weight of Ballaſt, Ordinance, *&c.* as well as by Ropes, leſt it ſhould ſtrain her Maſts too much. 'Tis done with a Deſign to trim her Sides or Bottom, to caulk her Seams, or to mend any thing that is at fault under Water: And from hence if a Ship lie on one Side when ſhe Sails, they ſay, *She Sails on the Careen*

CARIATIDES: See *Caryatides*.

CARIES, is the Corruption of a Bone from the continual Afflux of vicious Humours, or from their Acrimony and Malignity, or from a Bruiſe that ſome way affects the Bones, or from ſharp Medicines, *&c.* *Blanchard*.

CARINA, is a Term uſed both by the Anatomiſts for the firſt Rudiments of the entire *Vertebræ*, as they appear in a Chicken's Embryo while 'tis in the Shell, becauſe it is crooked in the Form of the Keel of a Ship. And alſo the Botaniſts for the ſame Reaſon uſe the Word *Carina*, to expreſs the lower *Petalum* of a *Papillionaceous* Flower. The Leaves alſo of the *Aſphodelus* they ſay are *Carinated*.

CARLING *Knees*, are thoſe Timbers which go athwart the Ship, from her Sides to the Hatchway, and which bear up the Deck on both Sides.

CARLINGS, are Timbers in a Ship lying Fore and Aft along, from one Beam to another; on theſe the Ledges reſt, on which the Planks of the Deck are made faſt. All the *Carlings* have their Ends let into the Beams, which is called *Culvertail*.

CARMINATIVE *Medicines*, are Remedies that diſpel or diſcuſs Wind, either by appeaſing the Fermentations that occaſion it, or by making it thin, and opening the Pores that it may be expelled. *Blanchard*.

CARNATION, is a Term in Painting, ſignifying ſuch Parts of an Human Body as are drawn naked, without any Drapery, or which expreſs the bare Fleſh; and when this is done Natural, Bold and Strong, and is well coloured, they ſay of the Painter, that his *Carnation* is very good.

CARNEL, the Building of Ships firſt with their Timber and Beams, and after bringing on their Planks, is called *Carnel-Work*, to diſtinguiſh it from *Clinch-Work*. Thoſe Veſſels alſo which go with *Mizen-Sails* inſtead of *Main-Sails*, are by ſome called *Carnels*.

CARNIVEROUS *Animals*, are ſuch as feed on Fleſh wholly or chiefly.

CARNOSITY, is a more than ordinary Fleſhineſs in any Part of the Body.

CARNOUS, Fleſhy; whence the *Membrana Carnoſa* or *Panniculus Carnoſus* takes its Name, which is a Fleſhy Membrane covering the whole Body.

CARO, the Fleſh of an Animal Body, is by Anatomiſts defined to be a Similar and Fibrous Part, ſoft and thick: They account it Five-fold; 1. *Muſcular*, *Fiſtular* or *Fibrous*, as is the Subſtance of the Heart and other Muſcles. 2. *Parenchymous*, as the Lungs, Liver and Spleen were thought to be by the Accidents: But ſince the uſe of Glaſſes, 'tis plainly diſcovered, that there is no ſuch thing as a *Parenchyma*, properly ſpeaking, but that all the *Viſcera*, as well as other Parts of the Body, are *Vaſcular*, and nothing but a *Plexus* or Net-work of ſmall Veſſels and Canals. They call the Fleſh of the Stomach and Guts. 3. *Viſcerous*; and they reckon a Fourth ſort, which they call *Glandulous*; as is

that of the Pancreas, the Tonſils, the Breaſts, *&c.* And, 5. They call the Fleſh of the Lips, Gums, of the Glans of the Penis, *&c. Spurious*, as being of a different Conſtitution from all the reſt.

CARO, a Botanick Word for the *Pulp*, *Fleſh* or ſoft Subſtance contained within any Plant, or its Fruit, ſuch as the Pulp of *Caſſia*, *Tamarinds*, *Prunes*, *&c.*

CAROTIDES, are Arteries in an Animal Body ſo called; they ſpring from the aſcending Trunk of the *Aorta* or great Artery at the ſame Place, nearly where the Subclavian Arteries ariſe; here the Trunk begins to be divided into two Branches, which are theſe *Carotides*; they aſcend directly upwards (though the Right ſometimes ariſes from the right *Subclavian*) and at their riſe are ſuſtained by the *Thymus*; then having beſtowed Twigs on the Larynx, Tongue, the Muſcles of the *Os Hyoides*, and the adjacent Glands, they paſs up on each Side by the Sides of the Wind-Pipe to the *Faucet*, together with the Internal Jugular Vein, and there are ſubdivided into the *External* and *Internal* Branches.

The *External* is ſmaller, and is diſperſed into all the Muſcles of the Cheeks, Forehead, Temples, Lips, and in general, through all the outer Parts of the Head and Face.

The *Internal*, which is larger, ſends firſt ſome more Twigs to the *Larynx*, Tongue, and ſo alſo to the Glands behind the Ears, and the ſpongy Parts of the Palate and Noſe: Then it entreth the upper Jaw, and beſtows a ſmall ſlip on the Root of each Tooth (as the *External* did on the Roots of the Teeth of the lower Jaw) whereby ſharp Humours flowing in upon them, ſometimes cauſe a very painful Tooth-ach. The remainder of it climbs upon the Skull, being about its *Baſis* divided into two Branches; the *leſs* and hinder whereof having ſent one ſlip to the inner Muſcles of the Neck, and another through the Hole of the uppermoſt *Ventebra* into the Membrane that inveſts the Spinal Marrow, aſcending further, enters the Skull at the Hole by which the ſixth Pair of Nerves (commonly called) comes out, and creeping along the *Dura Mater*, ends near its *Sinus* (which yet ſome ſay it enters.) The *larger* Branch, tending upwards, is carried through the bony Channel in the Wedge-like Bone, with a winding Duct to the *Sella Equina*; at whoſe *Baſis*, after it hath ſent out a Twig on each Side into the *Dura Mater*, it opens it ſelf into many ſmall Slips, which being interwoven with thoſe of the Cervical Artery (abovementioned) make the *Rete Mirabile*, which is more obſerveable in Beaſts than in Men, yet it is not all ſpent on the ſaid Slips, but perforating the *Dura Mater*, it enters the *Pia Mater*, with two notable Branches, which being divided into very ſmall Twiggs, are mingled with thoſe of the Cervical Artery, with which thhy paſs out of the Skull, and accompany the Spinal Marrow even to the Loins. Afterwards it ſends a ſmall Branch thro' the ſecond Hole of the Wedge-like Bone with the Optick Nerve, out of the Skull to the Eye: And yet ſtill ſupplying more Twigs to the Subſtance of the Brain and *Pia Mater*, and being united with ſome other Twigs of the Cervical Artery, it makes the *Plexus Choroides*.

CARPIA, is a Tent that is put into a Wound or Ulcer to cleanſe it.

CARPUS, commonly *Brachiale*, the firſt Part of the Palm of the Hand: *Heſchyus* calls it that Part of the Arm which is betwixt the lowermoſt Part of the Cubit and the Hand, or the Wriſt; it conſiſts of eight ſmall Bones, with which the Cubit is joined to the Hand. *Blanchard.*

CARRIAGE *of a great Gun*, is the Frame of Timber on which a Piece of Ordnance is laid, fixed and mounted. The common Proportion is 1 $\frac{1}{2}$ of the Length of the Gun for the Carriage, the Wheels $\frac{1}{2}$ of the Length of the Piece in Height, and 4 times the Diameter of the Bore of the Gun, gives the Depth of the Planks at the Fore-end, in the Middle $3\frac{1}{11}$.

CARTILAGE, is a white Part, drier and harder than a *Ligament*, and ſofter than a Bone; it is by ſome ſaid to be a Similar and Spermatick Part, but falſly; for it's no more made of Seed, than any other Parts; it renders Articulation more eaſy, and defends ſeveral Parts from the Injuries from abroad. In aged Perſons the Cartilages commonly grow Bony.

They have a Membrane juſt like the *Perioſteum*, and 'tis indeed but a Continuation of it.

CARTOUCHE; the ſame with *Cartridge*.

CARTRIDGES, or *Cartbyages*, are Caſes of Paper, or as they now are uſually made for the King's Ships, to prevent Danger from Fire in a Gun not well ſpunged, of Parchment; fitted exactly to the Bore of a Piece of Ordnance, and containing its due Charge of Powder. There are alſo Tin Cartridges, in which the Paper or Parchment ones are both formed and carried.

CARUNCULÆ *Myrtiformes*, are the Wrinklings of the Orifice of the *Vagina*, or Membranous Inequalities, not to be reckoned in any certain Number, which in Women with Child, and after Child-birth are ſo obliterated, that they are altogether imperceptible; there are for the moſt part four of them. *Blanchard.*

CARUNCULÆ *Oculi*, are Glandules placed at each great Corner of the Eye, which ſeparate Moiſture for moiſtening the Eyes, the ſame with Tears, which afterwards by the *Puncta Lachrymalia*, placed in the Bone of the Noſe, are diſcharged into the Noſtrils. Theſe are called *Caruncuſæ Lachrymales* by ſome.

CARUNCULÆ *Papillares*, are Ten little Bodies that are in the Reins and Kidneys; they are properly little Bundles, which ariſe from the centring together of a great many ſmall Channels, which the Reins are in a great meaſure made up of; and thoſe receive the *Serum* from the little *Ductus's*, and convey it into the *Plevis*. *Blanchard.*

CARUS, is a Sleep, wherein the Perſon affected being pulled, pinched and called, ſcarce ſhews any ſign of either hearing or feeling; it is without a Fever, greater than a Lethargy, and leſs than an Apoplexy. *Blanchard.*

CARYATIDES, an Order of Pillars in Architecture, in the Form of the Bodies of Women with their Arms cut off, and cloathed in a Garment down to their Feet: Theſe Figures do ſupport the *Entablature*. There are ſome Columns of this Order in the *famous Building at* Bourdeaux, called the *Tutelles*; and in the Great Hall of the *Swiſs* Guards at the *Louvre* in *Paris*; where four *Caryatides* ſupport a Gallery enriched with Ornaments very well cut.

The riſe of this order of Pillars was this; The Inhabitants of *Carya* in *Peloponneſus* did once treacherouſly join with the *Perſians* againſt their own Country,; but the *Græcians* got the Battle, and put

put all the Male Inhabitants of *Carya* to the Sword, reducing the City to Aſhes. The Women they took Captives, and carried in Triumph: And the more to perpetuate the Memory of this baſe Action, they would not permit theſe Women ever to put off their Triumphal Veſtments; but ordered the Architects of thoſe times to expreſs them in that dreſs, as ſupporting the heavy Weight of their Edifices, inſtead of uſual *Columns*.

The *Perſick Order* of Pillars had much the ſame Original: *Which ſee. Vitruv. lib.* 2. *c.* 1.

CASCABELL, is the hindermoſt round Knob or the utmoſt part of the Breech of a Piece of Ordnance.

CASCADE, an *Italian* Word, ſignifying a fall of Water, whether Natural or Artificial.

CASCAN, in Fortification, is a certain Hole or hollow Place in Form of a Well, from whence a Gallery dug in like manner under Ground is convey'd, to give Air to the Enemy's Mine. Some of theſe *Caſcans* are more hollow than others, being uſually made in the Retrenchment of the Platform near the Wall.

CASEMATE, in Fortification, ſometimes is the Well with its ſeveral Subteraneous Branches or Paſſages dug in the Paſſage of the Baſtion till the Miner is heard at work, and Air given to the Mine.

Alſo a certain Vault made of Maſon's Work, in that Part of the Flank of a Baſtion which is next the Curtain, on purpoſe to fire upon the Enemy, and to defend the Face of the oppoſite Baſtion of the Moat.

Sometimes it conſiſts of 3 Plat-forms one above another, the *Terreplan* of the Baſtion being the higheſt. Behind the Parapet, which fronts along the Line of the Flank, there are Guns placed laden with Cartridges of ſmall Shot to ſcour along the Ditch; and theſe are covered from the Enemy's Batteries by Earth-works Faced or Lined with Wall, and are called *Orillons* or *Epaulments*. This is the beſt Defence a Place can have.

CASERN, in Fortification, is a little Room, or Lodgment, or Building, erected between the Rampart and the Houſes of Fortified Towns, to ſerve as Apartments or Lodgings for the Soldiers of the Garriſon, to eaſe the Garriſon: There are uſually 2 Beds in each *Caſern* for ſix Soldiers to lie 3 and 3; but the third part being always on the Guard, there are but 4 left in the *Caſern*, 2 in a Bed.

CASE-SHOT, is when Musket-Bullets, Stones, old Pieces of Iron, *&c.* are put up into Caſes and ſo ſhot out of great Guns. 'Tis chiefly uſed at Sea to clear the Enemy's Decks when they are full of Men.

CASKETS (in a Ship) are ſmall Strings made of Sinnet, and faſtened to the upper Part of the Yards in little Rings (which they call *Grommets.*) Their uſe is to faſten the Sail to its Yard when 'tis to be furl'd up. The biggeſt and longeſt of theſe is in the middle of the Yard, juſt between *Tyes*, and is called the *Breaſt Casket*.

CASSIOPEA, or *Caſſiopœia*, the Name of one of the Conſtellations of the fix'd Stars in the *Northern* Hemiſphere, conſiſting of 25 Stars, and is placed oppoſite to the *Great Bear* on the other ſide the *Pole Star*.

CAST *a Point of Traverſe*, in Navigation, ſignifies to prick down on a *Chart* the Point of the Compaſs any Land bears from you, or to find on what Point the Ship bears at any inſtant, or what Way the Ship has made.

CASTOR, a fix'd Star of the ſecond Magnitude in *Gemini*, whoſe *Longitude* is 105°. 41′. *Latitude* 10°, 2′.

CASTOR *and Pollux*, are two *Meteors* which ſometimes in a great Storm at Sea appear ſticking to ſome part of the Ship, in the ſhape of Balls of Fire. Sometimes one is ſeen, and then 'tis call'd *Helena*; both of them are by ſome call'd *Tyndarides*.

CASTOR *and Pollux*, a Conſtellation of the fix'd Stars; the ſame with *Gemini*, being one of the 12 Signs of the *Zodiack*.

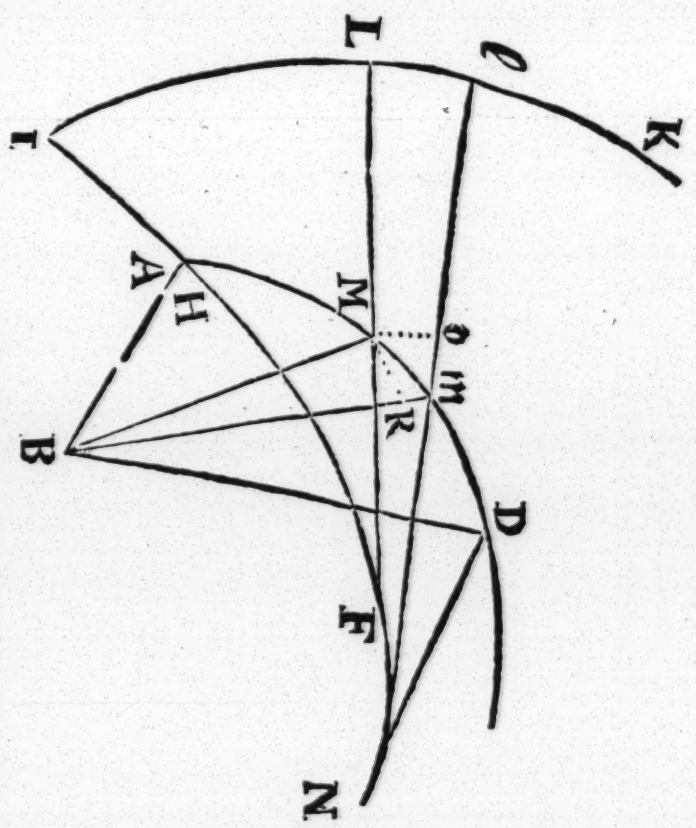
CASU *Conſimili*, is a Writ of Entry, granted where the Tenant by Curteſy, or Tenant by term of Life, or for the Life of another, doth alien in Fee, or in Tail, or for the Term of another's Life.

CASU *Proviſo*, is a Writ of Entry given by the Statute of *Glouceſter*, in caſe where a Tenant in Dower alieneth in Fee, or for Term of Life, or in Taile, and lieth for him in Reverſion againſt the Alienance.

CATABIBAZON, the *Dragon's Tail* is ſo call'd becauſe it goes exactly againſt the *Dragon's Head*.

CATACATHARTICKS, are Medicines that purge downwards.

CATACAUSTICKS, or *Cauſticks by Reflection*.



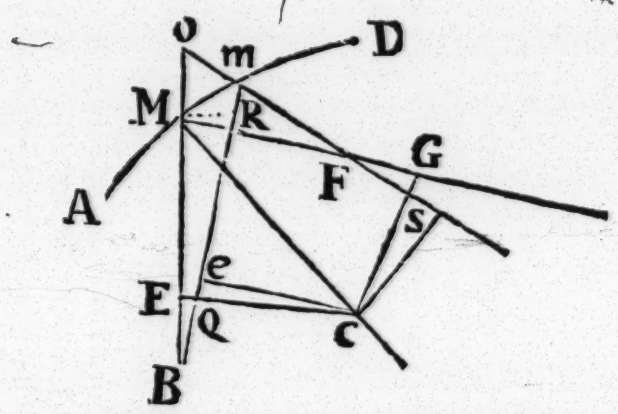
Suppoſe an infinite number of Rays as *BA*, *BM*, *BD*, proceeding from the radiating Point *B*, and reflected at the Curve *AMD*, ſo that the Angles of Incidence be ſtill equal to thoſe of Reflection; the Curve *HFN* to which the reflected Rays are Tangents continually (or which continually touches the Productions of them *AH*, *MF*, *DN*) is called the *Cauſtick by Reflection*. Or it will amount to the ſame thing, if one ſays, that the *Catacauſtick Curve* is that which is formed by joining the Points of Concourſe of the ſeveral reflected Rays. Let the reflected Ray *HA* be produced to *I*, and take *AI*=*AB*, and ſuppoſe the Curve *ILK* deſcribed by the *Evolution* (ſee the Word *Evolution*) of the *Cauſtick HFN*, beginning at the Point *I*. Again, ſuppoſing the incident and reflected Rays *BM*, *mF* infinitely near to the incident and reflected *BM*, *MF*; and drawing out *FM*

to *l*, on the Centers *F*, *B*, let the little Arches *MO*, *MR* be deſcribed. Theſe things promiſed, 'tis evident,

1. That the little Triangles *MOm*, *MRm* are always ſimilar and equal. For the Angles at *O* and *R* are Right ones; and the Angle *RmM*, *FmD* are equal from the Suppoſition of the Angles of Incidence and Reflection, and *FmD* = *OmM*, as being vertically oppoſite; and the Hypothenuſe *Mm* is alſo common to both Triangles: therefore they are ſimilar and equal, and *Om* always = *Rm*.

2. 'Tis clear that *Om* is the Increment of *LM*, and *Rm* the Increment of *BM*, and theſe Increments are perpetually equal to one another. Therefore their reſpective Sums are ſo too; but the Sum of all *Om* (for the Portion *AM* of the reflecting Curve *AMD*) is *ML* — *IA*, and the Sum of all *RM* (for the ſame Portion of the Curve *AM*) is *BM* — *BA*, which are therefore equal to one another.

3. From the Nature of *Evolution*, the Tangent of the *Cauſtick*, *FL* is = the Portion of the Curve *FH* + the Right-line *HI*, that is *FM* + *ML* = *AH* + *HF* + *IA*, and *ML* — *IA* = *AH* + *HF* — *MF*; but *ML* — *IA* = *BM* — *BA*, and therefore the Portion of the *Cauſtick* *HF* = *BM* — *BA* + *MF* — *AH*, perpetually. That is, the Portion of the *Cauſtick* *HF* formed from the reflected Rays of the Curve *AM*, is equal to the Difference of the incident Rays *BM*, *BA*, added to the Difference of the reflected Rays *MF*, *AH*. Or, taking any two incident Rays, as *BA*, *BM*, that Portion of the *Cauſtick* which is *evolved* while the Ray *BA* approached to a Coincidence with *BM*, is = to the Difference of theſe Incidents + the Difference of their reflected Rays. Now knowing how to determine the *Evoluta* of any given Curve, the Invention of the *Catacauſtick* from thence is eaſy.



Let the Point *C* be at the *Evoluta* of the reflecting Curve *AMD*, or which is all one, let *MC* be the Radius of the Concavity for the Point *M*; and ſuppoſing the Arch *Mm* infinitely ſmall, let *Bm*, *Cm*, *Fm* be drawn. Farther, upon the Centers *B*, *F*, let the little Arches *MR*, *MO* be deſcribed; and from the Point *C*, the Perpendiculars *CE*, *Ce*, *CG*, *Cg*, to the incident and reflected Rays. The Triangles *MRm*, *MOm* are ſimilar and equal, as was ſhewn before, and *MR* = *MO*. Alſo the Triangles *CEM* and *CGM* are ſimilar and equal, and ſo are *Cem* and *Cgm*; for the Angles at *E*, *e*, *G*, *g* are right, and *MC*, *mC* are common, and *EMC* = *GMC*, and *emC* = *gmC* (becauſe *MC*, *mC* are *Normals* to the Curve by ſuppoſition of the *Evoluta*, and the Angles of Incidence and Reflection are equal) therefore *CE* = *GC*, and *Ce* = *gC*, and conſequently *CE* — *Ce* = *CG* — *Cg*, that is, *EQ* = *SG*. Laſtly, the Triangles *BMR* and *BEQ* are ſimilar, and ſo are *FMO*, *FGS*. Now let *BM* = *y*, *ME* = *MG* = *a*; therefore *BM* + *BE* = 2*y* — *a*; let *RM* = *OM* = *x*, and *FM* = *z*, wherefore *FG* = *a* — *z*, and let it be required to find *z*, which determines the Point *F* in the *Cauſtick*. Then $EQ = \frac{\dot{y}x - a\dot{x}}{y}$, and $EQ + MR = \frac{2\dot{y}x - a\dot{x}}{y}$, alſo $SG = \frac{a\dot{x} - z\dot{x}}{z}$, and $SG + MO = \frac{a\dot{x}}{z}$: But by what was ſhewn before *RM* = *MO*, and *SG* = *QE*; therefore $EQ + RM = SG + MO$, *viz.* $\frac{2\dot{y}x - a\dot{x}}{y} = \frac{a\dot{x}}{z}$, and $2yz - za = ya$, and $z\ (= MF) = \frac{ay}{2y - a}$. *Q. E. I.*

Corol. 1. If the incident Rays are parallel, then $z = \frac{1}{2}a$. For *y* in this Caſe is infinite, and therefore 2*y* — *a* = 2*y*, the Quantity *a* vaniſhing if compared with *y*.

Corol. 2. If the incident Ray *BM* touches the Curve *AMD* in *M*, then *a* (= *ME*) is = 0; and therefore *z* (= *MF* = 0) alſo: From whence it follows, that the given Curve *AMD*, and the *Cauſtick* touch one another at the Point *M*.

Corol. 3. If the *Radius* of Concavity *MC* be = 0, then again *a* = 0, and *z* = 0; from whence it follows, that the Curve *AMD* and the *Cauſtick* do cut one another at the Point *M*, and make an Angle equal to the Angle of Incidence.

Corol. 4. If *CM* be infinite, then *a* (= *ME*) is infinite likewiſe, and *z* (= *MF*) = — *y*; and in this Caſe of the infinite Diſtance of the Point *C*, the Arch *Mm* becomes a Right-line.

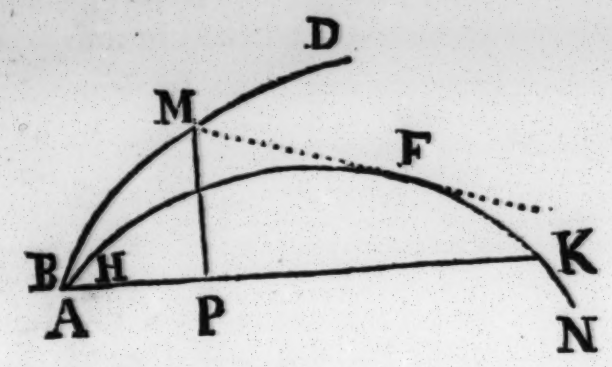
Corol. 5. 'Tis eaſy to apply all this that has been ſaid, when the Curve *AMD* is convex to the Radiating Point *B* (in which Caſe we ſhall have $z = \frac{ay}{2y + a}$) and to ſhew when the reflected Rays will come converging or diverging.

Corol. 6. When the Curve *AMD* is a Geometrick Curve, the *Cauſtick* will be ſo too; for if *AMD* be a Geometrick Curve, the *Evoluta* will be ſo too; that is, all the Points *C* may be Geometrically determined, and from the *Evoluta*, the Points *F* of the *Cauſtick* may be Geometrically determined alſo. But farther, the *Cauſtick* upon this Suppoſition ſhall always be rectifiable too, for Right-lines may always be found equal to any Portions of it.

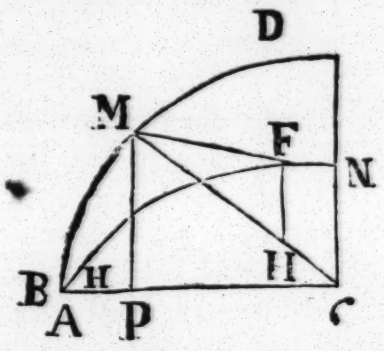
Corol. 7. 'Tis plain, that giving any 2 of the 3 Points *E*, *C*, *F*, that is, the *Radiating Point*, the *Point of the Evoluta*, and the *Point of the Cauſtick*, the 3d Point may be determined.

By this general *Theorem* and its *Corollaries*, the *Cauſticks* of particular Curves are eaſily determined, however the Rays go, Converging, Diverging or Parallel; but we will ſuppoſe the ſimpler Caſe of parallel Rays. Thus in the common *Parabola*, if the incident Rays are parallel, and cut the Ax at Right-angles, that is, are co-incident with the Ordinates to that Ax, then we have $z = \frac{1}{2}a$; ſo that taking in each reflected Ray the Length of $\frac{1}{2}a$ (*a* being the reflected Ray intercepted between

tween the Point of Incidence, and the Point where the *Normal* from the *Evoluta* meets that reflected Ray) by this Means the ſeveral Points of the *Cauſtick* will be determined. The Length of the *Cauſtick* Curve alſo taken from the *Vertex* of the *Parabola* (where it begins) to any other Point, is equal to the Sum of the Incident and reflected Rays.



As ſuppoſe *AMD* were the *Parabola*, whoſe Vertex *A*, and Ax *AK*, and *AHF* were the *Cauſtick*, beginning at the ſame Point; now becauſe the incident and reflected Rays at the Vertex are equal to nothing; that is, $AB=o$, and $AH=o$, therefore the Curve AHF ($=PM-BA+MF-AH$ by what was ſhewn before) $=PM+MF$.



In the Circle the Rays *PM* being (as before) parallel to each other, and *Normal* to the Diameter *AC*, we have alſo $z=\frac{1}{2}a$. But ſince the *Evoluta* of the Circle is contracted into the Center; the Radius *MC* being biſſected in *H*, a perpendicnlar *HF* to the reflected Ray *MF* gives the point *F* in the *Cauſtick*. The reflected *MF* is alſo equal to $\frac{1}{2}$ the Incident *BM* perpetually; for *MC* being $=r$, and $MP=y$, we have from the ſimilar Taiangles *MPC*, *MFH*, $r:y::\frac{r}{2}:z=\frac{y}{2}$. From hence 'tis clear, that the *Cauſtick* terminates at the point *K*, biſſecting the Radius *CB* at Right Angles to *AC*. Again, the Portion of the *Cauſtick* $AF=3MF$, becauſe $AF=PM+MF=y+z=y+\frac{1}{2}y$. But theſe hints of Examples may ſuffice, without deſcending to thoſe of other Curves, which are to be done after the ſame manner from the general *Theorems* that theſe were, and the Conſtructions likewiſe to be deduc'ed. 'Twould be no difficult matter to ſhew alſo what Curves theſe *Cauſticks* are in every Example: As in the laſt caſe of the Circle, that the *Cauſtick* is a Cycloid formed by the Revolution of the Circle deſcrib'd upon the Diameter *HM*, along the Quadrant deſcrib'd with the Radius *CH*. That the *Cauſtick* of the vulgar Semi-cycloid when the Rays are parallel to the Ax of it, is alſo a vulgar Cycloid, deſcrib'd by the Revolution of a Cyrcle upon the ſame Baſe. That the *Cauſtick* of a Logarithm Spiral, is the ſame Curve, but only ſet in a different Poſition; and the like others.

CATACHRESIS, is a Trope in Rhetorick, by which Liberty is given to borrow the Name of a thing, though quite contrary to what it ſhould be, becauſe it cannot be otherways Expreſs'd; as when we ſay *a Silver Ink-horn*; here Reaſon demurs at the Expreſſion; yet Neceſſity obliges us to make uſe of it. But perhaps *Ink-horn* is corrupted from *Inkern* or *Inker*.

CATACLIDA, is the Rib called the *Subclavian*.

CATACOUSTICKS, or *Cataphonicks*, is the Science of Reflected Sounds, or which teaches the Doctrine and Properties of *Echoes*.

CATADIOPTRICAL *Teleſcope*, or *Reflecting Teleſcope*: See *Teleſcope*.

CATAGMA, is a breaking of Bones, or a Separation of the *Continuum* in the hard parts of the Body; which is affected with ſome hard Inſtrument forcibly impreſſed upon the part; whoſe Differences are taken from the Form, the Part, and ſeveral Accidents. *Blanchard*.

CATAGMATICK *Medicines*, are ſuch as are uſed to help to Conſolidate Broken Bones.

CATALEPSIS, or *Catochus*, is a Diſeaſe almoſt like an Apoplexy, being an Abolition of all the Animal Functions; except that the Reſpiration remains entire, and the Patient preſerves the ſame Habit of Body that he had before he fell ſick. *Blanchard*.

CATALEPTICK *Verſe*: See *Diſpoſition*.

CATALLIS *Captis*, *Nomine Diſtrictionis*, is a Writ that lieth within a Borough, or within a Houſe, for Rent going out of the ſame, and warranteth a Man to take the Doors, Windows, or Gates for Rent.

CATALLIS *Reddendis*, is a Writ which lyeth where Goods being delivered by any Man to keep unto a certain Day, and be not upon demand delivered at a Day; and is otherwiſe called, *a Writ of detinue*.

CATAPASMA, a fragrant Powder which is ſometimes applied to the *Scrobiculum Cordis*, to ſtrengthen the Stomach.

CATAPHORA, is the ſame with *Coma*; they only differ in this, that *Cataphora* is taken as the Genus to all ſorts of Stupors that are not attended with a Fever. *Blanchard*.

CATAPLASM, is a topical Medicine of the conſiſtence of a Pultiſe; it is uſualy deſcrib'd two ways, either boiled, or without it; the former is more frequent, the latter of more efficacy: In the former, they are to take ſuch Vegerables as are proper, as Roots, Herbs, Seeds, Flowers, Fruits, *&c.* adding proper Meals, or omitting them; all which are boiled up in a convenient quantity of Liquor, *v. g.* Water, Beer, Milk, Honey, *&c.* to the conſiſtence of a Pultiſe: The latter is prepared commonly of Vegetables ſhred ſmall with the infuſion of ſo much Liquor only as may make it of the former Conſiſtence. You may add here Meal, Crums of Bread, Oyls, Ointments, as in the former ſort of *Cataplaſms*. *Blanchard*.

CATAPTOSIS, is one Symptome of an Epilepſie, when Men fall ſuddenly to the Ground. *Blanchard*.

CATARACT, a Diſeaſe in the Eyes, and is twofold, either *beginning*, as a *Suffuſion* only, or confirmed, as a *Cataract*, proper ſo call'd; the *Incipient* is but a Suffuſion of the Eye when little Clouds, Motes, and Flies ſeem to fly before the Eyes; but the confirmed *Cataract*, is when the Pupil of the Eye is either wholly or in part covered, and ſhut up with a little thin Skin; ſo that the Sun-beams have not due admittance to the Eye. *Blanchard*.

CATARACT, is a Precipiece in the Channel of a River, cauſed by Rocks, or other Obſtacle ſtopping the Courſe of its Stream, from whence the Water falls with a great noiſe and impetuoſity; as

as the *Cataracts* of *Nile*, *Danube*, *Rhine*, &c.

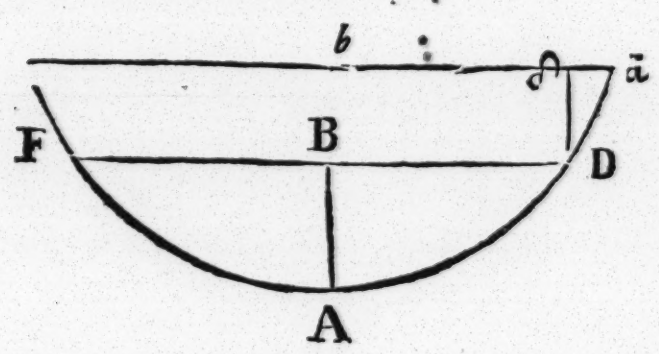
CATARRHUS, is a Defluxion of Humours from the Head towards the Parts under it, as the Noſtrils, Mouth, Lungs, *&c.* Some diſtinguiſh it by the Name of *Loryza*, when it falls on the Noſtrils, by that of *Bronchus* when on the Jaws; and by the Word *Rhume*, when it falls on the Breaſt.

CATCHES, are thoſe parts of a Clock that hold by hooking and catching hold of.

CATEGORIA and CATEGCREMA } the ſame with *Prædicamentum* in Logick: See *Prædicament.*

CATENARIA, is the Curve Line which a Rope hanging freely between two Points of Suſpenſion forms it ſelf into. What the Nature of this Curve is, was enquired amongſt the Geometers in *Galilæus*'s time, but I don't find any thing was done towards a Diſcovery till in the Year 1690, *James Bernouli* publiſhed it as a Problem; which, about two Months after, *Leibnitz* declared he had found out, and would communicate within the Year: In *December*, 1690, *John* the Brother of *James Bernoulli* communicated an Inveſtigation of it to the Editors of the *Acta Eruditorum*, which was publiſh'd afterwards *June* 1691. This *Catenary* or *Funicular* he ſaith he found not to be truly *Geometrical*, but of the *Mechanical Kind*, becauſe its Nature cannot be expreſſed by a determinate Algebraick Equation; but *Leibnitz* gives its Conſtruction Geometrically. In the Year 1697, the Month of *Auguſt*, Dr. *Gregory* publiſhed a Method of Inveſtigatioh of the former and ſome other new Properties of this Curve which you will find there, from whence this Method of finding the general Property of the *Cataneria* is taken.

1. Suppoſe a Line heavy and flexible, the two Extreams of which *F* and *D* are firmly fixed in thoſe Points; by its weight it is bent into a certain Curve *FAD*, which is call'd the *Catenaria*.



2. Let *BD* and *bd* be parallel to the Horizon, *AB* perpendicular to *BD*, and *Dδ* parallel to *AB*, and the Points *Bb* infinitely near to each other. From the Laws of Mechanicks any 3 Powers *in Æquilibrio* are to one another, as the Lines parallel to the Lines of their direction (or inclined in any given Angle) and terminated by their mutual Concourſes. Hence if *Dd* expreſſes the abſolute Gravity of the Particle *Dd* (as it will if we allow the Chain to be every way uniform) then *Dδ* will expreſs that Part of the Gravity that acts perpendicularly upon *Dd*, and by the Means of which this Particle endeavours to reduce it ſelf to a Vertical Poſition; ſo that if this Lineola *dδ* be conſtant, the perpendicular Action of Gravity upon the Parts of the Chain will be conſtant too, and may therefore be expreſſed by any given Right Line *a*. Father, the Lineola *Dδ* will expreſs the Force which acts againſt that *Conatus* of the Particle *Dd*) by which it endeavours to reſtore it ſelf into a Poſition perpendicular to the Horizon) and hinders it from doing ſo: This Force proceeds from the ponerous Line *DA* drawing according to the Direction *Dd*: and is (*cæteris paribus*) proportional to the Line *DA*, which is the Cauſe of it. Suppoſing the Curve *FAD*; therefore as before, whoſe Vertex (the loweſt Point of the *Catena*) *A*, *ax* is *AB*, Ordinate *BD*, Fluxion of the Ax *Dδ=Bb*, Fluxion of the Ordinate *dδ*, the Relation of theſe two Fluxions is thus, *viz.* *dδ* : *Dd* :: *a* : *DA* Curve; which is the Fundamental Property of the Curve, and may be thus expreſſed (putting *AB=x*, and *BD=y*, and *AD=c*)

$$y = \frac{ax}{c}.$$

CATHARPINGS, are ſmall Ropes in a Ship running in little Blocks, from one Side of the Shrouds to the other near the Deck, they belong only to the Main-Shrouds and Fore-Shrouds: Their uſeis uſe to force the Shrouds taught, for the eaſe and ſafety of the Maſts when the Ship rowls; they are alſo at the ſetting on of the Puttocks of the Shrouds, but there they do not run in Blocks, but are made faſt.

CATHARTICK, is a purging Medicine which cleanſes the Stomach, the Guts, and whatſoever is vitious and *heterogeneous* in the Blood, and throws it into the Common-Shore of the Guts. *Blanchard.* See *Purgatio & Vomitorium.*

CATHEMERINA *Febris*, the ſame with a *Quocidian.*

CATHETER, is a Fiſtulous Inſtrument which is thruſt up the Yard into the Bladder, to provoke Urine when its ſuppreſſed by the Stone; or into whoſe Cavity an Inſtrument called *Itinerarium* is thruſt to find out the Stone in the Bladder, that then the *Sphincter* of the Bladder may be ſhown, and an Inciſion be made in the *Perinæum.*

CATHETERISMUS, is the Adminiſtration or Operation of injecting any thing into the Bladder be a *Catheter* or a *Syringe.*

CATHETI, in a Right-angled Triangle, and the Sides including the Right-angle. If it be in the Singular Number, *Cathetus.*

CATHETUS, it ſignifies the Perpendicular only, the other Leg being called the Baſe. Alſo *Cathetus*, in *Catoptricks*, ſignifies a Line drawn from the Point of Reflection perpendicular to the Plane of the Glaſs.

CATHETUS, in Architecture, is taken for a Line ſuppoſed directly to traverſe the Middle of a Cylindrical Body, as of a *Balliſter* or Column. In the *Ionick* Chapiter it is alſo a Line falling perpendicularly, and paſſing through the Center or Eye of the *Voluta.*

CATHETUS *of Incidence*, is a Right Line drawn from a Point of the Object, perpendicular to the Reflecting Line.

CATHETUS *of Reflection*, or *Cathetus of the Eye*, is a Right Line drawn from the Eye perpendicular to the *Reflecting Line.*

CATHYPNIA, a deep or profound Sleep; ſuch as Men are in by taking Opitates, or by Lethargy, *&c.*

CATO-CATHARTICK *Medicines*, are ſuch as work downwards, and purge by Stool only: Theſe are called alſo *Catoreticks.*

CATOCHE, the ſame with *Catalepſis.*

CATOPSIS, the ſame with *Myopia.*

CATOPTRICKS, is that Part of the Science of *Opticks* which treats of *Reflex-viſion*, and explains the

the Laws and Properties of *Reflexion*.

CATORETICKS, the ſame with *Catherticks*.

CATT, or *Catt-Head*, a large piece of Timber ſo called in a Ship; 'tis faſtened aloft over the *Hawſe*, having at one end two *Shivers*, in which is reeved a Rope with a Block, and at the end of the Rope a large Hook, which is called the *Catt-Hook*: Its Uſe is to triſe up the Anchor from the *Hawſe* to the Top of the *Fore-Cuſtle*, where there is faſtened a *Stopper* (*i. e.* a piece of Rope ſpliced into it) at the Anchor, which ſerves to hitch the Hook of this *Catt-Rope* into the Ring of the Anchor.

CATT-HOLES, in a Ship, are Holes in her Stern above the Gun-Room Port, and through them, by means of a *Stem-faſt* (that is, ſome Faſtenings behind the Stern) to which a *Cable* or *Hawſer* is brought, a Ship (upon Occaſion) is heaved a Stern.

CAVALIER, in Fortification is a Heap or Maſs of Earth raiſed in a Fortreſs, to lodge the Cannon for ſcouring the Field, or oppoſing a Commanding Work. Theſe *Cavaliers* are ſometimes of a Round, ſometimes of a Square Figure, the Top being bordered with a Parapet to cover the Cannon therein mounted. There muſt be 12 Foot between Cannon and Cannon; and if they are raiſed on the Encloſure of any Place, whether in the Middle of the Curtin, or in the Gorge or Baſtion, are generally 15 or 18 Foot high above the Terre-plan of the Rampart.

A *Cavalier* is ſometimes called a *Double Baſtion*, and is deſigned to overlook the Enemy's Batteries, and to ſcour their Trenches.

CAVA VENA; the greateſt Vein in the Body deſcends from the Heart; ſo called from its great Cavity, and into it, as into a common Channel, do all the leſſer Veins, except the *Pulmonaris*, empty themſelves. Its Root may very properly be ſaid to be in the Liver; for by its Capillaries it receives the Blood that is tranſcolated through the Glandulous *Parenchyma* of the Liver, from the Capillaries of the *Porta*, and by its aſcending Trunk conveys it to the Heart. Theſe Capillaries emptying all the Blood exhauſted out of the Liver into the *Cava*, it is preſently divided into the *Aſcending* and *Deſcending Trunk*. The *Aſcending* enters the *Diaphragm* and goes to the *Thorax*. The *Deſcending Trunk* is ſomewhat narrower than the *Aſcending*, and paſſes down along with the great Artery, continuing undivided till the fourth *Vertebra* of the Loins. But in the mean time ſends forth divers Branches from its Trunk, as the *Venæ Adipoſæ*, *Emulgents*, *Spermaticks*, *Lumbares*; All theſe Veins being ſent forth of the Trunk, by the time it is come to the fourth *Vertebra* of the Loins where it turns to behind the *Arteria Magna*, above or before which it had thus deſcended, and is then divided into equal Branches, called *Iliaci*, becauſe they paſs over the *Os Ilion*, &c. as they go down to the Thighs.

This Vein carries nothing to the Liver, but receives the Blood from thence, carrying it, and what it receives from its other Branches into the Right Ventricle of the Heart, that it may be there anewimproved and inſpirited.

CAUDA *Lucida*, the *Lion's Tail*, a fixed Star of the firſt Magnitude, whoſe *Longitude* is 167°. 53′, *Latitude* 12°. 16′. *Right Aſcenſion* 173°. 9′.

CAVIN, in Fortification, is a hollow Place proper to favour the Approaches to a Fortreſs, ſo that one may advance therein under Covert towards the Enemy's, as it were in a Trench. If it be within Musket-ſhot, 'tis a Place of Arms ready madeto Hand; and a Convenience for opening the Trenches out of Fear of the Enemy's Shot.

CAULEDON, is the breaking of Bones acroſe, when the Parts of the Bones are ſo ſeperate that they will not lye direct.

CAULIFEROUS *Herbs* or *Plants*, amongſt the Botaniſts, are ſuch as have a true *Caulis* or Stalk, as a great many have not.

CAULIS, is in Botany, the Stalk of any Herb, or the Stem or Trunk of a Tree.

CAUSA *Matrimonii prælocuti*, is a Writ which lieth in Caſe where a Woman giveth Lands to a Man in Fee-ſimple, to the Intent he ſhall Marry her, and refuſeth ſo to do in reaſonable time, being required thereuntò by the Woman.

CAUSAL *Propoſitions*, are thoſe that contain two Propoſitions joined together by Conjunction of the Cauſe (*becauſe*, or *to the end that*) as, *Woe to the Rich, becauſe they have their Felicity in this World. The Wicked are advanced, to the end, that falling from on high, their fall may be the greater.*

CASUALITY, is the Action or Power of a Cauſe in producing its Effect.

CAUSAM *nobis ſignifices*, is a Writ which lyeth to the Mayor of the Town, or City, *&c.* that formerly by the King's Writ, being commanded to give Seiſin unto the King's Grantee of any Lands or Tenements, doth delay ſo to do, willing him to ſhew Cauſe why he ſo delayeth the Performance of his Charge.

CAUSODES, the ſame with *Cauſus*: Which ſee.

CAUSTICK *Curves*: See *Cata-cauſticks* and *Dia-cauſticks*.

CAUSTICK *Stones* or *Cauteries*, are thus made of Lime and Gravelled Aſhes: Put into a large Earthen Pan one Part of Quick-line, and two of Gravelled Aſhes, or of Calcined Tartar, both powdered and mix'd; on theſe pour good ſtore of hot Water, and then leave the Matter to infuſe 5 or 6 Hours, then boil it a little: Then filtrate through Cap-paper, and evaporating the Liquor that paſſed the Filtre, a Salt will remain at the Bottom. Put this Salt into a Crucible, and melt and boil it till all the Humidity which came from the Water is exhauſted. The Matter will ſtill remain fluid; and when by trying ſome of it on the End of a Spatula, you find it of a due Conſiſtence and that it looks like Oil in the Bottom of the Crucible, caſt it into a Baſon, and cut it, and form it into Pieces while it is warm; put them quickly into a ſtrong Glaſs Bottle, with a ground Stopple of the ſame Metal, for they will diſſolve and be ſpoiled if the Air come to them. Theſe are the ſtrongeſt *Cauteries* that can be made, and are ſoon and eaſily prepared.

CAUSTICKS, or *Eſcharoticks*, are thoſe things which burn the Skin and Fleſh into an hard Cruſt, as burned Braſs, unquenched Lime, ſublimated Mercury, and hot Iron, *&c.*

CAUSUS, or *a burning Fever*, is that which is attended with a greater Heat than other continued Fevers, an intolerable Thirſt, and other Symptoms, which argue an extraordinary Accenſion of the Blood. *Blanchard.*

CAUTERISATION, is an Artificial Burning made by a *Cautery*.

CAUTERIUM, is a Chyrurgeon's Inſtrument made of Iron, Silver or Gold, which after it's heated, has an actual Power of Burning into any thing; they differ in Bulk and Form.

It is ſometimes taken for a *Potential Cautery*, prepared of *Lixiviums*, or Lime and Soap.

CAUTIONE *Admittenda*, is a Writ that lieth againſt a Biſhop holding an Excommunicate Perſon in Priſon for his Contempt, notwithſtanding that he offereth ſufficient Caution or Pledge to obey the Commandments and Orders of the Holy Church from henceforth.

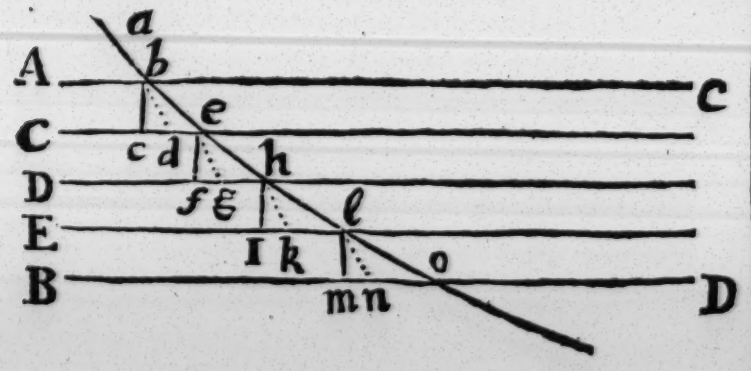
CAZEMATE, a Term in Fortification: See *Caſemate*.

CEGINUS, a fixed Star of the 3 Magnitude in the left Shoulder of *Bootes*, whoſe *Longitude* is 194°. 5'. *Latitude* 49°. 33'. *Right Aſcenſion* 215°. 39'. *Declination* 29°. 27'.

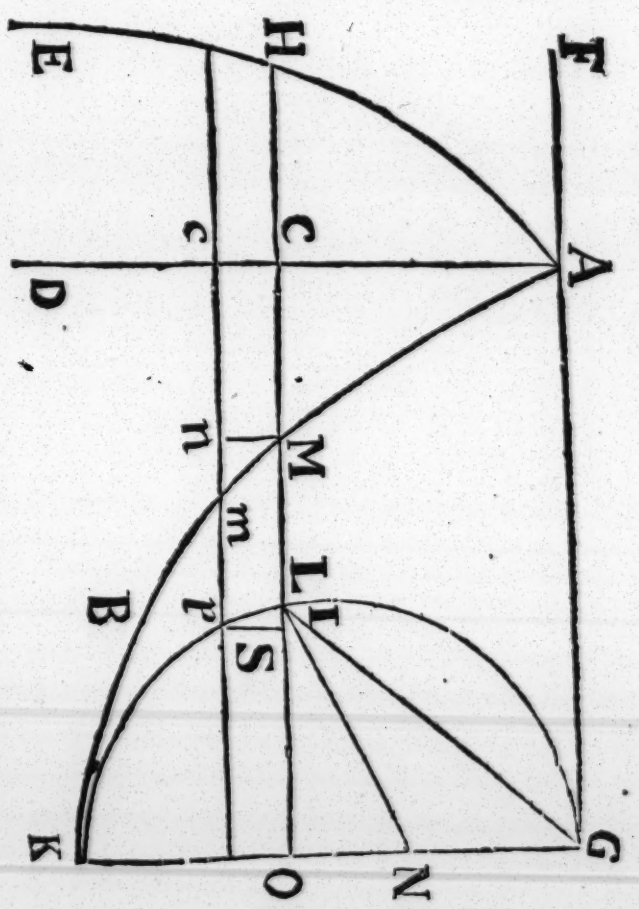
CELE, is a Tumour or Swelling in any Part of the Body.

CELERITY, is the Velocity or Swiftneſs of any Body in Motion; and it is defined to be an Affection of Motion by which any Moveable runs through a given Space in a given Time.

CELERRIMI *Deſcenſus Linea*, the Curve of the ſwifteſt Deſcent of any Body; or that in which an heavy Body deſcending by its own Gravity ſhould move from one given Point to another in the ſhorteſt Time. This was propoſed as a Problem by that excellent Mathematician M. *John Bernouli*, Profeſſor of Mathematicks at *Groningen*; and he did afterwards ſhew that this Curve was the ſame with that which a Ray or Particle of Light deſcribes in *Mediums* which are not uniform; for in ſuch a Rarity effects the Ray after the ſame manner, as the Acceleration of Velocity doth the heavy Body in its Deſcent. For if any heavy Body deſcend from any given Point, and deſcribe a Curve, and hath its Velocity in a Subduplicate Ratio of the Altitude: And if a Particle of Light coming from a given Point, and paſs through a *Medium* whoſe Rarity increaſes in a Subduplicate Ratio of the Altitude or Depth, then will the Velocity of the Particle or Ray of Light, be in a Subduplicate Ratio of ſuch Heighth or Depth; and conſequently, ſince the Velocity becomes the ſame whether produced by the uniform Action of Gravity, or by the Rariety of the *Medium*, the Line of Deſcent or Motion, or the Curve deſcribed will be in both Caſes the ſame. There have been publiſhed many Methods of Inveſtigating the Nature of this Curve; and the following one (which is ſhort, plain and eaſy) recommends it ſelf to us with this Advantage, that two Noble Problems in two diſtinct Sciences, are ſolved at one and the ſame time, the one an Optical one, the other a Mechanical.



Let us imagine the Medium *A B C D* to be made up of Fluids of ſeveral different Degrees of Denſities, but the Denſities (proceeding through the ſeveral Intervals of the Parallels *A C*, *C e*, *D b*, *E l*, *B o*, to encreaſe or diminiſh in a certain Law. In this Example we'll ſuppoſe the Degrees of Rarity in the Fluids to increaſe as we go from *A* towards *B*; ſo that the Ray *a b* is turned by the Refraction into *b e*, and *b e* into *e h*, and *e h* into *h l*, &c. from the Perpendicular *b c*, *e f*, *h i*, &c. at the Points of Incidence, *b*, *e*, *h*, &c. the prick'd Lines being the ſeveral Incident Rays produced. The refracted Ray intercepted between the Points *b* and *o*, *viz. b e h l o*, is a Polygon made up of all the Refracted Rays *b e*, *e h*, &c. which deflect from one another by the Angles of Refraction made at the ſeveral Points *b*, *e*, &c. Now if the Diſtances of the Parallels are leſſen'd infinitely, the Polygon *b e h l o* becomes a Curve Line; but alſo the Curve Ray in its Paſſage through the ſeveral Mediums, is ſuppoſed to take ſuch a Courſe, that it comes from the Radiating Point to the Point to be enlightned in the ſhorteſt time, 'tis evident (ſince 'tis every where ſo throughout the Polygon *b e h l o*) that the Curve into which that Polygon degenerates (being the Curve which the Ray by the continual Refraction is bent into) is the Curve of ſwifteſt Motion, or that by which the Light paſſes from the Point *b* to the Point *o* in the ſhorteſt Time. And ſince the Sines of the refracted Angles *c b e*, *f e h*, &c. are ſtill as the Rarities of the Mediums in thoſe ſeveral Points, that is, as the Velocities of the Globule of Light in thoſe Places; and ſince alſo thoſe refracted Angles are the Angles of the Inclination of the Lines *b e*, *e h*, &c. to the Perpendiculars *b c*, *e f*, &c. 'tis clear that the Curve muſt have this Property, that the Lines of the Inclinations to a Perpendicular muſt be every where in the Ratio of the Celerities.



Now let the Law of the Rarity or Denſity of the Medium be what it will, we may thus in general proceed to determine the Curve. Let the Medium *F G D K* be determined by the Horizontal Line *F G* to which *A D* is perpendicular, and is the Ax of the Curve *A H E*, whoſe Ordinate is *H C*; and let the Ordinate *H C* ſtill repreſent the Rarities of the Medium in the Depths *A C*, or which is all one, the Velocities of the Globule of Light in the Points of the Curve *M*. The incurved

ved Ray, or the *Semeta* of the Globule is the Curve *AMB*, the Nature of which is to be enquired into. The Lines *HCM* and *cnm* are parallel to *FG*, and *Mn* parallel to *AD*. Let $AC = x$, $Cc = Mn = \dot{x}$ $CM = y$, $nm = \dot{y}$, $AM = z$, $Mm = \dot{z}$, $HC = v$; and a a ſtable quantity taken at Liberty. If we put Mm for Radius, 'tis plain that nm is the Sine of the refracted Angle (or of the Curve's Inclination to the Vertical Line Mn at the Point M) therefore ſince the Sines of thoſe Angles are (as was ſaid before) always as the Celerities, then $\frac{m\,n}{HC}$ is a conſtant Ratio, that is, $\frac{\dot{y}}{v}$ is a conſtant Ratio; ſo that $\frac{\dot{y}}{v} = \frac{\dot{z}}{a}$ (for the Fluxions $\dot{z}$ being taken equal, as they may then $\frac{\dot{z}}{a}$ is alſo a ſtable Ratio) and $a\dot{y} = v\dot{x}$, and $a\,a\dot{y}\dot{y} = v\,v\dot{z}\dot{z}$, but $\dot{z}\dot{z} = \dot{y}\dot{y} + \dot{x}\dot{x}$ therefore $a\,a\dot{y}\dot{y} = v\,v\dot{y}\dot{y} + v\,v\dot{x}\dot{x}$, and $\dot{y} = \frac{a\dot{x}}{\sqrt{aa - v\,v}}$, which is the general Equation in Fluxions for the Curve *AMB*. Now 'tis all one whether we conſider the Increments of the Velocity as depending upon the Medium more or leſs reſiſting the Globule, or whether abſtracting from all Conſideration of a Medium, we ſuppoſe them to be the Effects of another Cauſe, but acting according to the ſame Law that was obſerved on the former, ſince on both Sides the Curve is ſuppoſed to be run in the ſhorteſt Time. Now if we imagine the Globule to be a heavy Body, and Gravity to be the Cauſe of the Acceleration; then the Curve *AHE* will be the common Parabola, ſince *HC* or v repreſents the Celerity for the Space x or *AC*; and in this Curve v is as $x^{\frac{1}{2}}$. The conſtant Line a being the Parameter, and ſo $v = \sqrt{a\,x}$; ſubſtituting this in the Room of v in the general Equation, we have $y = \sqrt{:\frac{x}{a-x}} \times \dot{x}$. From hence it follows, that the Curve of ſwifteſt Deſcent, *viz.* *AMD*, is the vulgar Cyloid, the Diameter of whoſe generating Circle *GLK* is $= a$, and whoſe Baſe is *AG*, and Vertex *K*, *GK* being Perpendicular to *AG*. Two things ſet this in the cleareſt Light: 1. To prove that *CM* is $= arc\,GL - LO$; And 2, from thence that *ML* is $= arc\,LK$, which is the known Property of the Cycloid. That $CM = arc\,GL = LO$ is certain, in that the Fluxions of them are perpetually equal in all Points of the Curve. Let $LO = s$, and the $arc\,GL = c$, and its Fluxion $Lp = \dot{c}$; then ſince $s = ax - xx$, we have $\dot{s} = \frac{a\dot{x} - 2\dot{x}\dot{x}}{2\sqrt{ax - xx}}$. Again, $\dot{c} = \frac{\frac{1}{2}a\dot{x}}{s} = \frac{a\dot{x}}{2s} = \frac{a\dot{x}}{2\sqrt{ax - xx}}$; therefore $\dot{c} - \dot{s} = \frac{2\dot{x}\dot{x}}{2\sqrt{ax - xx}}$ $= \frac{\dot{x}\dot{x}}{\sqrt{ax - xx}} = \sqrt{:\frac{x}{a-x}} \times \dot{x} = \dot{y}$, wherefore $c = s = y$, and $c - s - y$, viz. $CM =$ Arch $GL - LO$. Now if $CM = GL - LO$, then MO, which is $= CO - CM$, is $= CO - GL = LO$: But $CO = \frac{1}{2}$ Circle $GLK = GL + LK$; therefore MO, which is $= CO - GL + LO$, is $= GL + LK - GL + LO$; that is, MO is $= LK + LO$, and taking away LO, $ML = LK$: So that 'tis clear the Curve is the Cycloid above deſcribed. *Q. E. I.*

CELESTIAL *Globe*: See *Globe*.

CELLULÆ *Inteſtini Coli*; the little Cavities of the Gut *Colon*, are where the Excrements lodge ſome while, that they may refreſh ſome adjacent Part with their Heat, and digeſt and ferment any Crudities. *Blanchard.*

CEMENT, is both the Name of a Paſt with which Plates of Gold being ſtratified are purified, and according to *Helmont* and many others, is any *Lute* by which the Necks of Veſſels in Diſtillation are joined, or as we commonly ſay, *cemented together*. And alſo *Cement* is the ſame as,

CEMENTATION, which is one of the Ways of purifying of Gold, and as ſome ſay, of Silver; and 'tis thus done, Stratify in a Crucible thin Plates of Gold and *Cement*, *i.e.* the Paſt of that Name which is made of one Part of *Sal Armoniack*, two Parts of *Sal Gemmæ*, and four Parts of Potter's Earth or powder'd Brick, and covering the Crucible, make a violent Fire round about it, to calcine the Matter for 10 or 12 Hours, that the corroding Salts may carry off the Impurities of the Gold. But this Purification is by no means ſo good as that made with *Antimony* (which ſee under the Word *Purification*) for theſe Salts do ſometimes leave other Metals remaining with the Gold, and beſides, do often eat away the very Gold it ſelf.

CENCHRIAS, is a ſort of ſpreading Inflamation, running like Wild-fire; called alſo *Herpes Miliaris*, from the Reſemblance it bears to the Seed of the ſmall Grain called *Millet* or *Hyrſe*. *Blanchard.*

CENCRIAS, a ſpreading Ulcer, the ſame with *Harpes Miliaris*.

CENEANGIA, is, with ſome, the ſame as *Phlebotomy* or Blood-letting.

CENTAURE, a Southern Conſtellation, conſiſting of 40 Stars.

CENTESM, is the Hundredth Part of any thing, and is commonly mention'd in our new Decimal Diviſions of *Degrees*, *Feet*, &c.

CENTRAL-RULE, is a Rule found out and eſtabliſhed by our Famous Mr. *Tho. Baker*, late Rector of *Nympton* in *Com. Devon.* whereby he finds the Center of a Circle deſigned to cut the *Parabola* in as many Points as an Equation to be conſtructed hath real Root. How by this Means he conſtructed all Equations as far as Biquadraticks, you will find under the Word *Conſtruction of Equations*: And the Demonſtration of his *Central Rule*, I give here by it ſelf.

The Rules of Mr. *Baker* are theſe,

1. $\frac{L}{2} + \frac{q}{8L} = b = CD.$

2. $\frac{p}{4} + \frac{ppp}{6LL} \pm \frac{pq}{4LL} + \frac{r}{2LL} = d = DE.$

Or by Contraction, becauſe $L = 1$, as is ſuppoſed, to avoid Fractions.

1. $\frac{1}{2} + \frac{pp}{8} + \frac{q}{2} = b = CD.$

2. $\frac{1}{4}p + \frac{1}{8}ppp + \frac{1}{4}pq + \frac{1}{2}r = d = ED.$

To discover the Reason of which Rules,

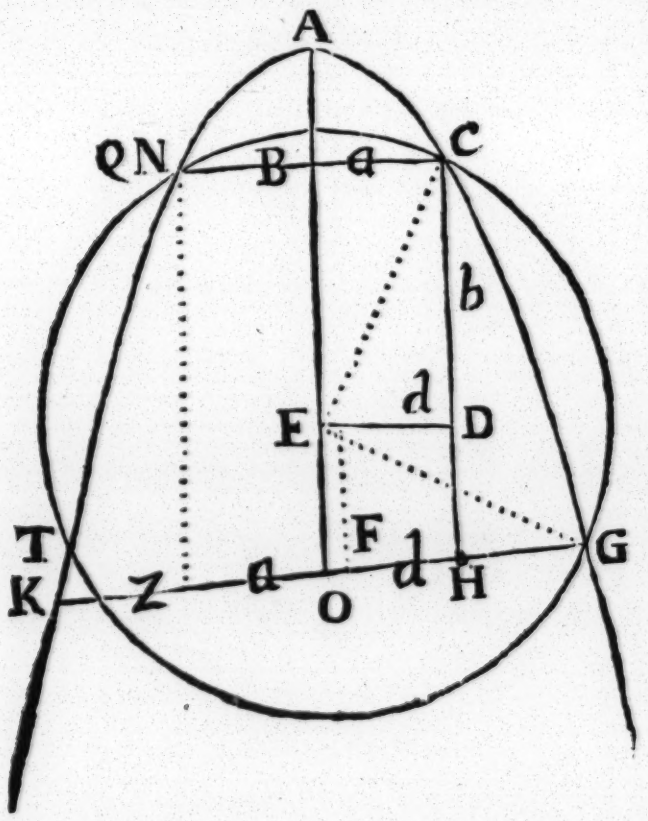
Suppose any *Parabola* drawn as in the following Figure: Then this *Lemma* may be premised; That the Line KG being an entire Ordinate, and cutting the Diameter CH consequently at Right Angles in the Point H; 'tis plain by Mr. *Baker*'s Property of the *Parabola*, That $L : HK$ (the Sum of the two Ordinates $GO + OH$, or BC) :: As HG, the Difference of these Ordinates: Is to HC the *Abscissa*. Wherefore the Rectangle under L the *Latus Rectum* or Parameter, and CH the *Abscissa*, is equal to that under KH and HG, or to the Rectangle KHG.

Suppose then Mr. *Baker*'s **L.** the *Parameter* or *Latus Rectum* belonging to this *Parabola* $= p$.

Let $CD = b$, $CB = a$.
$DE = d = FH$.
$GH = z$, the Root sought; Then will
$FG = z + d$, and
$HK = 2a + z$.

And consequently by the *Lemma*,

p (or L) $\times^{d}$. by $CH = 2az + zz$.



Wherefore $CH = \frac{2az + zz}{p}$, and $EF = DH = \frac{2az + zz}{p} - b$. But $EFq + FGq = CEq = CDq + EDq$; that is, $\frac{4aazz + 4az^3 + z^4}{pp} - \frac{4baz + 2bzz}{pp} + bb + zz + 2zd + dd = bb + dd$.

Expunge $bb + dd$, and there will remain $\frac{4aazz + 4az^3 + z^4}{pp} - \frac{4ba - 2bzz}{p} + zz + 2dz = 0$.

Then if you first multiply all that Equation by pp, and divide it afterwards by z, you will bring it to this, $4aaz + 4azz + z^3 - 4pba - 2pbz + ppz + 2ppd = 0$.

Or to reduce it to a more regular Form,

$$Z^3 + 4azz + ppz - 4pba + 4aaz + 2ppd - 2pbz = 0$$

Or if you had called the whole Line CQ by the Name of a (as *Baker* calls it p) the Equation would stand thus;

$$Z^3 + 2azz + ppz - 2bpa + aaz + 2pba - 2bpz = 0$$

Now compare this Equation Member by Member with one given to be solved in the usual Form; as suppose $Z^3 + mzz + rz + S = 0$.

Drawing any *Parabola*, take $QC = \frac{1}{2}m$ (because $2a = m$) and apply it into the *Parabola* at Right Angles to the Ax AO. Next comparing the Coeficients in the two next correspondent Terms, you have $pp + aa - 2pb = r$, or $pp + \frac{1}{4}mm - 2pb = r$: And consequently, $b = \frac{pp + \frac{1}{4}mm - r}{2p} = \frac{1}{2} + \frac{mm}{8p} - \frac{\frac{1}{2}r}{p}$.

Which is the Rule to find CD, or to determine the Point D, nearly the same (changing only the Letters) with *Baker*'s *first Rule*.

Then again, compare the next two corresponding Terms in both Equations together, and you have $2ppd - 2bpa = S$; wherefore $d = \frac{S + 2dpa}{2pp}$.

Which being all a known Quantity, the Line ED is known, and consequentaly the Centrical Point E of the Circle to be described, whose *Radius* will be EC or EG, and which will cut the *Parabola* so as to give you the Points G, T and N; from whence letting fall Perpendiculars to the Diameter CH, they shall be the three real Roots of this Cubick Equation $zzz + mzz + rz + S = 0$.

And which are Negative, and which are Affirmative, you will find in the *Construction* of these Equations by the *Parabola*: Which see.

If the Equation had been a Biquadratick, as suppose,

$$Z + mz - nzz + rz - S = 0.$$

Then the Circle would not have passed through the Vertex of the Diameter, but through another Point to be found according to the Rules mentioned in *Des Cartes*'s Construction of Equations; which is, to let $\surd : \frac{S}{pp}$ (if S represent the absolute Number or fifth Term in such an Equation, and have a Negative Sign) at Right Angles to EC, on the Vertex of the Diameter; but if it be $+S$, then that Line $\surd : \frac{S}{pp}$ must be inscribed in another Semicircle made on the Line EC; which being set from the Vertex of the Diameter C, will give in the Periphery of that Semicircle on EC, a Point through which the Intersecting Circle required shall pass. See the Manner how the *Central Rule* is investigated in the last Term of a Biquadratick, according to this Method of Mr. *Baker*, under the Word *Construction*.

From which appears.

The *Analytick* Method by which Mr. *Baker* found this Rule; for a *Parabola* being described, and a *Point* in its *Plain* given in *Position*, he expresses two ways, the *Radius* of a *Circle* passing through

thro' the *Vertex* of any *Diameter*; that is, by Poſition of the given *Center*; And Application of this new *Property*, (*That the Rectangle made of the Parameter and Difference of the Abſciſſa, is equal to the Rectangle made of the Sum of the two Ordinates into their Differences* (to expreſs the *Ratio* of the *Radius* to the given Line of the *Parabola*; ſo having an *Equation* of four *Dimenſions*, and rejecting the Equals on both Sides, he depreſſes it to a *Cubick*; but adjoining to it a Quantity for the *Homogeneum Comparationis*, thereby making the Whole equal to nothing, the *Equation* ſubſiſts in a *Biquadratick*, having all its *Terms*: If the *Circle* be ſuppoſed to paſs not thro' the *Vertex* of the *Diameter*, but thro' a *Point*, which being joined with the *Vertex* and the *Center*, may *terminate* a *Right-angled Triangle*.

This *Equation* he compares with another like it, and equal to it; then by *equating* the *Co-efficients* of theſe two *Equations*, he preſently diſcovers the *Central Rule*; whoſe univerſal Extent appears in *Biquadratick Equations*, affected under all *Parodick Degrees*; for all the other *Caſes* where any other Terms are wanting, are but *Corollaries*, or more compendious Conſtructions derived from the general Rule. So that the Invention of the *Rule* ſeems as much due to the laſt *Equation* of the *Co-efficient*, as to the aforeſaid Properties, which is demonſtrated by *Archimedes* in the *Section* of a *Parabolick Conoid* by a *Plane* parallel to the *Axis*, and is particularly uſed by *Sluſius* in his *Analyticks*, who thereby conſtructs a *Biquadratick Equation*, keeping all its Terms. But then the *Analyſis* of *Sluſius* by breaking the *Equation* into two others to find two Places, is very different from that whereby our Author found his *Central Rule*; than which nothing can be expected more eaſy, ſimple or univerſal, ſeeing any *Parabola* being once for all deſcribed, will give all the Roots, true or falſe, of any *Equation*, without Reduction or any Alteration whatſoever.

CENTRE *of a Circle*, or of a *Sphere*, is that Point from whence all Right Lines drawn to the Circumference or Surface are equal. To find the *Centre of a Circle*, ſee *Chord*.

CENTRE *of a Dyal*, is that Point where the Axis of the World interſects the Plane of the Dyal; and from thence, in thoſe Dyals that have Centres, all the Hour-Lines are drawn. If the Plane of the Dyal be parallel to the Axis of the World, it can have no Centre at all, but all the Hour-Lines will be parallel to the Style, and to one another.

CENTRE *of an Ellipſis* or *Oval*, is that Point where the two Diameters, the Tranſverſe and the Conjugate interſect each other.

CENTRE *of the Equant*, in Aſtronomy, is a Point in the Line of the *Aphelion*, being exactly diſtant ſo far from the *Centre of the Eccentrique* towards the *Aphelion*, as the *Sun* is from the *Centre of the Eccentrique* towards the *Perihelion*.

CENTRE *of Gravity*, of any Body, is a Point on which a Body being ſupported, or from it ſuſpended, all its Parts will be in *Æquilibrio* to one another.

CENTRE *(common) of the Gravity of two Bodies*, is a Point in a Right-line connecting their Centres; and ſo poſited in that Line, that their diſtances from it ſhall be reciprocally as the weight of theſe Bodies: And if another Body be placed in the ſame Right-line, ſo that its diſtance from any Point in it be reciprocally as the weight of both the former Bodies taken together, that Point ſhall be the common Centre of Gravity of all 3, *&c.*

CENTRE *of heavy Bodies*, is in our Globe the ſame as the *Centre of the Earth*, towards which all heavy Bodies do as it were naturally tend.

CENTRE *of an Hyperbola*, is a Point in the middle of the Tranſverſe Axis; and conſequently, is without the Figure, and common to the oppoſite Section.

CENTRE *of Magnitude*, of any Body, is that Point which is equally remote from its extream Parts.

CENTRE *of Motion*, of any Body, is that Point about which any Body moves when faſtned any way to it, or made to revolve round it.

CENTRE *of Oſcillation*, ſee *Oſcillation*.

CENTRE *of a Regular Polygon* or *Regular Body*, is the ſame with that of the inſcribed Circle or Sphere.

CENTRIFUGAL *Force*, is that Force by which all Bodies which move round any other Body in a Circle or an *Ellipſis* do endeavour to fly off from the Axis of their Motion in a Tangent to the Periphery of it. And this *Force*, as Mr. *Hugens* demonſtrates is always proportional to the Circumference of the Curve in which the Revolving Body is carried round.

The *Centrifugal Force* of any Body to the *Centripetal*, is as the Square of the Arch which the Body deſcribes in a given Time, divided by the Diameter, to the Space thro' which an heavy Body moves in falling from a Place where it was at reſt in the ſame time.

If any Body ſwim in a *Medium* heavier than it ſelf, (and in one lighter it cannot do ſo) the *Centrifugal Force* is the difference between the Specifick Weight of the *Medium* and the Floating Body.

What the *Centrifugal Force* in the Planets is, or the *Conatus Recedendi ab Axe motus*, the endeavour to recede from the Axis of the Motion; you will find explained under *Planets*; where the Reaſon of all their Motion is expounded.

CENTRIPETAL *Force*, is that *Force* by which any Body moving round another is drawn down, or tends towards the Centre of its Orbit; and is much the ſame with Gravity: See *Vis Centripeta*.

If a Body, being ſpecifically heavier than any *Medium*, ſinks in it, the exceſs of that Body's Gravity above the Gravity of the *Medium*, is the *Centripetal Force* of the Body downwards.

CENTROBARYCAL, is what relates to the *Centre of Gravity*.

CEPHALA, is an obſtinate Head-ach.

CEPHALÆA, an old obſtinate Head-ach.

CEPHALALGIA ſignifies in general, any pain of the Head, but is more eſpecially taken for a new Head-ach.

CEPHALALGICA are Medicines which purge the Head. *Blanchard*.

CEPHALICA, a Vein which creeps along the Arm, between the Skin and the Muſcles; it divides into two Branches. The External Branch goes down to the Wriſt, where it joins the *Baſilica*, and turns up the Back of the Hand, where it gives a Branch which makes the *Salvitella*, between the Ring-finger and the Little-finger. The Ancients uſed to open this Vein in Diſeaſes of the Head, but ſince the knowledge of the Circulation of the Blood, there is no difference whether one be blooded in the *Cephalica*, *Mediana* or *Beſilica*.

CEPHALICK *Medicines*, are Spirituous and Volatile ones, uſed in Diſtempers of the Head. Alſo the outermoſt Vein in the Arm is called *Cephalica*, becauſe it uſed formerly to be opened in Diſeaſes of the Head rather than any other.

CEPHALOPHARYNGÆI, ſignifies the firſt Pair of Muſcles of the upper Part of the Gullet, which proceed from beſide the Head and Neck, and are ſpread more largely upon the *Tunick* of the Gullet. *Blanchard.*

CEPHALOPHARYNGÆUM, is a Muſcle that ariſeth from that part where the Head is joined to the firſt *Vertebra* of the Neck; from thence marching down, it is ſpread about the *Pharynx* with a large *Plexus* of Fibres, and ſeemeth to make its Membrane. This ſtraightens the Throat in ſwallowing.

CEPHALOPHONIA, is a Pain or Heavineſs in the Head.

CEPHEUS, a Conſtellation in the Northern Hemiſphere, conſiſting of 17 Stars.

CEPI *Corpus*, in the Common-Law, is a Return made by the Sheriff, that upon a *Capias Exigent*, or other Proceſs, he hath taken the Body of the Party.

CERATIAS, according to ſome Writers, is a Horned Comet, ſometimes appearing Bearded, and ſometimes with a Tail or Train. Some Comets of this kind they will have to reſemble the Figure of a New Moon; others that are Tailed, have a crooked Tail, bending either upward or downward; and others have their Tail of an equal Breadth or Thickneſs.

CERATODES, the ſame with *Cornea Tunica.*

CERATOGLOSSUM, is the proper Pair of *Muſcles* belonging to the Tongue, proceeding from the Horns of the Bone called *Hyoides*, and joined to the ſides of the Tongue: Their uſe is to move or draw the Tongue ſtraight into the Mouth, when they act joyntly; but if either the one or the other be contracted ſingly, they move it to the Right or Left-ſide.

CERATUM or *Cerecloath*, is a Medicine applied outwardly, made of Wax, Oyls, and ſometimes Duſt intermixed, thicker than an Ointment, and ſofter than a Plaiſter.

CERCHNOS, is a certain *Aſperity* of the *Larynx*, which to touch feels like a Collection of Juniper-berries, whence proceeds a little dry Cough. *Blanchard.*

CERCIS, is the ſecond Bone of the Cubit, called *Radius*, becauſe it's like the Spoke of a Wheel. *Blanchard.*

CEREA, are the Horns of the Womb in Brutes, wherein the *Fœtus* is uſually formed.

CEREBELLUM, is the hinder part of the Brain, conſiſting like the Brain it ſelf, of an Aſhy or Barkiſh Subſtance and a white Marrowy one, wherein the Animal Spirits which perform involuntary and meer Natural Actions, are ſuppoſed to be generated in Man; but not ſo in Beaſts; it ſeems to conſiſt of a great many thin Plates that lay upon one another.

CEREBRUM, the Brain, is ſtrictly taken for the foremoſt part of the Subſtance, which is within the Skull; and it is a Subſtance of a ſort peculiar to it ſelf. Outwardly it is covered with the Skin called *Pia Mater*. It is wrought with many Turnings and Windings. Its exteriour Subſtance is Aſhy, wherein the Animal Spirits are thought to be generated: The Interior is white, which receives the Animal Spirits from the former, and diſcharges them by the *Corpus Calloſum*, and the *Medulla Oblongata* into the Nerves, upon which voluntary Actions do chiefly depend. Likewiſe the Brain is the Subject of Imagination, Judgment, Memory, and Reminiſcence; for the Ideas or Species of things being received from the Organs of the External Senſes, are carried to the common Senſory, or the Beginning of the *Medulla Oblongata*, and then by the *Corpora Striata*, and the *Corpus Calloſum*, there the Judgment and Imagination are probably formed; but the Seat of the Memory is ſaid to be in the Cortical Part of the Brain; and if the Idea's after ſome time chance to be called for out of the Place of the Memory, then it's properly ſaid to be *Reminiſcence* or Remembring. Sleep is likewiſe tranſacted in the Brain; concerning which ſee in its proper Place. *Blanchard*: See *Brain.*

CERTIFICATE (in Law) is uſed for a Writing made in any Court, to give Notice to another Court of any thing done therein.

CERTIFICATION *of Aſſize of Novel Diſſeiſin, &c.* is a Writ granted for the re-examining, or Review of a Matter paſſed by Aſſize before any Juſtices, and is called *Certification of new Diſcoveries.*

CERTIFICANDO *de Recognitione Stapulæ*, is a Writ directed to the Mayor of the Staple, *&c.* commanding him to certify the Chancellor of a Statute of the Staple, taken before between ſuch and ſuch, in Caſe where the Party himſelf detaineth it, and refuſeth to bring it in.

CERTIORARI, is a Writ out of the *Chancery* to an Inferiour Court, to call up the Records of a Cauſe therein depending, that conſcionable Juſtice may be therein adminiſtred, upon complaint made by Bill, that the Party which ſeeketh the ſaid Writ, hath received hard *Dealing* in the ſaid *Court.*

CERVICAL or *Vertebral Veſſels*, are the Arteries and Veins that paſs thro' the *Vertebræ* and Muſcles of the Neck up to the Skull.

CERVICALIS *Vena: Vid. Vertebralis.*

CERUMINA, is the Filth or Wax of the Ear, which ſeems to be ſweat out from the Cartilages: Others think it comes from the Glandules which border upon the Ears. It ſerves to hinder Duſt, Motes or little Animals from getting into the Ear.

CERUSSE, or *White-Lead*, is Lead turned into a white Form by the Means of the Smoak or Vapours of boiling Vinegar.

CÆSARIAN *Section* or *Operation*, is the cutting open the Womb of the Mother to preſerve the Child: And the

CÆSARIAN *Birth*, is that of a Child which is born this way; and thoſe that were ſo, as *Cæſar, Scipio Africanus, Manlius, &c.* were called *Cæſares*, and *Cæſones*; a *Cæſo matris utere.*

CESSAVIT, is a Writ that lieth upon this general Ground, that he againſt whom it is brought hath neglected to pay ſuch Rents, or to perform ſuch Service as he is tied to by his Tenure, and hath not upon his Land or Tenement ſufficient Goods or Chattels to be diſtrained.

CETUS, the *Whale*, a Southern Conſtellation conſiſting of 23 Stars.

CHACONNE (in Muſick) is a kind of *Sarabrand*, whoſe Meaſure is always Triple Time.

CHAFE, Seamen ſay a Rope chafes, when it galls or frets by rubbing againſt any rough and hard thing. Thus they ſay *the Cable is chafed in the*

the Hawſe, when it is fretted or begun to be worn out there.

CHAIN, is an Inſtrument uſed in *Surveying*, to meaſure Land withall; of which there are ſeveral ſorts, as,

1. A *Chain* of 100 *Foot* long, each *Link* being *one Foot* in length, and at each 10 *Foot* there is a *Plate* of Braſs, with a Figure engraven thereon, to ſhew readily how many Feet are from the beginning of the *Chain*: And for more eaſe in accounting, there is, or ſhould be, a *Braſs Ring* at every five Links, that is, one between every two *Plates*.

This *Chain* is moſt commodious for meaſuring of large *Diſtances* or *Lengths*.

2. A *Chain* of 16 *Foot* and a half in Length, and made ſo as to contain 100 *Links*, with *Rings* at every 10th *Length*.

This *Chain* will be good to meaſure ſmall *Garden-Grounds* or *Orchards* by *Perch* or *Pole Meaſure*.

3. A *Chain* of *Four Pole* or *Perches* in *Length*, which is 66 Foot. or 22 Yards, for each *Perch* contains 16½ Foot. This whole Chain is divided into 100 equal Parts or *Links*, whereof 25 are a juſt *Pole* or *Perch*; and for ready accounting, there is uſually a remarkable Diſtinction by ſome Plate or large Ring at the End of every 25 *Links*: Alſo at the End of every 10th *Link*, 'tis uſual to faſten a Plate of Braſs with Notches therein, denoting how many *Links* are from the Beginning of the *Chain*.

This *Chain* of all others is the moſt commodious for *Land-meaſure*.

When you are to meaſure any Line by the *Chain*, you need to regard no other Denomination, but only *Chains* and *Links* ſet down with a Prick of your Pen betwixt them: Thus if you found the Side of a *Cloſe* to be 6 *Chains* and 35 *Links* long, it muſt be put down thus, 6. 35.

But if the *Links* be under 10, a Cypher muſt be prefixed; ſo 7 *Chains* and 9 *Links* muſt be thus ſet, 7. 09.

How to caſt up the Content of a Figure, the Lines being given in Chains *and* Links.

Having multiplied Length by Breadth or Baſe by the half Perpendicular, *&c.* according to the Rules for finding the Content of Figures under the Word *Area*.

Rule 1. From the Product cut off 5 Figures towards the Right-hand with a Daſh of your Pen, ſo ſhall thoſe to the Left-hand again ſignify *Acres*.

2. If theſe five cut off to the Right-hand were not all Cyphers, multiply them by 4, and cutting off 5 Figures toward the Right-hand again, the reſt will be *Roods* or Quarters.

3. Alſo, if amongſt theſe five Figures cut off at the ſecond Multiplication, there be any Figures beſides Cyphers, then multiply all the five by 40, cutting off five again with a Daſh, and thoſe on the Left-hand ſignify Square *Perches* or *Poles*. As for Inſtance.

Having a *Square Field* given, whoſe Sides are each of them 7 *Chains*, 25 *Links*, the Content of this *Square* is required in *Acres*, *Roods*, and *Perches*.

```
Length 7. 25
Breadth 7. 25
-------------
        3625
       1450
      5075
-------------
Acres 525625
          4
-------------
Rood 1|02500
         40
-------------
Perch 2 00000
```

Anſw. 5 Acres, 1 Rood, and 1 Perch.

The Reaſon of this practical Rule is plain, if you conſider that 5 *Chains* (or 20 *Perches*) in Length, and 2 *Chains* (or 8 *Perches*) in Breadth make an Acre (or 160 Square Perches;) alſo 5 *Chains* multiplied by 2, is the ſame with 500 *Links*, by 200, which makes 100000 Square *Links*.

Wherefore 'tis evident, that 525625 Square *Links*, (*i. e.* the Product of 7, 25) by 7, 25) divided by 100000, that is, by cutting off 5 Figures on the Right-hand, leaves 5 *Acres* and 25625 Square *Links* over.

Alſo, if 25625 Square *Links*, do contain any Quarter or Quarters of an *Acre*; then 'tis but multiplying by 4, and dividing by 100000 (*i. e.* five cut off from the Products) they will contain ſo many *Acres* as now they do Quarters or Roods, for any number of Quarters multiplied by 4, produce the like number of Integers, and only Diviſion reduces them to the right Denomination: So that 25625 multiplied by 4, gives 1 02500, which divided by 100000, leaves 1 *Acre*, and 2500 Quarters of Square *Links* over.

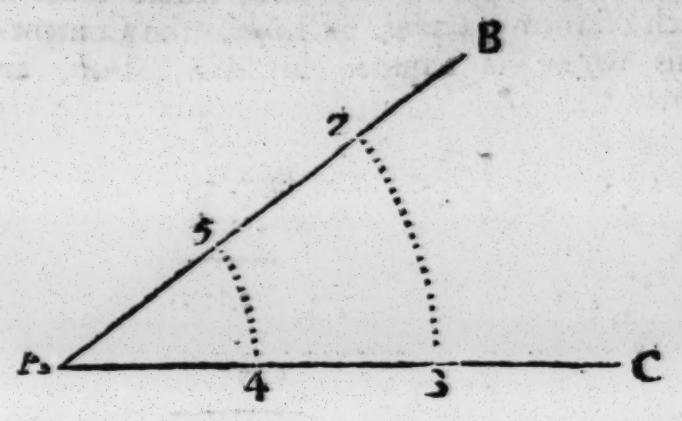
This laſt Remainder 2500 (being the true number of Square Links multiplied by 4) if multiplied by 40 (which is ¼ of 160) it muſt as often contain 100000 ſquare *Links*, as the ¼ of 2500, *i. e.* 625, containeth the ſquare Perches.

Thus, 100000 divided by 160 gives 625, as anſwering to 1 Perch: Alſo 2500 multiplied by 40, gives 100000, or 1 *Acre* (after Diviſion) or five Figures cut off.

How by the Chain *to take an* Angle *in the Field.*

Firſt, meaſure along the Hedge *AB* any ſmall Diſtance, as *A* 2, two *Chains*: Alſo meaſure along the Hedge *AC* what number of *Chains* you pleaſe, no matter whether they be equal to the former or not, as *A* 3, two *Chains*: Then meaſure the Diſtance 2, 3, ſuppoſe it be 1 *Chain* 68 *Links*.

To



To plot which, draw the Line *A B* at pleaſure, and ſet off 2 *Chains* from *A* to 2; then take in your Compaſſes the Diſtance *A* 3, 2 *Chains*, ſetting one Foot in *A*, deſcribe the Arch 2, 3; take alſo in your Compaſſes 1 *Chain*, 68 *Links*, ſet it from 2 to 3, and through the Point 3 draw *A C*, ſo you have the Angle *B A C* of the Field truly plotted.

The ſame may be otherwiſe performed thus;

Set a Stick in the Angle, and putting the Ring at one End of the *Chain* over it, take the other End in your Hand, and ſtretch out the *Chain* along the Hedge *A B*, and where it ends at 5; ſet a Stick; then ſtretch the *Chain* along the Hedge *A C*, and at the End thereof ſet another Sick, as at 4, then let looſe the *Chain* from *A*, and meaſure the Diſtance 5, 4, which ſuppoſe 74 *Links*. Then *plot* it as before.

By this Means you may *Survey* a *Field* by going round the ſame with the *Chain* only, by taking all the Angles, and meaſuring the Sides. The ſame may be plotted by Direction given under the Word *Surveying*.

CHAIN-SHOT, is two Bullets, or rather half Bullets, with a Chain between them; their uſe is at Sea to ſhoot down Yards or Maſts, or cut the Shrouds or any Rigging of a Ship.

CHAIN-WALLS, in a Ship, are the broad Timbers which are made jutting out of her Sides; to which with Chains the Shrouds are faſtned, and by them ſpread out, the better to ſupport the Maſts.

CHAINS, in a Ship, are thoſe Irons to which the Shrouds of the Maſts are made faſt to the *Chain-Walls* at the Ship's Sides,

CHALASTICK *Medicines*, are ſuch as by their temperate and moderate Heat do comfort and ſtrengthen the Parts to which they are applied.

CHALAZA, the Treadle of an Egg; every Egg has two of them, one in the obtuſe, and the other in the acute End: There is more of them in the White, yea they ſtick cloſer to the Yolk, and are faſtned to its Membrance. They are ſomething long Bodies, more concrete than the White, and whiter, knotty, have ſome ſort of Light, as Hail, whence they have their Name; for each *Chalaza* conſiſts, as it were, of ſo many Hail-ſtones ſeparated from each other by that White; one of them is bigger than the other, and further from the Yolk; is extended towards the obtuſe End of the Egg; the other is leſs, and extends it ſelf from the Yolk towards the acute End of the Egg. The Greater is made up of two or three Knots, like ſo many Hail-ſtones, which are moderately diſtant from each other, the leſs in order to ſucceed the greater.

It is alſo a Diſeaſe incident to Swine *Elanchard*.

CHALZIA, is a little Swelling in the Eyelids like a little Hail-ſtone.

CHALCANTHUM *Rubefactum*, is only Vitrol calcined to Redneſs.

CHALLENGE (in Common-Law) ſignifies an Exception againſt Perſons or Things; as a Priſoner may except againſt the partial impannelling of a Jury, or againſt the Inſufficiency of the Jurors.

CHALOUP: See *Shallop*.

CHALYBEAT, is that which partakes of the Nature of Steel; thus *Chalybeat Medicines* are a Preparation of Steel or Iron, or a Compoſition in which Steel or Iron is an Ingredient.

CHALYBEAT *Chryſtals of Tar*: See *Cream of Tartar*.

CHAMADE, is a Signal made by the Enemy, either by Beat of Drum or Sound of Trumpet, when they have any Matter to propound; as when they ſound or beat a *Parley*.

CHAMBER, that Part of the Cavity of a great Gun where her Charge lies, is called the *Chamber*: Thoſe Pieces which at Sea they call *Murtherers*, have *Chambers* which are put in at their Breeches.

CHAMBRANLE, an Ornament in Maſonry and Joyner's Work, bordering the three Sides of Doors, Windows and Chimneys. It is different according to the ſeveral Orders, and conſiſts of three Parts, *viz.* the Top, called the *Traverſe*, and the two Sides the *Aſcendants*.

CHAMPARTY (in Common-Law) ſignifies a Maintenance of any Man in his Suit depending upon Condition to have Part of the things (be it Lands or Goods) when recovered.

CHANCE-MEDLEY (ſignifies in Law) the caſual killing of a Man, not altogether without the Killer's Fault, though without an evil Intent.

CHANDELIERS, in Fortification, are Wooden Parapets made of two upright Stakes ſix Foot high, which ſupport divers Planks laid acroſs one another, or Bavins filled with Earth. They are made uſe of in Approaches, Galleries and Mines to cover the Workmen, and to hinder the Beſieged from forcing them to quit their Labours. The only Difference between *Chandeliers* and *Blinds*, is, that the Former ſerve to cover the Pioneers before, and the Latter to cover them over Head.

CHANEL, in the *Ionick Capital*, is a Part which is ſomewhat hollow under the *Abacus* after the *Liſtel*, and lies upon the *Echinus*, having its Contours or Turnings on each Side to make the *Voluta's*.

CHAOS: The ancient *Ethnick* Philoſophers ſuppoſe the World to be formed at firſt out of a *Chaos*, that is a datk kind of turbulent Atmoſphere, or a diſorderly Syſtem of Mixture of all ſorts of Particles together, without any Regularity in any Reſpect. This the Greeks called Πυρὸν ἄερ & ζοφώδης, and the Latins *Rudis Indigeſtaque Moles*——. It is probable enough that the Notion came from *Moſes*, who ſays, the Earth *was without Form and void, and that Darkneſs was upon the Face of the Abyſs*: Though he gives no farther Deſcription of it, nor tells us whence it took its Original, and came into ſuch a confuſed State.

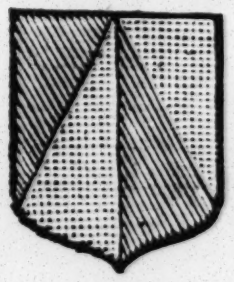
Mr. *Whiſton* in his late *new Theory of the Earth*, ſuppoſes the ancient *Chaos*, the Origin of our Earth, to have been the Atmoſphere of a Comet; for

which new, though indeed all things considered, not improbable Assertion, he endeavours to make out by many Arguments, drawn from the Agreement which appears to be between them: *See his Theory*, P. 69. So that according to him every *Planet* is a *Comet* formed into a regular and lasting Constitution, and placed at a proper distance from the *Sun*, revolving in a nearly Circular Orbit: And a *Comet* is a *Planet* either beginning to be destroyed or remade, that is, a *Chaos* or a *Planet* unformed, or in its Primeval State, and placed as yet in an Orbit very excentrical.

CHAPEAU, in Heraldry, is a Cap of Dignity used to be worn by Dukes; 'tis of a Scarlet Colour, lined with Ermines, and on it, as on a *Wreath*, the *Crest* of Noblemens Coats of Arms is born, and by it parted from the *Helmet*, which no *Crest* much touch immediately.

CHAPITERS (in Law) signifies a Summary or Content of such Matters as are to be enquired of, or presented before Justices in Eyre, Justices of Assize, or of Peace in their Sessions.

CHAPITERS, in Architecture, are the Crowns or upper Parts of a Pillar: Those that are destitute of Ornaments, are called *Chapiters with Mouldings*, such as the *Tuscan* and *Dorick*; the first whereof is the most simple, having its *Abacus* Square without any Mouldings; but the *Abacus* of the other is crowned with an *Astragal* and three *Annulets* under the *Echinus*. All those that have Leaves and carv'd Ornaments, are term'd *Chapiters* with Sculptures, and the finest of them is the *Corinthian*, which is adorned with two Rows of Leaves, as also eight greater, and as many lesser *Voluta's* placed under a Body called a *Tympanum*. These are called usually *Capitals*.



CHAPPE, the Herald's Term for the Partition of an Escutcheon of this Figure; and they Blazon it thus, *Chappe Or*, and *Vert*.

CHARACTERISTICK *of a Logarithm*: See *Index* or *Exponent*.

CHARACTERS, are *Marks*, *Signs*, or *Symbols* of things invented by Artists, and peculiar to several Sciences, by which the Knowledge of the Things themselves is always more expeditiously and most times more clearly conveyed to the Learner; especially after he hath a little enured himself to them.

Characters used by *Mathematicians*, are chiefly in *Geometry*, *Trigonometry* and *Algebra*, and are as followeth:

= Is the *Mark of Equality*, though *D. Cartes*, I know not why, instead of it useth ∞, in which he is scarcely followed by any Body; and this (=) mark with him, or his Commentators, signifies the Difference of two Quantities when 'tis not known which is the greatest; which now a-days we mark thus ∞. But now this Sign = is universally used for *Equal to*; and if you should see $a = 2b$, you must read it, *a* is equal to twice *b*.

\+ Is in *Algebra* a Sign of real Existence in the Quantity it stands before, and therefore all Quantities that have no Signs are always supposed to have this Sign + before them. 'Tis called the *Affirmative* and *Positive Sign*, because it implies the Quantity to be of a Positive and Real Nature; and is directly contrary to the following Sign —.

This Sign + is also the Mark of *Addition*, and when you see $a + b$, you must read it *a* added to *b*; or as the way usually is, *a more b*; and you are to suppose it to be the Sum of those two Quantities *a* and *b*.

— Is the Note of *Negation*, *Negative*, *Existence*, or *Non Entity* in *Algebra*. And whenever it stands singly before any Quantity, it shews that Quantity to be no real one, but less than nothing; and therefore such Quantities are called *Negative*. Thus — 3 is a *Negative* 3, or 3 less than Nothing. And though such Quantities as these are only Imaginary, they have yet very great use in *Algebra*. And any one may have a distinct Idea of such a Negative Quantity, if he consider a Man to have in Cash, or be worth but 1000 Pounds, and yet to owe to 1500; for then that Man is certainly 500 *l.* worse than nothing; which Quantity of 500 *l.* in respect to him, will properly be expressed by putting this Negative Sign before it; for its truly to that Man — 500 *l.* or 500 *l.* less than, or worse than nothing.

This *Character* is also the Note of *Substraction*, and when you see $a - b$, you must read it, *a*, *substracting* or *abating*, or as the usual way is now, *a less b*; implying, that the Quantity is the *Difference* between *a* and *b*, or the *Remainder*, when *b* the lesser is substracted from *a* the greater. Therefore this Note (as also doth the foregoing) always belongs to the Quantity following it.

∽ Is the *Character* expressing the *Difference* between any two Quantities when 'is not yet discovered which is the greater: And therefore the Sign — cannot be used, because it always supposes the Quantity following to be less than what precedes it.

× Is the *Character* of *Multiplication*, implying the Quantities on each Side the *Sign*, are to be multiplied one into another. Thus $a \times b$ is to be read *a* multiplied by *b*; or the *Rectangle between*, or *Product* of *a* and *b*. But this Sign in *Algebra* is usually omitted, and the Quantities are put down like Letters in a Word. Thus *ab* signifies the Product of *a* multiplied by *b*. In compound Quantities the *Sign* is most times used, as $a + b \times c + d - e$.

÷ Is the Mark of *Division*. Thus $a \div b$ signifies that the Quantity *a* is to be divided by *b*. But most times in *Algebra* the Quotient is expressed Fraction-ways; as $\frac{a}{b}$ signifies the Quotient of *a* divided by *b*. Some Writers express it thus, $b) a$ (, as in the common Division.

Ꝺ Is the *Character* of *Involution*, as they call it, that is, of producing the Square of any Quantity, or of multiplying any Quantity into it self. In *Branker* and *Pell's Algebra*, and since that, in *Ward's* and others, 'tis placed in the Margin, and shews that the *Step* of the Equation against which it stands is to be multiplied by it self, or squared, or if it be a Square already, then to be raised up to that Power, which the *Index* set after the *Character* expresses, *v. gr.*

|1|Ꝺ.3|4|aaa + 3aab + 3bba + bbb| shews that the first *Step* of that Equation, which (was $a + b$) was, in the 4th Step, multiplied Cubically, or raised up to the 3d Power.

ɯ Is the *Character* of *Evolution*; that is, of *Extraction of Roots out of the several Powers*; and is is the Reverse of the foregoing Sign Ꝺ.

: : Is the Mark of *Geometrical Proportion disjunct*, and is usually placed between two Pairs of Proportionals, as in the *Golden Rule*; thus 4 : 6 :: 8 : 12; and shews, that 4 hath the same Ratio to 6 that 8 hath to 12.

∴ Is the Mark of *Geometrical Proportion continued*, and implies the Ratio to be still carried on without any Interruption, as, 2, 4, 8, 16, 32, 64, 128 ∴. Some *French* Writers use this Mark for *Arithmetical Proportion*.

√ : Is the Sign of *Radicality*, and shews (according to the Index of the Power that is set over or after it) that the Square Cube or other Root is extracted, or is to be so, out of any Quantity; as √ : 25, or $\sqrt[2]{}$ 25, or √ (2) 25, finifies the Square Root of 25; and $\sqrt[3]{}$ 25, or √ : (3) 25, finifies the Cube Root of Twenty five. Sometimes this *Radical Sign* belongs to as many of the following Quantities as have a Line drawn over them; as, √ : $\overline{b + d}$ signifies the Square Root of the Sum of b and d added together: And √ (3) $\overline{f + c - g} - 3$ signifies the Cube Root of the Sum of f and c, after g is subtracted from that Sum; and that after this, 3 is to be taken from the said Cube Root.

⌞ or ⌝ Is the *Character* of *Greater*, and

⌟ or ⌞ The Sign of the *Lesser* of any two Quantities.

|| Is the Mark for Parallel, and implies, that 2 Lines or Planes are equidistant one from another.

△ Triangle.

□ Square.

▯ ▭ Rectangle.

⊙ Circle, or *Sol* the Sun.

∠ Equi-angular or Similar.

⏤ Equilateral.

∠ Angle.

∟ Right-Angle.

⊥ Perpendicular.

: : : Is the Mark for Arithmetical Proportion.

$\dot{y}$, $\dot{x}$, $\dot{z}$. Any Letters with Points so over their Heads, denote the Fluxions of variable Quantities: And if they have 2, 3 or 4 Points, they denote Second, Third or Fourth Fluxions: See *Fluxions*.

— 1, — 2, — 3, — 4, *&c.* are the *Exponents* of a Series of Fractions in a Geometrical Progression.

$\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, are the *Exponents* of √ : x. $\sqrt[3]{}$: x. $\sqrt[4]{}$ x. which therefore in the new Notations are written thus, $x^{\frac{1}{2}}$, $x^{\frac{1}{3}}$, $x^{\frac{1}{4}}$, &c. Also

$x^{\frac{4}{5}}$, stands for $\sqrt[5]{x^4}$; and in Fractions,

x^{-1}. x^{-2}. x^{-3}. stand for $\frac{1}{x}\ \frac{2}{x}\ \frac{3}{x}$, *&c.* Also $x^{\frac{1}{2}} + \frac{1}{3}$ expresses the Product of $x^{\frac{1}{2}}$ into $x^{\frac{1}{3}}$, and $x - \frac{1}{3} - \frac{1}{3}$ (or $x - \frac{2}{3}$) is the Product of $x - \frac{1}{3}$, into its self, or Square of $x - \frac{1}{3}$.

$x^{\frac{1}{2}} - \frac{1}{3}$ (or $x^{\frac{1}{6}}$ is the Exponent of the Quotient of $x^{\frac{1}{2}}$ by $x^{\frac{1}{4}}$.

$\overline{a + b}^{-1}$ Expresses an Unite divided by $a + b$.

$\overline{a + b}^{-3}$ Is an Unite divided by the Cube of $\overline{a + b}$.

$\overline{a + b}^{\frac{2}{4}}$ Is the Biquadratick Root of the Cube of $a + b$.

CHARACTERS CHYMICAL.

Air ☆ ▲ *Æs Uſtum* ⊕—∈
Allum ○, ⏢
Amalgama a̅a̅a̅. ###, ⧆
Alembick ⧖
Antimony ◇, ⊡, ♁
Arſenick ⚯, ♁
Auripigmentum ⚮ ⚯
Auri chalcum ⧫ ⧫
Aqua communis ▽ ≋
—Vitæ ⚲
—Fortis ▽ *or Spenting water*
—Regis ▽R, ▽3 *or Stygian water*
—Diſtillata ▽
Aſhes E
Bath or Balneum B
Balneum arenoſum or Sand Bath ÆB
Balneum Mariæ or Maris MB
Balneum vaporis VB
Bole Armenick ÆB
Borax W ⏤ ⅄
Brick ▩
Black Sulphur ♁
To Calcine ⩚
Camphire ○—○—○
Cinnabar ♆ ♁ 3
Calx Viva Ψ
Calx in General C
Caput Mortuum ☺
Ceruſs ☥
to Clement ⟅
to Coagulate H̄, Ē
Copper or Venus ♀
Cop. Burnt or Æs Uſſu. ♀, ♀c, 3 ♀ ♈
Chryſtal ♆
Comon Salt ⊖, ⊕, ♁, ⏢
Crocus Martis ♆ ♁
Crocus of Cop. See Æs Uſtum
Crucible ✝ ▽ ⧈
a Cucurbite ♁ ▲
to Digeſt ♋
to Diſtill ☌ ☋
Diſtilled Vinegar ✝
Day or Light ☉
Earth ▽
Fire △
wheel Fire ⏢
to Fix ♆
to Filtrate ⅄
Flowers of Antimony ♁
Filings of Steel ○⟶
Gold ⊙ ✹
Glaſſe ☋
Gravelled Aſhes ⏚
Gum ⚳
Harts Horn C C
an Hour ⧖, ⧗
Ink ⌖
Iron ♂
Iupiter or Tinn ♃
Lead or Satum ♄, ♄, ♄
Lime C, ☾
Quick Lime or Calxviva ♆
Lithange ⊢ *to Lute* N
Lutum Sapientiæ ☾
a Marcaſſite ♏, ♂, ⏛, ♏
Mercury ☿
Mercury Sublimate ☿ ☿
—Precipitated ☿ ☿
a Month ☒
Magnet ⚯
Mars Iron or Steel ♂
Night ☽
Nitre or Salt Peter ◐
Oil °o°, ♎, ⌖ ⚹
Philoſophers Sulphur ♃
to Precipitate ⚍
to Purify ☋
Powder ℙ, ♁
Pot Covered ☿
Quinteſſence Q E
Realgar ☌, ☌, ☌
Retort ☋, ☋
Sand ⏢
Saffron of Mars see Crocus martis
—of Venus see Æs Uſtum
Soap ◊
Sal Alkali ♁ ▭
Sal Armoniack ✳
Salt Comon ⊖ ⊕ ♁ ⏢
Sal Gemmæ ♁ ⊸
Sulphur ♆ ♆
Sulphur Philoſophorum ♃
black Sulphur ♁
Sulphur Vivum ♆
to Sublime ⚯ ⚯
Spirit ⚲. *Sp. of Wine* ♈
Stratum Super Stratum S.S.S.
Sol or Gold ⊙
Silver ☾, ☽
Falck X
Tartar ▭
Tutia or Tutty ⊠
Tincture R
Vitriol ⊖ ⊕
white Vitriol ⊏ ⊐
blew Vitriol ⊕
Verdigreaſe ⊕
Vinegar ✝ X
-diſtilled Vinegar ✙, ✙
Urine ⊡
Wax ⌖

CHARGE, in Heraldry, ſignifies whatever thing is born in the Field of a Coat of Arms; whether Animal, Vegetable, or any other Repreſentation or Figure. *Proper Charges* are called *Ordinaries*: Which ſee. Thus *Guillim*, but *Bloom* calls thoſe *Charges* on which Rewards and Additions of Honour are often placed in a Coat of Arms, ſuch as *Cantons*, *Quarters*, *Gyrons*, *Flasks*, &c.

CHARGE, the Seamen call a Ship, *a Ship of Charge*, when ſhe draws much Water, or ſwims deep in the Sea; and ſometimes it's uſed for an unweildy Ship that will not ware nor ſteer, for ſuch a one they ſay alſo is a *Ship of Charge*.

CHARLES's WAIN, ſeven Stars in the Conſtellation called *Urſa Major*.

CHART, is a Draught projected for the uſe of Seamen, Diſcovering the Sea-coaſts, Sands, Rocks; and is ſometime taken for the *Nautrical Compaſs*.

CHARTA *Pardonationis ſe defendendo*, is the Form of a Pardon ſlaying another Man in his own Defence.

CHARTA *Pardonationis utlagariæ*, is the Form of a Pardon for a Man that is outlawed.

CHARTER-PARTY, is an Indenture of Covenants and Agreements made between Merchants or between Owners of Ships and the Maſters and Sea-faring Men, touching their Affairs, or Commanders.

CHARTIS *Reddendis*, is a Writ which lies againſt him that hath Charters of Feoffment, delivered him to keep, and refuſeth to deliver them.

CHASE, to *Chaſe* is to purſue a Ship at Sea, which is called *Giving Chaſe*. *A Stern Chaſe* is when the Chaſer follows the Chaſed a-ſtern, directly upon the ſame Point of the Compaſs: To *lie with a Ship's Fore-foot in a Caſe*, is to ſail and meet with her by the neareſt diſtance, and ſo to croſs her in her way, or *to come acroſs her Fore-foot*. A Ship is ſaid to have *a good Chaſe*, when ſhe is ſo built forward on, or a-ſtern, that ſhe can carry many Guns to ſhoot forwards or backwards, and ſo hath either *a good Forward*, or *a good Stern-Chaſe*.

CHASE-GUNS, are ſuch whoſe Ports are either in the Head (and then they are uſed in *chaſing of others*) or in the Stern, which are only uſeful when they are purſued or chaſed by any Ship or Ship.

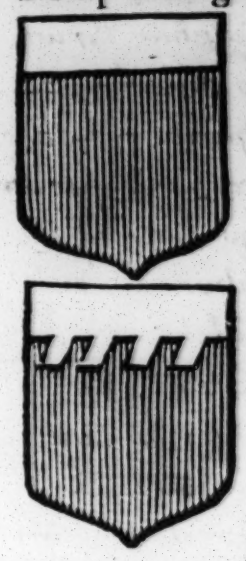
CHASE *of a Gun*, is its whole Length.

CHAUSE-TRAPPES, or *Coltrops*, in *Fortification*, are Iron Inſtruments with four Spikes about 4 Inches long, made after ſuch a manner, that whatſoever way they fall, one Point will always lie uppermoſt like a Nail. They are uſually ſcatter'd and thrown into Moats and Breaches to gall the Horſes Feet, and to ſtop the haſty approach of the Enemy.

CHECKY, the Herald's Term for a Bordure or Ordinary that hath more than two Rows of Checkers; for if it hath only own, they call it *Countercomponed*.

CHEEKS, are (in a Ship) two Pieces of Timber fitted on each Side of the Maſt at the Top, ſerving to ſtrengthen the Maſt there; and alſo having Holes in them (which are called *Hounds*) through which the *Ties* run to *hoiſt* the *Yards*.

Alſo the uppermoſt Rail or Piece of Timber in the Beak of a Ship; and thoſe on each Side the *Trail Board*, are called *the upper and lower Cheek*. The Knees alſo which faſten the Beak-Head to the Bows of a Ship are called *Cheeks*; and ſo are the Sides of any Block, as alſo the Sides of a Ship-Carriage for a Piece of Ordnance.



CHIEF, one of the Eight Honourable Ordinaries in Heraldry, containing a Third Part of the Field, and determined by one Line, either ſtreight or crooked, that is, *Invected*, *Engrailed*, &c. drawn through the *Chief Point* of the Eſcutcheon. Thus the Field is *Gules*, a *Chief*, *Argent*. He beareth *Gules*, a *Chief Crenele*, or *Embatteled*, *Argent*.

Sometimes one *Chief* is born upon another, which is called *Surmounting*, and it is uſually expreſſed by a Line drawn along the upper part of the *Chief*; for if the Line be drawn along the lower Part of the *Chief*, it is called a *Fillet*. The former of theſe is an Addition, the Latter a Diminution of Honour. *Chief Point*: See *Eſchutcheon*.

CHEMIN *de Ronds*, in Fortification, is the way of the Rounds, or a Space between the Rampart and the low Parapet under it for the Rounds to go about. The ſame with the *Fauſſe Bray*.

CHEMISE, in Fortification, is a Wall with which a Baſtion, or any other Bulwark of Earth is lined for its greater Support and Strength; or it is the Solidity of the Wall from the *Talus* to the Stone Row.

CHEMOSIS, is the Tumour of the *Albugineous Tunick* that maketh the Black of the Eye appear Concave, being a very great Inflammation of the Eyes with vehement Pain, both the Eye-lids being turned the Inſide out, ſo that the Eyes can ſcarcely be covered with them, whilſt the White of the Eye ſtands higher, and the Red runs over moſt Part of the *Iris*.

CHERSONESUS, a Term in Geography, being the ſame with *Peninſula*, and ſignifies a Part of the Land encloſed all round about with Water, except one narrow Neck, by which it joins to the Main Land; and that Neck is called *an Iſthmus*.

CHESSE-TREES, are two ſmall Pieces of Timber with a Hole in them, on each Side of the Ship, a little before her *Loof*, for the Main Tack to run through, and to which it is haled down.

CHEVAUX *de Friſe*, or *Friſeland Horſe*, in Fortification, is a large Joiſt or Piece of Timber about a Foot in Diameter, and ten or twelve in Length; into the ſix Sides thereof are driven a great number of Wooden Pins about ſix Foot long, croſſing one another, and having their Ends armed with Iron Points. Their chief Uſe is to ſtop up Breaches, or to ſecure the Avenues of a Camp from the Inroads both of Horſe and Foot. They are much the ſame with *Turn-pikes*.

CHEVILS, or *Kevils*, are ſmall Pieces of Timber nailed to the Inſide of a Ship to *belay* or faſten the *Sheets* and *Tacks*.

CHEVRON, one of the Honourable Ordinaries in Heraldry: It repreſents two Rafters of an Houſe ſet up as they ought to ſtand, and was anciently the Form of the Prieſteſſes Head Attire. It contains the Fifth Part of the Field, and is Figured thus:

He beareth *Gules*, a *Chevron Argent*, by the Name of *Fulford*. The *Chevron* is divided into the

CHEVERONEL, which is the Moiety of a *Chevron*; and a *Couple-Cloſe*, which is the fourth Part.

CHICANRY, is a trickiſh and guileful Practice of the Law.

CHILIADS; ſo the *Tables of Logarithms* are frequently named by many Authors.

CHILIOGON, a Regular Plane Figure of 1000 Sides and Angles; of which, though the Eye can form no diſtinct View, we may have a very clear Idea in the Mind; and can eaſily demonſtrate, that the Sum of all its Angles are equal to 1996 Right ones; for the internal Angles of every Plane Figure, are equal to twice as many Right Angles as the Figure hath Sides; except thoſe 4 which are about the Point in the Middle, from whence the Figure is reſolved into Triangles.

CHIMES *of any Clock*: How to calculate Numbers for them, and to fit and divide the *Chime-Barrel*: See in *Watch-Work*.

CHIRAGRA, is a ſort of Gout in the Hands only.

CHIROGRAPHER, is he that in the Common-Pleas, ingroſſes Fines acknowledged in that Court into a perpetual Record (after they are acknowledged and fully paſſed by thoſe Offices by whom they are firſt examin'd) and that Writes and delivers the Indentures, one for the Buyer, and another for him that ſells, and makes another indented Piece, containing alſo the Effect of the Fine, which he delivers over to the *Cuſtos Brevium*, which is called *the Foot of the Fine*. The *Chirographer* alſo, or his Deputy, proclaims all the Fines in the Court every Term, according to the Statutes, and then repairing to the Office of the *Cuſtos Brevium*, there endorſes the Proclamations upon the Back-ſide of the Foot thereof, and always keeps the Writ of Covenant, as alſo the Note of the Fine.

CHIROMANCY, the ſame with *Palmaſtry*, is a pretended way of Divination, telling of Forturities, preſaging Futurities, or diſcovering the Tempers and Conſtitutions of Perſons by a ridiculous Inſpection into the Hand, and Obſervation of Wrinkles and Strokes of the Skin.

CHIVES, is the Botanick Word by which our Mr. *Ray* renders the Latin *Apices*: *Which ſee*. But Dr. *Grew* calls the *Stæmina* on which the *Apices* are fixed, by this Name of *Chieves*.

CHLOROSIS, or *Morbus Virgineus* commonly *Iterus Albus*, or the *Green-ſickneſs*, ſeems to be a kind of Plhegmatick Pituitous Dropſy, ariſing from an Obſtruction of the Menſes, want of Fermentation in the Blood, and Detention or Depravation of the Ferment in the Womb; whereupon the

Muſcu-

Muſcular Fibres being obſtructed, they become Lazy and unfit for Action. *Blanchard.*

CHOANA, is a ſort of Cavity or Tunnel in the *Baſis* of the Brain, by which the ſerous Excrements are brought down from the Ventricles of the Brain to the *Pituitary Glandules*; alſo the *Pelvis* of the *Reins*, of which in its proper Place. *Blanchard.*

CHOLEDOCHUS *Ductus*, is the Communion of the *Ductus* or *Porus Bilarius* with the *Ductus Cyſticus*, into one Paſſage, and is thence called the *Ductus Communis Choledochus.* This goes obliquely to the lower End of the *Duodenum*, or the beginning of the *Jejunum*; and creeping obliquely between the Tunicks of the Inteſtine, hath the Return of the *Bile* hindred (as by a Valve) from coming into the *Ductus* again.

CHOLER: See *Bile.*

CHOLERA *Morbus*, is a depraved Motion of the Ventricle and the Guts, whereby the *Bilious Excrements* are diſcharged in great plenty upwards and downwards. *Blanchard.*

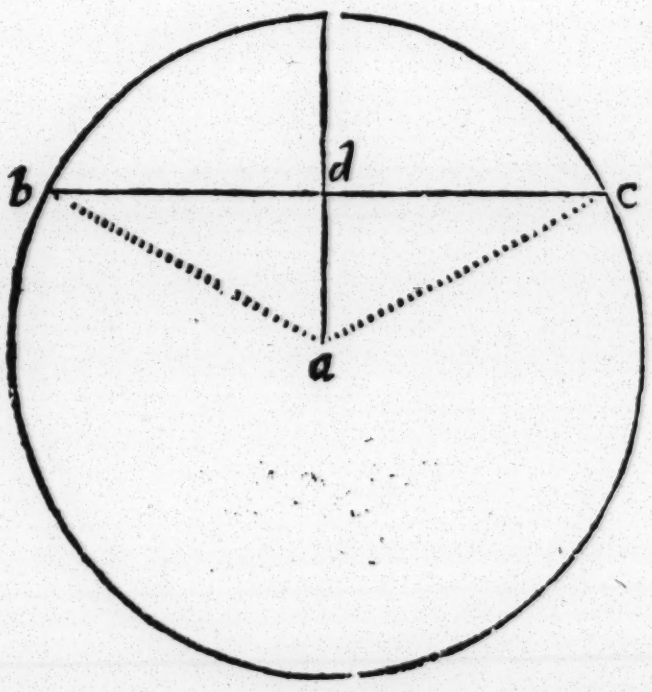
CHOLOGOGUES, are Medicines which purge Choler, Sulphureous and Bilous Humours; as *Rhubard*, *Senna*, *&c.* according to the old Notion.

CHONDROSYNDESMUS, the joyning or uniting of the Bones by a Cartilage placed betwixt them.

CHORD, in Geometry, is a Right Line connecting the Extremities of any Arch of a Circle, and is othewiſe called a *Subtenſe.*

Prop. I.

A *Chord (b c)* is biſſected by a Perpendicular *(d a)* drawn from *(a)* the Center.

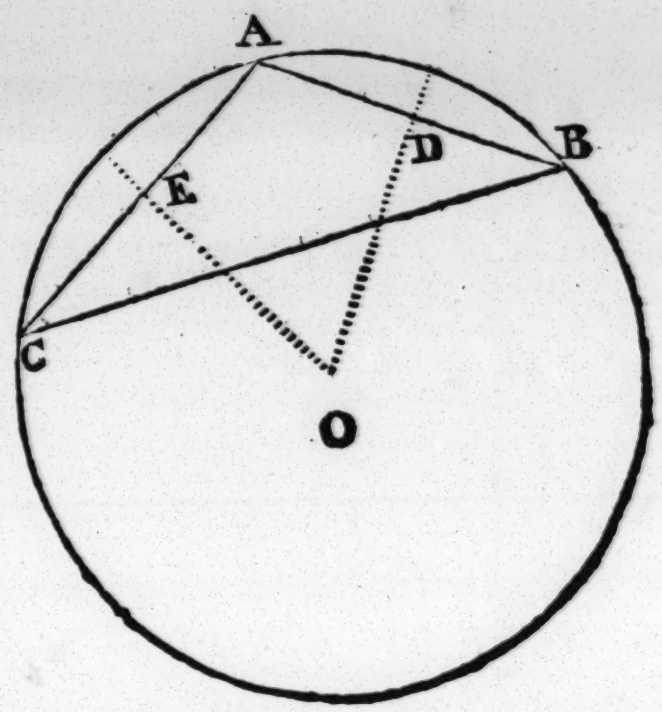


For the Triangle *a b c* is an *Iſoſceles*, (becauſe *a a* = *b a*) and therefore the Perpendicular *a d* biſſects the *Baſe* or *Chord b c* (10. *e.* 1. *Eucl.*) and conſequently the Ark *b c* is alſo by this Means biſſected. From whence are deducible and demonſtrable theſe

Problems.

1. To make a Circle paſs thro' any three Points given, nor lying in a Right Line.
2. To find the Center of any Circle.
3. To compleat a Circle from an Ark given.
4. To deſcribe a Circle about any Triangle given.

1. Let the three Points be *A B C*; join *A B* and *A C*, which biſſect in *D* and *E*, by drawing the Perpendiculars *D O* and *E O*: The Point *O*, where they croſs one another, muſt be the Center, becauſe they both paſs thro'-it by this Propoſition. With the Diſtance *A O* draw the Circle, and the Demonſtration will be plain.



2. If the Circle had been given, or any Part of it, as ſuppoſe the Ark *C A D*, and the Center of the Circle had been required: You need only mark out any three Points in the Circumference; as ſuppoſe *A*, *B*, *C*; then proceed as before, you'll find the Center *C.*

3. The ſame way alſo you may deſcribe a Circle about the Triangle *A B C*; for the Perpendiculars that biſſect any two Sides of the Triangle, will, where they croſs, find the Center *C*, from whence a Circle being drawn, it ſhall circumſcribe the Triangle *A B C.* The Demonſtration is the ſame with the former.

N. B. The Center of a Circle may very eaſily be found by the Square thus; Apply the Corner of the Square any where to the Circumference, as ſuppoſe at *A*; and draw *D R* between the Points where the Legs cut the

Circumference. The Line biſſected, ſhall give *C* the Center of the Circle; for the Angle *D A R* being a Right one, *D R* muſt be the Diameter, by 31. *e.* 3. *Eucl.* The half of which *D C* or *C R* muſt be the *Radius.*

CHORDA *Membranæ Tympani*, is a certain Nerve coming from the third Branch of the fifth Pair, extended above the Membrane of the *Tympanum* or Drum of the Ear, and which goes alſo to the Muſcles of the *Malleolus*, and then joins the *Portio Dura* before it comes out of the *Cranium*.

CHORDAPSUS, ſo *Celſus* names it, barbarouſly called *Miſerere me*, by others *Iliaca Paſſio*, by others *Volvulus*, commonly *Ileus*; is an Ejection of the Excrements at the Mouth only, becauſe the *Periſtaltick* or Vermicular Motion of the Guts, whereby the Excrements are excluded, becomes inverted. *Blanchard*.

CHOREA *Sancti Viti*, is a ſort of Madneſs, which formerly was very common amongſt ſome People, wherein the Perſon affected laid not down, but ran hither and thither dancing to the laſt Gaſp if they were not forcibly hindred. *Horſtius* ſays, That he hath ſpoke with ſome Women, who paying a Yearly Viſit to the Chapel of Saint *Vitus*, which is near the City *Ulme* in *Sweedland*, have been taken with ſuch a Violent fit of Dancing Night and Day, together with a ſort of Franticknes in the Mind, that they fall together like ſo many People in Extaſies; and are ſenſible of little or nothing for a Year together till next *May*, about which time they perceive themſelves ſo tormented with a Reſtleſſneſs in their Limbs, that they are forced to repair to the ſame place again about the Feaſt of Saint *Vitus* to Dance.

CHOREUS, vulgarly called *Trocheus*, is the Foot of a Latin Verſe, conſiſting of two Syllables, where the firſt is long, and the laſt ſhort, as *Annus*; ſo that this is the Reverſe of an *Iambus*.

CHORIAMBUS, is the Foot of a Latin Verſe compounded of a *Chorus* and an *Iambus*; it conſiſts of four Syllables, of which the firſt and laſt are long, and the middle ones ſhort; as *Hiſtoriæ*.

CHORION, is the outer Membrane involving the *Fœtus* in the Womb; 'tis pretty thick, ſmooth within, but rough without-ſide to which the *Placanta* adheres: It hath many Veſſels which ſpring from the *Placenta*, and from the Umbilical Veſſels. The former are diſperſed thro' it before the *Fœtus* is ſhaped (as *Diemerbroek* affirms) but the latter not till the Navel-Rope is grown out to a juſt length; at which time they enter in it, and are intermixt with the former, and from this Membrane are inſerted into the *Placenta* to which the *Chorion* adheres. This Membrane, the *Chorion*, is always ſingle, tho' the *Fœtus* be *Twins*, tho' then there is a double *Amnion*, treble, quadruple, *&c.* if the *Fœtus* are 3, 4, *&c.* Originally the *Chorion* did inveſt the *Ovum*, but when that is brought down into the Womb, and is become a Conception, this Membrane imbibes the Moiſture of that part very plentifully; for while the Conception lies looſe there, and is faſtned to no part by any Veſſels which go from it, or come to it, it ſeems to have its increaſe juſt as the Egg hath in the Body of the Hen; which whilſt it is in the *Racemus* or Knot, hath no other Subſtance but the Yelk; and when it drops off from thence, and deſcends thro' the *Infundibulum*, it receives no Alteration, but when it comes into the Cells of the Proceſs of the *Uterus*, it begins (ſaith *Harvey*) to gather a *White*, altho' it yet ſtick to no part of the *Uterus*, nor hath any Umbilical Veſſels: But juſt as the Eggs of Frogs and Fiſhes gather themſelves a *White* out of the Water, ſo doth there come out of the *Plicæ* or Wrinkles of the Womb an Albugineous Moiſture, whence the Yelk (by its vegetative and innate Heat) gathers and concocts its White. After this manner doth the *Chorion* imbibe that Albugineous Matter, which from the firſt Conception encreaſes daily in it (and which tranſudes thro' the *Amnion* in which the *Embryo* ſwims) till the Umbilical Veſſels and the *Placenta* are formed; from and thro' which the *Fœtus* may then receive its Nouriſhment. And the Liquor which this *Chorion* imbibes, Dr. *Gibſon* takes to be the Nutritious Juice which ouzes into the Cavity of the *Uterus* out of the Capillary Orifices of the Hypogaſtrick and Spermatick Arteries, and is of the ſame Nature with that which is afterwards ſeparated in the *Placenta*, and carried to the *Fœtus* by the Umbilical Vein, and with that alſo which abounds in the *Amnious*, even till the Birth: For the Plaſtick or Vegetative Vertue is only in the *Ovum* it ſelf, and the Augment that the firſt Lineaments of the *Fœtus* receives, is only by Appoſition of this Nutritious Juice. But the *Chorion* is grown ſo denſe and thick by that time the *Placenta* and Umbilical Veſſels are formed, that it is not capable of imbibing more, but that which in this time is in it, doth in a little while tranſude into the *Amnios*, and ſo it ſelf becomes empty, and gives way to the encreaſe of the *Allantoides* (which from hence begins to appear) and whoſe Liquor encreaſes daily as the *Fœtus* grows near to the Birth. This Opinion, which ſeems indeed very probable, the Learned Dr. *Gibſon* in his *Anatomy* (laſt Edition, *p.* 220.) propoſes only as a Conjecture, and ſubmits it to the Cenſure of the Learned.

CHOROGRAPHY, is a particular Deſcription of ſome Country, as of *England*, *France*, or any Shire or Province in them, *&c.*

CHOROIDES, is the folding of the *Carotidal Artery* in the Brain, wherein is the *Glandula Pinalis*: It is alſo the *Uvea Tunica*, which makes the Apple of the Eye.

CHROMATICK, a Term in Muſick, being the ſecond of the three kinds, which abounds in Semi-tones, and contains only the leaſt *Diatonical Degrees*. It is recorded in Hiſtory, that *Timotheus* the *Mileſian* firſt invented this ſort of Muſick, in the time of *Alexander the Great*, and the *Spartans* baniſhed him becauſe being accuſtomed only to the *Diatonick* kind, they judged the *Chromatick* to be too ſoft.

CHRONOLOGY, in the common Senſe of the Word now, is the Arithmetical computing of Time for Hiſtorical Uſes; ſo as thereby truly to date the Beginnings and Ends of Princes Reigns, the Revolutions of Empires and Kingdoms, Battles, Sieges, or any other Memorable Actions.

CHRONOMETRUM *Perpendiculum*, or *Chronoſcopium*, the ſame as *Pendulum*: Which ſee.

CHRONOSCOPE, the ſame with a *Pendulum* to meaſure Time: See *Pendulum*,

CHRYSOCERAUNIUS *Pulvis*, is the ſame with *Aurum Fulminans*: Which ſee.

CHRYSTAL *Mineral*: See *Sal Prunellæ*.

CHRYSTALS *of Copper*: See *Vitriol of Copper* or *Venus*.

CHRYSTALS *of Silver*, or *Vitriol of the Moon*, is an Operation in Chymiſtry, where by the Body of Silver is opened and reduced into the form of a Salt by Spirit of Nitre. 'Tis done thus; Diſſolve an Ounce or two of Silver in about three times the Weight of *Aqua Fortis*, or which is better, good Spirit of *Nitre*. Evaporate the Diſſolution in a Glaſs

Glaſs Cucurbite and over a Sand-heat till about ¾ of the Liquor is blown off, then let the Remainder ſtand without ſtirring it, and it will ſhoot into Chryſtals, which take out, and when they are dry, keep them in a Viol well ſtopt. Theſe *Chryſtals* are uſed to make an Eſchar, by touching any part with them. They are alſo given inwardly in Dropſies ſometimes, from two to ſix Grains, and they will purge gently. The Purgative Quality in theſe *Chryſtals* (there being no ſuch thing either in the Silver or the Spirit of Nitre) muſt ariſe from the new Texture and Conformation of the Parts of both, happening from this Union of the Parts of the Silver with thoſe of Spirit of Nitre.

Theſe *Chryſtals* may eaſily be *revived* into good Silver again, if you put them to diſſolve, as they will readily do in a Veſſel of hot Water, in the bottom of which you ſhall have laid a Plate of Copper; the Silver will precipitate down in a white Powder, which gather, waſh and dry, and then melt it in a Crucible with a little Salt Petre, 'twill run into good Silver of the ſame weight as at firſt.

CHRYSTALS *of Tarter*: See *Cream of Tarter*.

CHRYSTALLINE *Heavens*, in the *Ptolomaick Syſtem* were two. *One* ſerved them to explain the ſlow Motion of the fixed Stars, and cauſed them (as they thought) to move one Degree Eaſtward in about 70 Years.

The *Second* helped them out in ſolving a Motion, which they called *the Motion of Trepidation* or *Libration*; by which they imagined the Sphere to ſwag from Pole to Pole.

CHRYSTALLINE *Humour of the Eye*: See *Humours*.

CHRYSTALLIZATION, is and Operation in Chymiſtry, by which the Salts diſſolved in any Liquor are made to ſhoot into little prettily figured Lumps or Fragments, which they call *Chryſtals*, from their being pellucid or clear like Chryſtal. In order to bring the Salts duly to *Chryſtallize*, you muſt gently evaporate part of the Moiſture; for if there be too much Liquor in propotion to the Salt, it will not coagulate or chryſtallize at all; and if there be too little, the Salts will all run into one another, and not chryſtallize regularly. The general Rule to know when enough of the Moiſture is evaporated, is when a little Skin begins to be on the Surface of the Liquor.

CHYLE, is a white Juice in the Venticle and Inteſtines, proceeding from a light Diſſolution and Fermentation of the Victuals, eſpecially of their Sulphur and Salt with which Edible things abound, and which by the Invention of the *Acid* Humour in the *Ventricle* becomes white; for if you pour an *Acid* upon any Liquor that is impregnated with Sulphur and Volatile Salt, it preſently turns Milky, as is obvious in preparing Milk of Sulphur, or the Reſinous Extracts of Vegetables. Nay, *Spirit of Harts-horn* and of *Soot*, abounding with Volatile Salt, if it be mix'd with an Acid, or with but plain Water, grows to be of a Milky Colour: At laſt the *Chyle* after a Commixtion and Fermentation with the *Gall*, and the *Pancreatick Juice*, either Volatile or Acid, paſſing the *Lacteal Veins*, *&c.* is mixed with the Blood. It is called in Latin alſo *Chymus*. *Blanchard*. As to the manner how this *chyle* is firſt made and perfected, ſee

CHYLIFICATION, which is the Action of the Stomach, Guts, *&c.* in the making of *Chyle*, and 'tis done thus, as I find the Acurate Mr. *William Cowper*, Chyrurgeon, hath accounted for it in a Paper publiſhed in *Philoſ. Tranſactions*, N, 220.

The Aliment which is uſually taken down into the Stomach of Adult Perſons, is ſuch whoſe Groſsneſs of Parts requires *Maeſtication* or Chewing: In order to which, the *Dentes Inciſores* are ſometimes employed to divide it from the more Bulky Part, and to receive it into the Mouth; and then the lower Jaw being variouſly moved by its proper Muſcles Maſtication is begun, and carried on by the Aſſiſtance of the Tongue, Cheeks, and Lips, the two firſt ſtill applying the leſs divided Parts of the Aliment to the *Dentes Molares* till there is an equal Comminution of all its Parts; nor is the Action of Maſtication meerly performed for dividing the groſſer Parts of the Aliments, but divers of the Muſcles employed in the Motion of the lower Jaw, are at the ſame time alſo ſerviceable in haſtening the *Saliva* or Spittle, ſeparated from the Blood by the Parotid Glands, thoſe of the lower Jaw, and under the Tongue, into the Mouth; the Saliva Glands of the Cheeks and Lips alſo contributing their Juice, do altogether joyn with the Maſticated Aliments, before, or at the ſame time it's made fit to be ſwallowed; which Action is called *Deglutition*.

Deglutition is thus performed: The Aliment, as well what's fluid as that maſticated, being lodged on the Tongue, which does ſomewhat hollow it ſelf by means of its own proper Muſcular Fibres, for the more commodious entertaining the larger Quantity, its Tip and Sides are applied to the Indices of all the Teeth of the upper Jaw, (and *Gingivæ* or Gums of thoſe that want Teeth) the Tougue is ſuddenly drawn up by the *Muſculi Styloglooſſi* or *Myloglooſſus*, together with thoſe Muſcles which pull the *Os Hyoides* upwards; at the ſame time the *Fauces* are drawn up, and their Cavity enlarged by the *Muſculi Stylopharyngæi*; and about two thirds of the Tongue's ſuperiour Surface is adequately applied to the Roof of the Mouth; the *Epiglottis* from its Poſition being conſequently depreſſed, does thereby cover the *Glottis* or *Rimula* of the *Larynx*, and prevents any part of the Aliment from deſcending into the Wind-pipe: In this part of the Action of *Deglutition* the Glands under the Tongue, and excretory Ducts of thoſe of the lower Jaw are compreſs'd, and their ſeparated Liquors or Spittle voided by their *Papillæ*, ſituated at the lower part of the *Frænum* or Ligament of the Tongue; and this is done by the *Muſculus Mylo-Hyoidæus*; when the Aliment by the abovementioned Motion of the Tongue, is forced into the *Fauces* or upper part of the *Gula*; at the ſame time the *Gargareon*, together with the *Uvula* are drawn upwards by the *Muſculi Sphænoſtaphili*, by which means any part of the Aliment is hindred from aſcending into the *Foramina Narium*: The *Fauces* by the *Muſculus Perygopharyngæus* and *Oeſophagus* are contracted, whereby the Aliment is not only compreſs'd into the *Gula*, but the Matter ſeparated from the Blood by the Glands of the *Fauces*, eſpecially of thoſe large ones called *Tonſillæ*, is forced out of their Cells or Excretory Ducts, to join with it in its deſcent to the Stomach by *Gula*, through which the latter paſſes by the Action of its *Muſcular Fibres*.

The Aliment thus impregnated with *Saliva* in Maſtication and Deglutition being received into the Stomach, there meets with a Juice ſeparated from the Blood by the Glands of that Part whoſe Excretory Ducts open into the Cavity of the Stomach: By the commixture of theſe Liquors, whether of *Saliva* or the Juice of the Stomach a pro-

per

per *Menſtruum* is compoſed, by which the Parts of the Aliment are ſtill-more and more divided by its inſinuating into their Pores, and by which the Air before impriſoned in their leſs-divided Parts, is not only ſet more at liberty, but by the natural Heat, it muſt neceſſarily ſuffer ſuch a Rarefaction, as that thereby the whole Stomach becomes ſtill more and more diſtended; hence it is we have leſs Appetite ſometime after eating (when this Intumeſcency is made) than we had immmediately after; hence alſo ariſe thoſe frequent *Eructations* from divers Aliments, as old Peaſe, Cabbage, and divers other Vegetables we frequently eat; all which become very much deſturbing in depraved Appetites and weak Stomachs. Though we have not uſed the Word *Fermentation*, yet we do not ſuppoſe the Diſſolution of the Aliment within the Stomach can be done at leaſt without an Inteſtine Motion of its Particles with the *Menſtruum*; but we have omitted that Term, becauſe it may be apt to lead us into an Idea of a greater Conflict than in truth there really is.

At the ſame time this Intumeſcence an Agitation of the Matter is made in the Stomach, the Contents of the neighbouring excretory *Ductus*'s namely, the Bile in the Gall-Bladder and Liver-Ducts, and Pancreatick Juice in the *Ductus Pancreaticus*, are compreſs'd into the *Inteſtinum Duodenum*, through the Extenſion of the Stomach it ſelf; the refluent Blood of the Stomach at that inſtant being in ſome meaſure retarded, whereby the *Muſcular Fibres* are more liable to be contracted.

Nor can we conceive how the Liquor of the Stomach, after having joyned with the *Saliva* and Aliment, ſhould be ſtill ſo plentifully excreted from the Glands of that Part, as to irritate its Internal Membrane, and excite its *Muſcular Fibres* to contract, ſince the Muſcles of the *Abdomen* would, like as in Vomiting, be drawn into a Conſent of Co-operating, and the Aliment would be forcibly rejected by the Mouth: Beſides, ſhould the Liquor of the Stomach be ſo diſturbed in *Chyliſication*, what would it be ſo ſoon as all its Contents were diſcharged? The Irritation the Stomach undergoes in Hunger, we are firmly perſwaded does not ariſe but through an Accumulation of the *Saliva* in the Stomach, in conjunction with the Liquor of the Glands of that Part; whence it is we rather diſcharge the Spittle at that time by the Mouth, than to ſuffer any more of it to deſcend into the Ventricle: Hence proceeds what we call *the watering of the Mouth*; hence alſo, when the *Saliva* is vitiated, the Appetite is depraved.

The Stomach, by means of its *Muſcular Fibres* contracting it ſelf, does gradually diſcharge its Contents by the *Pylorus* into the *Duodenum*, in which Gut, after a ſmall *Semicircular* Deſcent, it meets with the Pancreatick Juice and Bile; both which joyning with it, renders ſome Part of the Aliment more fluid, by ſtill diſuniting the groſſer Parts from the more pure; and here *Chyliſication* is made perfect.

The Bile which abounds with Lixivial Salts, and apt to intangle with the groſſer Parts of the Concocted Aliment, ſtimulates the Guts, and deterges or cleanſes their Cavities of the *Mucous Matter*, ſeparated from the Blood by the Glands of the Guts, and lodged in their Cavities; which not only moiſtens the Inſides of the Guts, but defends the Mouths of the Lacteal Veſſels from being injured by *Alien Bodies* which often paſs that way.

The Contents of the Inteſtines moving ſtill on by means of the *Periſtaltick* or Worm-like Motion of the Guts, whilſt thoſe thinner Parts fitted for the Pores of the Lacteal Veſſel called *Chyle*, is abſorbed by them, the thicker move ſtill more ſlowly on, and by the many Stops they continually meet with by the *Connivent Valves*, all the *Chyle* or thin Parts are at length intirely abſorbed, the Remains being meerly Excrementitious, are only fit to be excluded by Stool.

The Analogous White Appearance of the *Chyle*, whether in the Stomach or Inteſtines, and always in the *Venæ Lacteæ* and *Thoracick Duct*, may be ſeen in the Commixtures of divers Liquids, which ſeparated exhibit no ſuch Appearance; nor is this *Phænomenon* any otherwiſe than a Tranſpoſition of Particles, whether by a *Menſtruum* inſinuating into them, dividing them into groſs Globules, as an Acid into Sulphur, as Vinegar with Oil, *&c.* or elſe by Precipitation, as when a Gummous or Refinous Body is diſſolved in a Spirituous *Menſtruum*, and mixed with a Phelgm; ſo Tincture of Myrrh and Benjamin, *&c.* make a milky Appearance in common Water,

The Longitudinal and Tranſverſe Order of the Fibres of the Guts, are the Inſtruments by which the Periſtaltick Motion of them is performed, which Motion is not only neceſſary for puniſhing their Contents forwards, but by reciprocal Contraction of the Muſcular Fibres of the Guts, and Appoſition of their *Connivent Valves*, the Mouths of the Lacteals are diſpoſed to recieve what is fitted for them; hence it is we can by no Means make any Fluid whatever paſs from the Cavity or the Guts into thoſe Lacteal Veſſels in a dead Animal.

A further uſe of this Contraction of the *Muſcular Fibres* of the Inteſtines, is to accelerate the *Chyle* in its Progreſs in the Lacteals, till the *Lympha* derived from the Extremities of the Arteries of the Guts joins with it; which Conjunction is made in the *Lacteals* before they leave the External Surface of the Inteſtines. By this Means the Progreſſion of the *Chyle* is made towards the Meſenterick Glands, into whoſe Cells it is received, where it again mixes with a Juice brought in by the Arteries of each Gland; which Juice or Lymphatick Liquor not only farther dilutes the *Chyle*, like that from the Arteries of the Inteſtines, but adds a freſh *Impetus*, by which its Motion is farther carried on through the *Vaſa Lactea ſecundi generis*; (ariſing out of each Meſenterick Gland, and diſcharging their Contents into the *Receptaculum Chyli.*) Here the *Chyle* meets and joins with the *Lympha* ſent through the *Lymphatick Ducts* from the inferiour Limbs and neighbouring Parts, whereby the *Chyle* is not only farther prepared, but its Aſcenſion is promoted in the Thoracick Ducts, whoſe ſeveral Diviſions and Inoſculations (like the Veins of the Teſticles) with its many Valves looking from below upwards, and advantagious Scituation between the great Artery and *Vertebræ* of the Back together with the Lympheducts, diſcharging their *Lympha* derived from the Lungs and neighbouring Parts of the Thorax, does demonſtrate the utmoſt Art ſtill uſed in order to its Aſcenſion towards the left Subclavian Vein, where meeting with the refluent Blood of the Superiour Parts, its paſſes with it through the deſcending

descending Trunk of the *Vena Cava*, and joins with the refluent Blood of the inferiour Parts in the Right Auricle of the Heart; whence its expelled by its Contraction into the Right Ventricle, when the Heart is in *Diastole*; but by the *Systole* or Contraction of the Heart, it's again driven out thence into the *Arteria Pulmonaris*, thro' whose Extremities, in conjunction with those of the *Vena Pulmonalis*, it passes to the Left Auricle and Ventricle of the Heart, from whence it's again expelled in the *Systole* (as above) into the *Aorta* or *Arteria Magna*, by whose Branches it's conveyed thro' the whole Field of the Body: The three tricuspid Valves in the Right, and two Mitral Valves in the left Ventricle of the Heart opposing its rrturn into the Veins, and the Semilunary Valves of the *Arteria Pulmonaris* and *Aorta* preventing its Ingress into the Ventricles, are sufficient (when rightly considered) to demonstrate the necessity of a Circulation of this grand Fluid called *Blood*. Thus *Sanguification* is begun, and as we have mentioned the divers Preparations of the Aliment before Chylification, so here may be observed the various Mixtures and Preparations of *Chyle* in order to Sanguination.

CHYLI *Receptaculum*: See *Receptaculum Chyli*.

CHYLIOSIS, the same with *Chylificatio*.

CHYMIA, or *Chemis*, is a Resolution of mix'd Bodies in their Elements; and again, when it can be done, *Co-agulation* or Redintegration of the same Elements into the Bodies which they constituted before: There are two Parts of it, *Solution* and *Co-agulation*; by the Addition of the *Arabick* Article it is called, *Alchymia*, or *Alkymia*; it is called also *Spagyria*, *Hermetica ars*, *ars perfecti Magisterii*, *ars Segregatoria*, *Separatoria* and *Destillatoria*. *Blanchard*.

CHYMICA, or *Chymicalia*, are Medicines which the *Chymists* prepare, that they may be taken in a less or more grateful Quantity. *Blanchard*..

CHYMISTRY, is variously defined, but the Design of the Art is to separate usefully the purer Parts of any mix'd Body, from the more Gross and Impure. It seems probably to be derived from the Greek Word, χυμὸς, which signifies a Juice, or the purer Substance of a mix'd Body; though some will have it to come from χέειν, *to melt*. It is also called *the Spagyrick*, *Hermetick*, and *Pyrotechnick Art*, as also by some *Alchymy*. The Reasons whereof you may see under those Words.

CHYMOSIS, or *Chemosis*, is a Distortion of the Eye-lids, arising from an Inflammation; also an Inflammation of the *Cornea Tunica* in the Eye. *Blanchard*.

CHYMUS, the same with *Chylus*.

CHYRONIA, is a great Ulcer, and of different Cure.

CHYRURGERY, or, as 'tis now a-days pronounced and written *Surgery*, is the Third Branch of the Curative Part of Medicine, and teacheth how sundry Diseases of the Body of Man may be cured by *Manual Operation*. Some divide it into these five Parts. 1. *Synthesis*, a setting together of things separate. 2. *Diæresis*, a separating of things that were continued before. 3. *Diorthosis*, a correcting of things squeezed together, and contorted. 4. *Exeresis*, a taking away of Superfluities. 5. *Anaplerosis*, a restoring of that which was deficient.

CICATRISANTIA, are such things as by drying, binding and contracting, fill up *Ulcers* with Flesh, and cover them with a Skin. *Blanchard*.

CICATRICULA, is that little whitish Speck in the Coat of the Yelk of an Egg, in which the first Changes towards the Formation of the Chick appear in an impregnated Egg: 'Tis commonly called the *Treddle*. The Chick lodged in the *Cicatricula* is nourished only by the White of the Egg, till 'tis grown of a competent Largeness; the Yelk seeming to be reserved by Providence for a more strong and solid sort of Aliment, which is fitter for the Animal when grown greater.

CICATRIX, *Cicatrices*, Scars or Marks which are left after great Wounds or Ulcers: Some are Simple, others are accompanied with *Cavities*, Diminution or Excrescence in the Parts affected.

CICATRINING *Medicines*: See *Cicatrisantia*.

CILIA and *Supercilia*, are the Eye-brows, hard Cartilaginous Bodies; but *Supercilia* properly the Hair upon the Eye-brows, at the Extremity of the Forehead.

CILIARE *Ligamentum*, or *Processus Ciliaris*, is a Collection of small slender Filaments which take their Rise from the inner Part of the *Tunica Uvea* in the Eye, and thence run towards the Prominent Part of the Chrystalline Humour, which they compass in and connect to the *Uvea*: Its use is to help, contract, or dilate the Figure of the Chrystalline Humour, and to draw it farther from, or bring it nearer to the *Uvea*, according as occasion serves.

CINCTURE, in Architecture, is that part which makes the middle of a Pillar; 'tis *Conge* in *French*; the Greeks called it ἀποφύγη, because that Part of the Pillar taking as it were, a Rise, seems to fly from the Basis: It is no more than the Rings of Ferrils formerly used to preserve Wooden Pillars from splitting, and which they afterwards imitated in Stone Work.

CINEFACTION, with some Chymists is used for *Calcination*.

CINERITIA, or *Substantia Corticalis*, is the External Substance of the *Cerebrum*; it is Soft, Glandulous, and of an Ashy Colour. *Blanchard*. See *Cortical*.

CINNABAR, is a Mixture of Sulphur and Quick-silver sublimed together; and is either *Natural*, when this Mixture is made in the Earth by Means of the Subterraneal Heat, and then 'tis called *Native Cinnabar*: Or else, 'tis *Artificial*, which is thus made, The Sulphur is melted in a great Earthen Pan, and then is put into it by Degrees, thrice its Weight of Mercury, and the Mixture is stirred about till all the Quick-silver disappears. After this the Mixture is cooled and powdered, and then *sublimed* in Pots with an open Fire, a hard red Mass will be raised, shaped like Needles. 'Tis brownish when in the Lump, but being powdered finely, is of a very high red, and is called *Vermillion*. The chief Design of this Operation is to make the Mercury Portable; which 'tis not safely, when in its natural Form, because of its great Weight and Fluidity.

Cinnabar is revived into Mercury, by mixing with it in Powder, three times as much Quicklime, and distilling in a Glass Retort, into a Receiver filled with Water, by Degrees of Fire; the Quick-silver will be found at the Bottom of the Receiver. You may receive Quik-silver also by mixing an equal

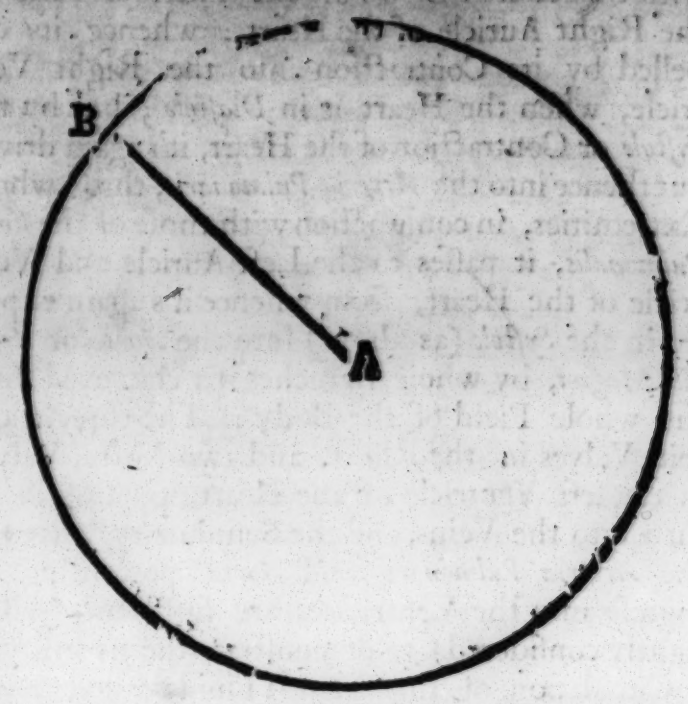
qual Quantity of Filings of Iron with the *Cinnabar*, and diſtilling as before.

CINNABAR *of Antimony*, is thus made: Fill a Retort half full of equal Parts of Powder of Antimony and Sublimate Corroſive; and ſetting the Veſſel in Sand, proceed at firſt as in the making of *Butter of Antimony*, which will alſo this way be made: But when, the Fire being encreaſed, you find red Vapours begin to ariſe, fit on another Receiver, but without luting the Junctures, and raiſe the Fire by degrees till the Retort be red hot, in which State it muſt be kept three or four Hours. Then the Veſſels being left to cool, break the Retort, and you will find, if the Operation ſucceed (which now and then it will not) the *Cinnabar* ſublimed and adhering to the Neck of the Retort. 'Tis accounted a good Medicine for Epileptick and Cephalick Diſtempers.

CION, *Columella, Gargareen, Gurgulio, Uva, Uvula, Uvigena, Uvigera, Epiglottis, Sublinguium*, is the Cover of the Wind-pipe; it hangs betwixt the two *Glandules*, called *Amygdalæ*, above the Chink of the *Larynx*, and is a Proceſs from a Subſtance, as one would think, Glandulous, Spungy, and red; which *Columbus* is of Opinion, ariſes from the *Tunick* of the Mouth, redoubled in that Place. But *Riolan* ſays, it proceeds from ſome *Muſcles* which are terminated there. It is of a Figure roundly oblong, in the upper Part thicker, and ending acutely. Its uſe is to attemperate the Coldneſs of the Air, and hinder the Drink from falling upon the Noſtrils: Sometimes this *Uvula* ſticks out too far, from the Humours that fall upon it, which cannot return by the *Lymphatick Veſſels*, whence proceeds the falling of the *Uvula*, which we call *Roof of the Mouth*. *Blanchard*.

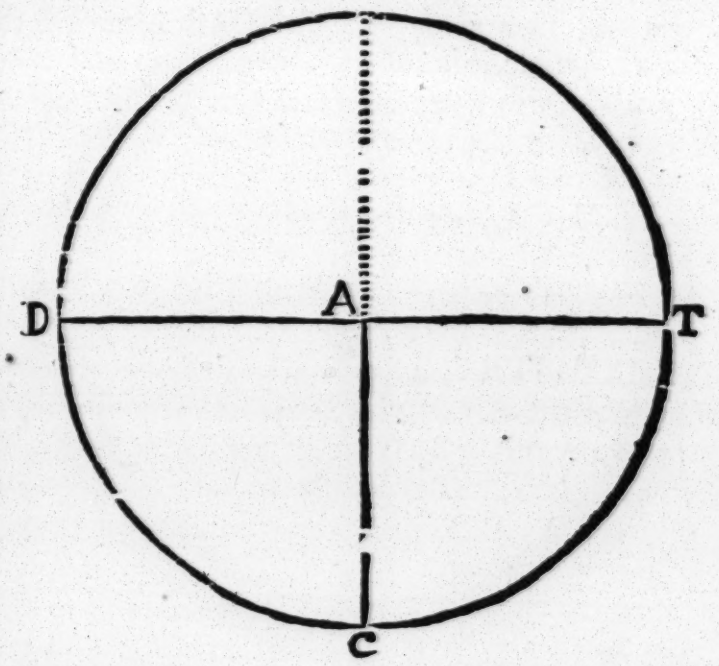
The *Uvula* is moved by two Pair of Muſcles, the *Pterigoſtaphilinus Externus*, and *Internus*; (which ſee) and the former of theſe draws the *Uvula* backwards, and the latter plucks it forwards, becauſe of the Pulley through which its Tendon paſſes, and which alters the Direction of its Motion; both which Motions are neceſſary for Deglutition, for the Articulation of the Voice, as well as to hinder any Drink, *&c.* from going into the Noſtrils.

CIRCLE, is a Plane Figure bounded with one only Line, and to which all the Right Lines that can be drawn from a Point in the Middle of it are equal to one another. And it may very well be ſuppoſed to be made thus; If you imagine the Line *A B* faſtned at one End to the Point at *A*, but yet ſo as to be moveable on *A* as a Center, till the End *B* arrive at the Place where it began; the Line *A B* in its Motion deſcribes a Figure, called a *Circle*, and the Point *B*, at the ſame time, deſcribes a *Curve Line*, called the *Circumference of a Circle*.



From which *Geneſis* 'tis plain, That all Right Lines drawn from the Point *A* (which is called the *Center*) to the *Circumference*, muſt be of equal length, or be equal to one another. And theſe Lines are called *Radius*, and by ſome *Semi-Diameter*.

The Line *D T* paſſing through the *Center*, and terminated at each End by the *Circumference*, is called the *Diameter*, and its half the *Semi-Diameter* or *Radius*.



Theſe *Diameters* are all equal to one another, and do divide the *Circle* into two equal Parts which are called *Semicircles*.

Any Part of the *Circumference* of a *Circle* is called an *Ark*, which Ark is the *Meaſure of any Angle*, whoſe Vertex or Angular Point is at the Centre of that *Circle*.

Every *Circle* is ſuppoſed to be divided into 360 equal Parts, which Parts are called *Degrees*; of theſe a *Semicircle* contains 180, and a *Quarter of a Circle* 90, which is called a *Quadrant*, as *C T*.

To find the Superficial Content of any *Circle*, ſee *Area* and *Polygon*; where the Ground of the Practice is demonſtrated. And ſince 'tis there proved from *Archimedes*, that a *Circle* is equal to a *Rectangle Triangle*, one of whoſe Sides is the *Radius*, and the other the *Periphery* (or a Line equal to it.) Let the *Radius* be called $\frac{1}{2}d$ (ſuppoſing d to be the *Diameter*) and whatever the unknown *Ratio* of the *Periphery* be to the *Diameter*, let it be expreſſed by r: Then will the *Periphery* be $r\,d$; and conſe-

conſequently the Perpendicular $r\,d$ being multiplied by half a *Radius*, that is, by $\frac{1}{4}\,d$, the Product will be $\frac{1}{4}\,r\,d$ = *Area* of the *Circle* (becauſe of the Triangle.)

From which way of Notation may it bepreſently proved, *That Circles are to one another as the Squares of their Diameters.*

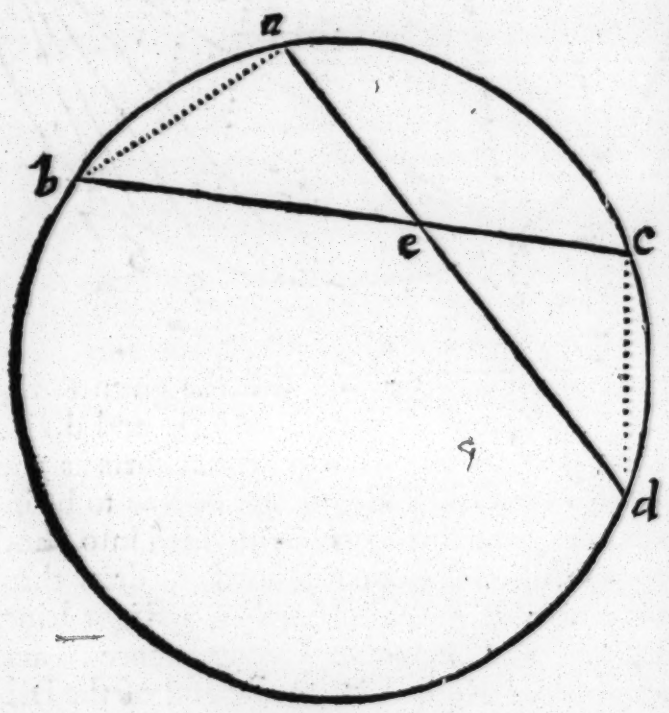
For let the Diameter of one *Circle* be d, and of the other D; then their *Areas* will be $\frac{1}{4}\,r\,d\,d$ and $\frac{1}{4}\,r\,D\,D$, where $\frac{1}{4}\,r$ being a common Efficient or Multiplicator, alters not the *Ratio*; for no doubt $\frac{1}{4}\,r\,d\,d : \frac{1}{4}\,r\,D\,D :: d\,d : D\,D$. *Q. E. D.*

Propoſition I.

The Parts of any two Chords cutting each other in a *Circle*, are Reciprocally Proportional.

That is, $a\,e : e\,b :: e\,c : e\,d$.

Draw $b\,a$ and $c\,d$.



Demonſtration.

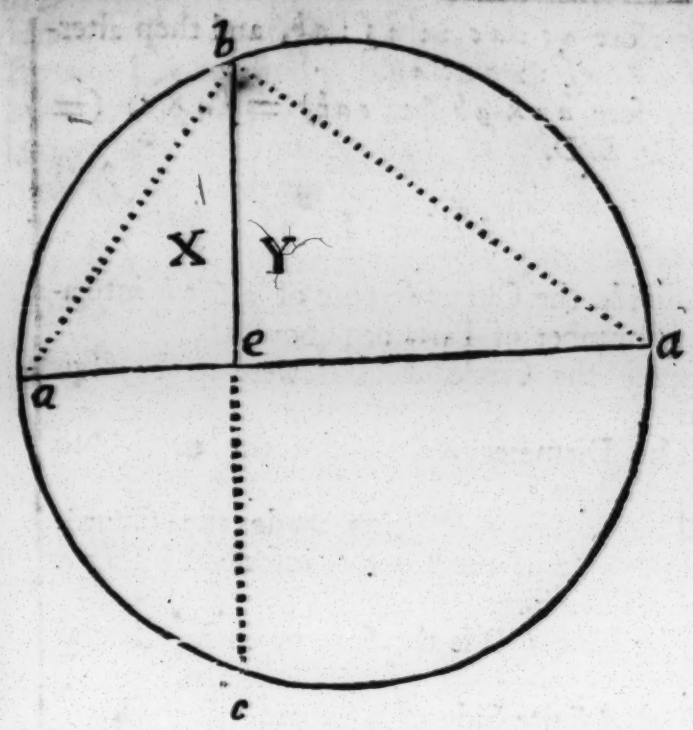
1. The Triangles $a\,e\,b$ and $c\,e\,d$ are ſimilar, becauſe the Angles at e are equal, and $a = c$, becauſe in the ſame Segment; therefore the Sides about the equal Angles are Proportional, that is, $a\,e : a\,b :: e\,c : e\,d$. *Q. E. D.*

Coroll. 1. Hence, if two Chords cut each other, the Product made by the Multiplication of the Parts of one Chord, is always equal to the Product of the Parts of the other:

That is, the □ of the Extreams $a\,e\,d$ = □ of the mean Terms $b\,e\,c$.

Coroll. 2. If one Chord $(a\,d)$ be a Diameter, and the other $(b\,c)$ cut it Perpendicularly; then is $b\,e$, or its equal $e\,c$, a mean Proportional between the Parts of the Diameter $a\,e$ and $e\,d$.

For if you imagine the Lines $a\,b$ and $b\,d$ to be drawn, the Triamgles x and y will be ſimilar, and therefore $a\,e : e\,b :: e\,b : e\,d$. And then the □ $a\,e\,d$ = □ $e\,b$.



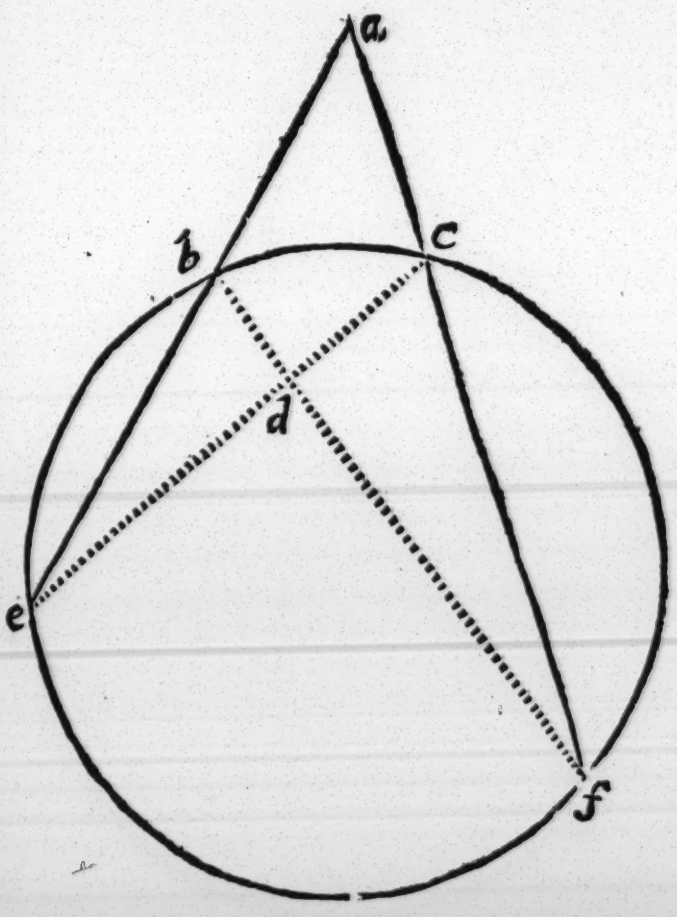
And this may be called *the General Property of the Circle ariſing from the Nature of the Curve.*

And if you call the Diameter of the Circle $2\,r$ (becauſe the *Radius* is $= r$) and conſider it as the Axis of a Conick Section; the Part $a\,e$ in the Figure, will be the *Abſciſſa* or intercepted Ax prope to the Ordinate $b\,e$, wherefore calling, as is uſual, the *Abſciſſa* x, and the Ordinate y, this general Property of the *Circle* will be thus expreſſed $2\,y\,x - x\,x = y\,y$; for $a\,e$ being x, $a\,d$ muſt be $2\,r - x$; and that multiplied by x, gives $2\,r\,x - x\,x$ which muſt be equal to □ $b\,a = y\,y$.

Propoſition II.

If two Lines (as $a\,f$ and $a\,e$) from a Point (a) without a *Circle*, be draw to its *Circumference* within (as to e and f) the Rectangles made by thoſe Lines and their External Parts ſhall be equal.

That is, □ $e\,a\,b$ = □ $f\,a\,c$. Or thoſe Lines are to each other reciprocal in a Proportion of their External Parts, *i. e.* $a\,e : a\,f :: a\,c : a\,b$.



Draw $b\,f$ and $e\,c$: Then are the Triangles $e\,a\,c$ and $a\,b\,f$ equiangular, for the ∟ f = ∟ e being in the ſame Segment, and a is common.

Therefore $ae : ac :: af : ab$, and then alternately $ae : af :: ac : ab$.

Therefore $ae \times ab\ (= eab) = fa \times ac\ (= fac.)$ *Q. E. D.*

Problem I.

To divide the Circumference of a *Circle* into any number of Parts not above 10.

Suppoſe the Circle *ABCD* were to be divided.

1. The Diameter *AC* divides the *Circle* into two equal Parts.

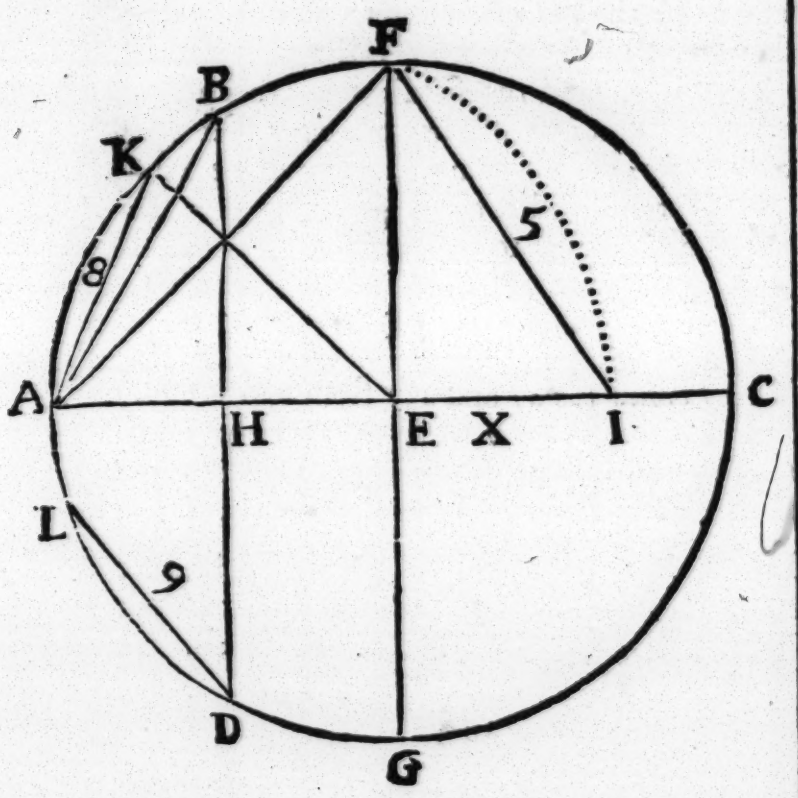
2. The *Radius AE* being made the Chord, *AB* is the Side of the *Hexagon* inſcribed by 15 *e.* 4. *Eucl.* Therefore.

3. The Line *BD* is the Side or an Equilateral Triangle.

4. And *AF* the Side of a Square inſcribed.

5. With the Diſtance *HF* deſcribe the Ark *FI*; the Right Line *FI* is the Side of a *Pantagon* inſcribed. 10 *e.* 13. *Eucl.*

6. The Line $BH = DH$ is the Side of the *Heptagon.*



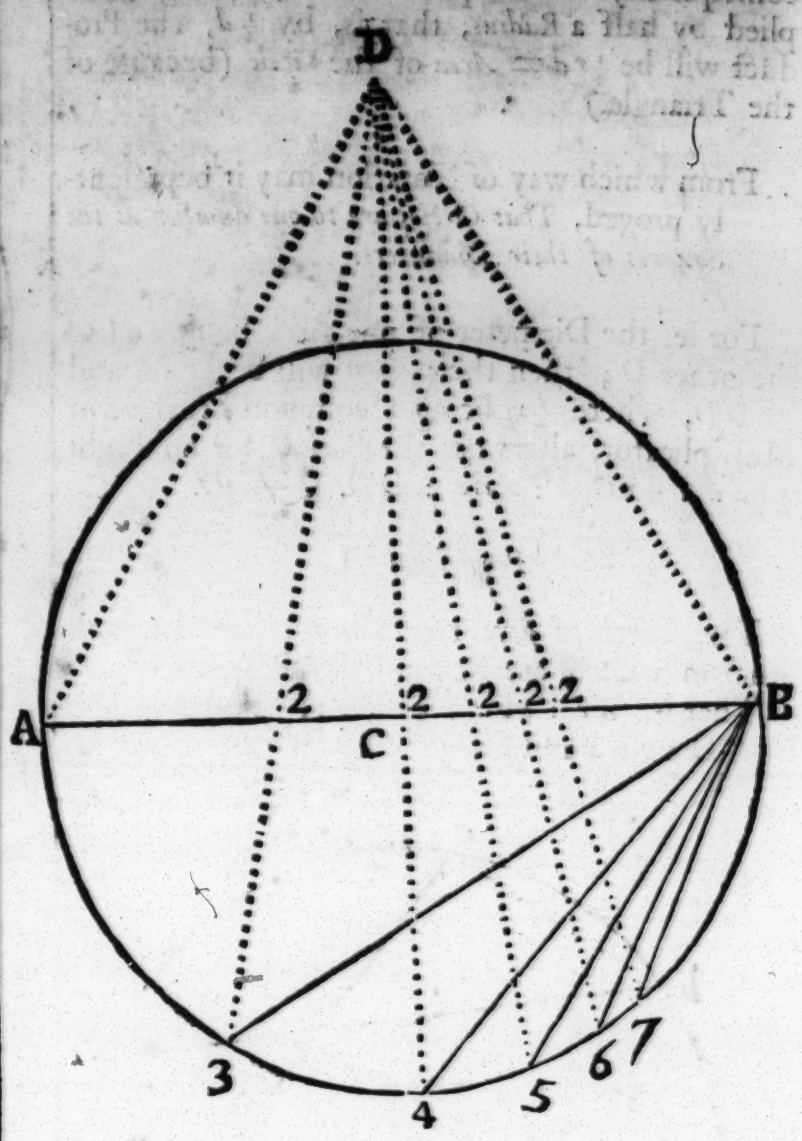
7. The Line *AK* (which is the Chord of half the Ark *AF*) is the Side of an *Octagon* inſcribed.

8. The Line *DL* (which is $\frac{1}{3}$ of the Arch *BAD*) is the Side of a *Nonagon*.

9. The Line *EI* is the Side of a *Decagon.*

Problem II.

To divide the Circumference of a *Circle* into any number of equal Parts.



Upon the Diameter *AB* (of the given *Circle*) make an Equilateral Triangle *ABD*, and divide the Diameter *AB* into as many equal Parts as you deſign there ſhall be Sides of the *Polygon* to be inſcribed, or as the *Circle* is to be divided into; and omitting two, *e. g.* from *B* toward *A*, draw thro' the beginning of the third from *D*, a Right Line, to the oppoſite Concave Circumference, and thence another Right-Line to the end of the Diameter *B*.

Thus, *e. g.* to Divide the Circumference into three equal Parts, Divide the Diameter *AB* into three equal Parts; and then omitting two of them through the beginning of the third, or thro' *B* 2 draw the Right Line *D* 3; and from 3 the Line 3 *B*, which laſt will be the Side of the Triangle to be inſcribed; ſo 4 *B* will be the Side of a Square, *B* 5 the Side of a *Pantagon*, *B* 7 of an *Heptagon*, &c.

The Plane of any Circle may be conſidered as made up of an infinite number of Concentrical Peripheries, encreaſing from the Center in Arithmetical Proportion; wherefore a Rank of ſuch Peripheries will be to a like Number equal to the greateſt, as 1 to 2. Wherefore the *Area* of a *Circle* is to the *Surface* of a Cylinder, whoſe Height is equal to the *Radius*, and its *Baſe* that *Circle*, as 1 to 2. And conſequently, if the Height of the Cylinder had been equal to the Diameter of the *Circle* (which is the caſe of the Cylinder circumſcribing a Sphere) the Curve Surface of the Cylinder would be equal to 4 times the Baſe of it (*i. e.*) the Surface of a Sphere is quadruple to the *Area* of one of its great Circle: for the Surface of the Sphere is equal to the Gurved Surface of ſuch a Cylinder; as is proved elſewhere. See *Cylinder.*

The Proportion of the Periphery of a *Circle* to its Diameter is leſs than $3\frac{10}{70}$, and greater than $3\frac{10}{71}$ to 1.

The *Area* of any *Circle* to the Square of its Dia-

Diameter :: is as $\frac{1}{4}$ of the Periphery to the ſaid Diameter, as is proved under *Cylinder*.

The *Area* of any *Circle* is incommenſurable to the Square of the Diameter; and ſo is alſo the Periphery to the Diameter: See *Sturmius*'s *Mathef. Enucleat. Prop.* 43.

CIRCLE *Equant*, in the *Ptolemaick* Aſtronomy, is a Circle deſcrib'd on the Center of the *Equant*; its chief uſe is to find the Variation of the firſt Inequality.

CIRCLE *of perpetual Apparition*, is one of the leſſer *Circles* parallel to the *Equator*, being deſcribed by any Point of the Celeſtial Sphere which toucheth the Northern Point of the *Horizon*, and carried about with the Diurnal Motion. All the Stars that are included within this *Circle* never ſet, but are always viſible above the *Horizon*: And the

CIRCLE *of perpetual Occultation*, is another *Circle* at a like diſtance from the *Equator*, and contains all thoſe Stars which never appear in our Hemiſphere. But the Stars ſituated between theſe *Circles* inceſſantly riſe and ſet at certain times.

CIRCLES *of Altitude*: See *Almicanters*.

CIRCLE *of Declination on the Globe*; So ſome Writers call the Meridians on which the *Declination* or Diſtance from the *Equator* of any Planet or Star is accounted.

CIRCLES *of Longitude*, on the Globe, are great *Circles* paſſing thro' the Star and the Pole of the Ecliptick, where they determine the Star's Longitude, reckon'd from the beginning of *Aries*. On theſe Circles are accounted the Latitudes of the Stars.

CIRCLES *of Poſition*, are *Circles* paſſing by the common Interſections of the *Horizon* and *Meridian*, and thro' any Degree of the Ecliptick, or the Center of any Star, or other Point in the *Heavens*; and are uſed for the finding out the Situation or Poſition of any Star, *&c.*

CIRCUITY *of Action* (in Law) ſignifies a longer courſe of proceeding than is needful, to recover the thing ſued for.

CIRCULAR *Numbers*, or *Spherical ones*, according to ſome, are ſuch whoſe Powers terminate in the Root themſelves.

As for Inſtance, 5 and 6, all whoſe Powers do end in 5 and 6, as the Square of 5 is 25, the Square of 6 is 36, *&c.*

CIRCULATE, *Circulation*, in Chymiſtry, ſignifies the giving a Motion to Liquors contained in a *double Veſſel* (that is, when the Necks of two Veſſels are excellently well luted one into another) excited by Fire and cauſing the Vapours to aſcend and deſcend to and fro; which Operation is intended either to *ſubtilize* the Liquors, or elſe to open ſome hard Body that is mingled with them. The circulating Veſſel is ſometimes called a *Pelicane*, or a blind *Alembick*.

CIRCULATION *of the Blood*, is that Motion of it which is produced by the continual Reciprocation of the Pulſe; whereby there is a conſtant Expulſion of the Blood from the Heart into the Arteries, and as conſtant and continual an Influx of Blood into it out of the *Cava*; and ſeeing the *Vena Cava*, from whence the Supply comes, is never drawn dry; nor on the other Hand, the Arteries which receive the Blood from the Heart continually, are unduly ſwell'd with it; it muſt neceſſarily follow (as our great *Harvey* firſt plainly proved) that this Motion proceeds circularly, and that the Blood is continually driven out of the Heart into the Arteries, and out of theſe into the Parts to be nouriſh'd; from whence it is reſorbed by the Capillary Veins, which carry it into the larger, and theſe into the *Cava*, from whence it returns to the Heart again. The Reaſons enforcing the Neceſſity of a *Circulation* of the Blood are theſe.

1. The great Quantity of Blood that is driven out of the Heart into the Arteries at every Pulſe. For tho' the Ancients who knew not this *Circulation*, imagin'd, that only a drop or two was expell'd by every *Syſtole*, which they were neceſſitated to ſuppoſe, to avoid the great Diſtention that the Arteries muſt be liable to, if any conſiderable Quantity iſſued into them; yet it is certain and demonſtrable, that there muſt needs an Ounce, or more, be driven into them each time: For (taking it for granted, that there is no other way for any Liquor to paſs from the Stomach to the Kidneys but thro' the Heart, along with the Blood) ſeeing if ſome Men at ſome times drink three Pints of Drink, they ſhall piſs it out again in half an Hour, yea more of *Tunbridge* Water in that ſpace: And ſeeing, *Secondly*, that there is commonly as much Blood as *Serum*, that flows to the Kidneys (the Blood returning back by the Emulgent Veins) it is clear, that by the two Emulgents (which are none of the largeſt Arteries) there muſt paſs in half an Hour 6 Pounds of Liquor, all which muſt come from the Heart; and how much more then may we conceive to be driven thro' all the other Arteries that run thro' the whole Body? This is moſt accurately evinced by Dr. *Lower*'s Experiment, which is this; "I cut aſunder *(ſays he)* "both the *Cervical Arteries* in a large Dog, and at "the ſame time thro' an Hole made in the left "ſide of his Breaſt over-againſt the Heart, I com-"preſs'd the Trunk of the *Aorta* below the Heart "with my Finger, to hinder any Blood from de-"ſcending by it; and, laſtly, I took care alſo to "ſtraiten the *Brachial Arteries* under the *Axillæ*, by "which means almoſt all the Blood was driven "out of the Heart thro' the *Cervicals* (beſides that "which was ſent into the *Vertebrals)* and which is "wonderful to be related, within the twentieth "part of an Hour the whole Maſs iſſued out; ſo "that it is not to be denied, but that all paſſes "thro' the Heart in that ſpace. And tho' it may be granted, that amidſt ſuch Wounds and Tortures the Heart does beat ſomewhat quicker than at other times; yea the ſame thing is partly evident from Wounds in the Limbs when ſome notable Artery is cut aſunder; for 'tis ſtrange in how ſmall a time a Man will bleed to Death even at that one great Artery: Yet we may give a gueſs how much Blood is ſent out of every Pulſe, even from ordinary opening of one Vein in the Arm, from whence a notable quantity of Blood will iſſue in a ſhort time, how much then may we ſuppoſe would flow out of all the Veins, if they were open'd at one time? Seeing then 'tis evident ſo great ſuch a quantity of Blood is expell'd out of the Heart at every *Syſtole*, and that for all that the Arteries are not unduly diſtended, nor any part ſwell'd by it, neither yet the *Cava* and other Veins emptied; 'tis certain that the Blood that is driven into the Arteries flows back to the Heart by the Veins in a conſtant *Circulation*.

2. A ſecond Argument to prove it, may be taken from the Valves in the Veins, which are ſo framed that Blood may freely flow thro' them out of the leſſer Veins into the greater (and ſo into the

Cava) but not on the contrary, out of the greater into the leſs. Yea, if one blow into the *Cava* thro' a Pipe, there will no Wind paſs into the ſmaller Veins; but on the contrary, if you blow up the leſſer Veins, the Wind will readily paſs to the larger, and ſo to the *Cava*.

3. And laſtly, the ſame thing is moſt clear by the Ligature in Blood-letting: For whether you let Blood in the Arm or Foot, you always tie the Fillet above where you intend to make the Orifice, and then the Vein below the Ligature will preſently fill and grow tumid, but above it will fall and almoſt diſappear; which muſt needs be from hence, for that the Blood being driven along the Arteries towards the extream parts, returns by the Veins, and aſcends upwards, which coming to the Ligature, and being ſtop'd there, ſwells the Vein below the Ligature, and ſpurts out as ſoon as the Orifice is made; but when the Fillet is looſed again, the Blood flows no longer out thereat, but holds on its wonted Channel, the Vein and the Orifice cloſes up again.

Having ſufficiently demonſtrated the Circulation of the Blood, we will ſhew two things farther; *Firſt*, How the Blood paſſes out of the Arteries into the Veins; and, *Secondly*, in what time it may be ſuppoſed to paſs thro' the Heart in its ordinary Circulation.

As to the *firſt*, it was the Opinion of *Riolanus*, that the Blood circulated only thro' the larger Veſſels, by Anaſtomoſis or Inoſculation of the Veins with the Arteries; and that that which run into the ſmaller, was all ſpent on the Nutrition of the Parts. But it is clear, that there muſt be a *Circulation* even in the ſmalleſt, from the great quantity of Blood that will flow out of the leaſt Artery in the Hand or Foot when it is cut; which it were very abſurd to imagine to be all ſpent on the nouriſhment of the reſpective Parts. Now there are but two ways whereby the Blood can be ſuppoſed to paſs out of the Arteries into the Veins, *viz.* either by the former's being continued to, or opening into the latter by Inoſculation, or elſe by the Capillary Arteries letting out their Blood into the Pores of the Subſtance of the Parts, on whoſe Nutrition part is ſpent, and the Remainder imbibed by the gaping Mouths of the Capillary Veins. That it is neceſſary to admit of this latter way, is evident, becauſe if part of the Arterial Blood did not iſſue into the Subſtance of the Parts, they could not be nouriſh'd by it; for while it is in the Veſſels, it may add Warmth indeed to the Parts thro' which it flows, but cannot nouriſh them, ſeeing even the Veſſels themſelves are not nouriſh'd by that Stream of Blood that glides along their Cavity, but by Capillaries running thro' their Coats; and if the Blood be driven into the Subſtance of the Parts, and that in a greater quantity than ſuffices for their Nouriſhment (as was juſt now ſhewn that it is) what is ſuperfluous muſt needs enter the Mouths of the Capillary Veins, from which it goes forward to the larger, and ſo to the Heart: But ſeeing this way of transfuſing the Blood thro' the Subſtance of the Parts, has ſeem'd to ſome not to anſwer to that haſty Circulation of it as above demonſtrated; they have thought it neceſſary alſo to admit of the *former* way, namely, Anaſtomoſes, by which the Veins are continued to the Arteries, and that not only in their larger Branches (as that notable one of the Splenick Artery with the Splenick Vein) but alſo in their ſmaller Twigs in the extreme Parts. But we muſt conſider, that in a living Body the ſolid Parts are infinitely more porous and permeable than in a dead; ſo that tho' the Anatomiſts find their Subſtance ſo denſe and cloſe, as to make it ſeem almoſt impoſſible they ſhould permit ſo quick a paſſage to the Blood thro' them, yet they ſhould rather believe it, than ſuppoſe ſuch Anaſtomoſes as they cannot diſcover (tho' it were not difficult to find them out if they had an Exiſtence;) for abating the ſingle one of the Splenick Artery with the *Ramus Splenicus* of the *Porta* (and perhaps ſome of the *Arteria* with the *Vena Pulmonaris* in the Lungs) none of the lateſt moſt accurate Anatomiſts have been able to find out any. And as for that mentioned, it ſeems rather to be of an Artery with an Artery (ſuch as are frequent in ſeveral Parts of the Body, as are alſo of one Vein with another) than of an Artery with a Vein; for the *Porta* from which this *Ramus* is propagated, is generally reputed rather an Artery than a Vein.

And, *Secondly*, as to the Space of Time in which the whole Maſs of Blood may ordinarily circulate thro' the Heart, it is probably much ſhorter than many have imagin'd. For ſuppoſing that the Heart makes 2000 Pulſes an Hour (which is the leaſt Number any ſpoke of, and ſome have told twice as many) and that at every Pulſe there is expelled an Ounce of Blood (which we may well ſuppoſe, ſeeing the Ventricles are wide enough to contain 2 Ounces; and that it is probable alſo, both that they are filled near full in the *Diaſtole*, and that they are near, if not quite emptied by the ſtrong Conſtriction of the Heart in the *Syſtole*) ſeeing the whole Maſs uſually exceeds not four and twenty Pound, it will be circulated ſix or ſeven times over thro' the Heart in the Space of an Hour. And by ſo much the oftner, by how much the Blood comes ſhort of the ſuppoſed Quantity, or the Pulſe either naturally, or by a Fever, Spirituous Liquors, or violent Motion is rendred more frequent. By which quick Motion the Blood it ſelf is kept from Coagulation and Putrefaction, and the Parts are cheriſh'd with vital Heat, which Heat of the Parts is much according to the Slowneſs or Rapidneſs of the Circulation: So when we ſit ſtill, and the Pulſe is ſlow or rare, we grow cold; but when upon running, or any other violent Exerciſe the Pulſe becomes more frequent and quick, we become hot.

CIRCULATORIUM, is a Glaſs Veſſel, wherein the Liquor infuſed by its aſcending and deſcending, rolls about as it were in a Circle: There are ſeveral ſorts of theſe Veſſels, but two eſpecially of moment and uſe, that called *Pelicanus*, and the other *Diota*: Which ſee; as alſo *Double Veſſel*.

CIRCULUS, is a round Inſtrument made of Iron, uſed by Chymiſts for the cutting off the Necks of Glaſs Veſſels; which is perform'd thus; The Inſtrument being heated is apply'd to the Glaſs Veſſel, and is there continued till it grow hot; then with ſome drops of cold Water, or a cold Blaſt upon it, it flies in pieces. This way they cut off the Necks of Retorts or Cucurbits.

CIRCUMAGENTES *Muſculi*, are certain oblique Muſcles of the Eyes, ſo called from their helping to wind and turn the Eyes round about.

CIRCUMAMBIENT: See *Ambient*.

CIRCUMFERENCE, is the outermoſt bounding Line of any Plane Figure, but it more properly belongs to the Perimeter of a Circle; as is apparent

parent from the Geneſis of a Circle. See *Circle.*

CIRCUMFERENTER, and Inſtrument uſed in Surveying, being the ſame with the *Theodolite*: Which ſee.

CIRCUMFLEX *Accent*, in Grammar, is compoſed both of the *Acute* and the *Grave*, and it's expreſſed thus (^).

CIRCUMGYRATION, is the wheeling Motion of any Body round a Center.

CIRCUM-POLAR *Stars*, are ſuch Stars as being pretty near our *North Pole*, do move round it, and in our Latitude never ſet, or go below the *Horizon.*

A TABLE of Circum-Polar Stars.

Magnitude.	Names.	Right Aſcenſion in Time under the Pole Star. H. M. S.	Difference in Time between the Pole-Star and the Pole. H. M. S.	Azimuth under the Pole-Star D. M. S.	Coaſtline.
2	Upper follower in □	0 03 52	0 04 26	0 37 12	E
3	Penult in Dragon's Tail.	00 20 1	0 03 15	0 19 12	E
2	Cor Caroli	00 36 4	0 00 03	0 00 54	E
2	Alioth.	00 39 25	0 00 14	0 02 02	W
2	Middle Great Bear's Tail	01 07 02	0 03 44	0 33 00	W
2	Tip of his Tail	01 28 56	0 05 49	0 57 00	W
2	Antepenult. in Dr. Tail	01 47 40	0 10 58	1 16 48	W
2	Upper Guard of the little Bear	02 26 05	0 24 10	1 55 48	W
3	Lower Guard	02 57 15	0 26 50	2 21 36	W
3	Draco, 27. in *Tycho*'s Catalogue.	02 59 49	0 18 0	2 27 00	W
3	——26——	03 35 17	0 21 04	2 55 48	W
3	——25——	03 54 54	0 24 39	3 10 12	W
3	——24——	04 36 43	0 30 49	3 34 48	W
3	——20——	03 58 34	0 30 43	3 12 36	W
3	First in his Head	04 59 30	0 23 4	3 45 00	W
2	Bright one in the Head	5 25 01	0 24 11	3 53 24	W
1	Lucida Lydra	6 05 34	0 20 30	4 00 36	W
3	*N.* in *Draco*'s upper Turn	06 37 01	0 35 44	4 01 12	W
3	South in its upper Turn	07 11 22	0 37 56	3 56 24	W
3	*Swan*'s upper Wing	07 13 26	0 21 45	3 56 24	W
3	Star in her Breaſt	07 51 26	0 19 20	3 45 00	W
2	—in her Tail	08 10 30	0 19 59	3 37 12	W
2	*Cepheus*'s right Shoulder	08 45 35	0 25 02	3 18 36	W
3	——Girdle	08 53 30	0 30 44	3 13 48	W
3	——Knee	11 10 00	0 17 59	2 25 48	W
3	*Caſſiopea*'s Chair	11 46 07	0 05 54	0 51 00	W
3	——Breaſt	12 20 48	0 01 50	0 16 48	W
2	Star in the Hip	12 37 50	0 00 02	0 00 10	W
2	—in her Knee	13 08 45	0 03 41	0 31 12	E
3	—in her Leg	13 39 38	0 07 53	1 01 12	E
2	Foot of *Andromeda*	13 50 37	0 06 19	1 12 00	E
3	*Meduſa*'s Head	14 59 14	0 11 45	2 13 48	E
2	Bright Star in his Side	15 14 55	0 14 2[illegible]	2 26 24	E
	Capella in *Auriga*	17 13 55	0 20 49	3 40 48	E
2	—in his right Shoulder	17 58 07	0 21 55	3 55 12	E
3	*N.* in Gr. Bear's right Foot	20 50 49	0 20 52	3 28 12	E

The Table *continued.*

		H. M. S.	H M. S.	D. M. S	
3	*N.* in the lame Foot	20 55 23	0 20 13	3 21 00	E
3	——in the left Knee	21 24 15	0 19 57	3 07 12	E
2	Lower Leader in the □	22 54 50	0 12 57	1 50 24	E
2	Upper Leader----	22 57 59	0 14 20	1 47 24	E
3	Laſt in *Draco*'s Tail	23 24 13	0 13 36	1 20 24	E
2	Gr. Bear's left Thigh	23 43 36	0 06 38	0 59 24	E

N. B. □ *ſtands for* 4 *Stars in* Charles's Wain.

The Uſe of this Table.

1. *For the Hour of the Night.*

In a *North* Widow (or any convenient Place) hang up a fine String with a weighty Plummet, and placing your Eye at ſome diſtance (backward) mark when any Star in the Table comes to your String, ſo that it cut both it and the *Pole-Star* together; then from *that Star*'s *Right Aſcenſion* (in the Table) take the *Right Aſcenſion of the Sun* (adding 24 Hours to the Star's (if need be) the Remainder is the exact Time of the Night.

N. B. The Stars mark'd with *W.* in the laſt Column, come under the Pole after they have been in the Vertical of the *Pole-Star*, when they are *Weſt* of the Pole.

2. *To find a true Meridian.*

Place a ſecond Line and Plummet behind the former (which was for the Hour) and having by the former obſerved when any Star in the Table comes to a Perpendicular with the *Pole-Star*, then count (by a Pendulum Clock or Watch) the difference in Time expreſſed in the ſecond Column, and belonging to the Star you obſerve; then at the Moment when the Account is up, bring the two Strings and the Star all in a Right-Line, and then your two Strings are in the *Meridian.*

The two laſt Columns ſerve for the ſame uſe.

For when any of theſe Stars are under the *Pole-Star*, making the two Strings cut both the *Pole-Star* and the other; theſe two Strings hang ſo far out of the *Meridian Line*, as is the *Azimuth* expreſs'd in the *Table*; which *Azimuth* is ſhewn to be *Eaſt* or *Weſt*, as in the laſt Column.

N. B. There are 3 Stars in the Table, which being under the *Pole-Star*, are inſenſibly near the Meridian, *viz. Caſſiopeia*'s *Hip*, *Cor Caroli*, and *Alioth*; ſo that when they are under the *Pole-Star*, a Meridian may be found (very near) by one Thread.

Obſerve alſo, That there is juſt four Hours (wanting only one Second) between the coming of *Cor Caroli* and the 24th Star of *Draco* (in *Tycho*'s Catalogue) under the *Pole-Star.*

CIRCUMSCRIBED; in Geometry a Figure is ſaid to be *Circumſcribed*, when either the Angles, Sides or Planes of the outward Figure, touch all the Angles of the Figure that is inſcribed.

CIRCUMSCRIPTION, in Natnral Philoſophy, is the Termination or certain Bounds or Limits of any Natural Body. They make it either *Internal*, which belongs to the Eſſence and Quantity of every Body, whereby it hath a certain determinate Extenſion, Bounds and Figure: Or *External*, which they call alſo *Local*, becauſe it is referred to the Place within which any Body is confined; for a Body is ſaid to be *Circumſcribed Locally*, or to be in a Place *Circumſcriptively*, when it hath a certain and determinate *Ubi* or Place, in reſpect of the *Circum-Ambient* Bodies.

CIRCUMVALLATION, or *the Line of Circumvallation*, in Fortification, is a Trench bordered with a Parapet, dug round about the Beſieger's Camp, within Cannon-ſhot of the Place, to hinder the Relief of the Beſieged, and to ſtop Deſerters: It is uſually flank'd at the Diſtance of a Musket-ſhot with *Redoubts* and other ſmall Works, or with Field Forts raiſed upon the moſt eminent Poſts: Care muſt be taken never to draw a *Line of Circumvallation* at the Bottom of a riſing Ground, leſt the Enemy, having ſeized on the Station, ſhould plant Cannon there, and by that Means command the Line. This Line is uſually about ſeven Foot deep, and twelve broad.

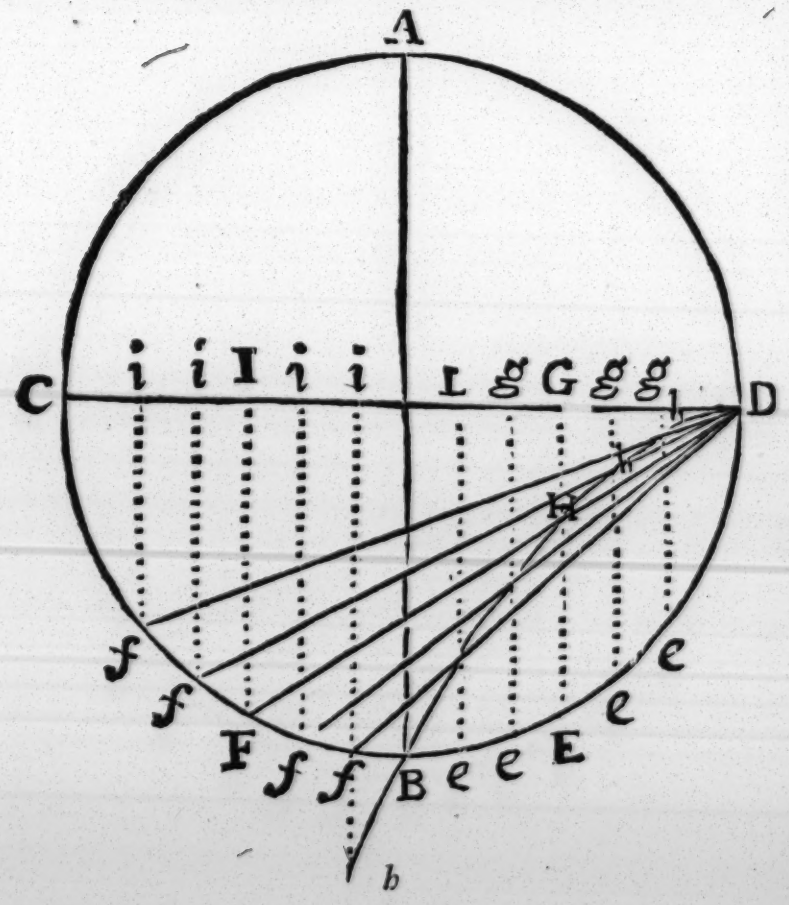
CIRRI, in Botany, are thoſe fine Strings or Hairs by which ſome Plants faſten themſelves in order to their Support in their creeping, as Ivy, *&c.*

CIRSOCELE, is a Swelling of the preparing Veſſels about the Teſticles, ſo that they ſometimes look like a Third Teſticle. *Blanchard.*

CIRCOS or *Varix*, is a Dilatation and Swelling of the Veins, crooking or winding, and ariſing in one or more Parts of the Body, inſomuch as the Veins threaten a Rupture. *Blanchard.*

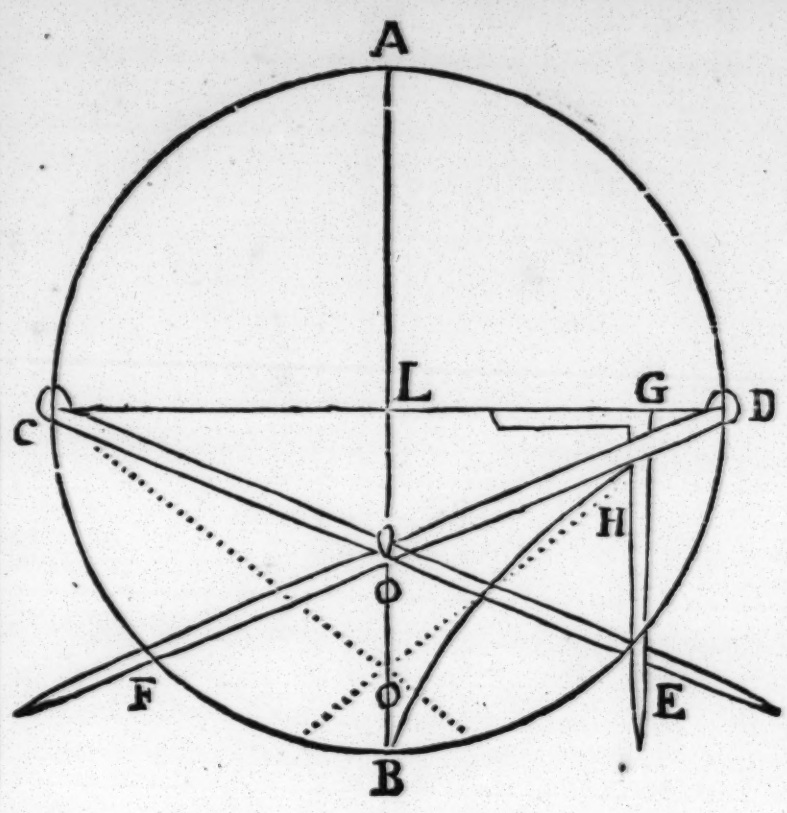
CISSOID, the Name of a Curve Line invented by *Diocles*, and thus produced or generated.

Let there be two Diameters of a Circle *A B* and *C D* cutting one another at Right Angles.



From *B* take equal Arks, as *Be* and *Bf* or *B E* and *B F*; and then from *e* or *E*, *&c.* erect the Perpendiculars *e g* or *Eg*. Then draw the Tranſverſe Lines *D f* and *D F*, *&c.* cutting thoſe Perpendiculars in *H* and *h*, *&c.* by which Means you may find as many Points as you pleaſe in thoſe Perpendiculars, through which to draw the Curve *D h Ah B b* (which may be continued below the Circle if you pleaſe.) And this is called the *Ciſſoid.*

A Way to deſcribe which Curve Organically the Second Figure repreſents.



Where two Rulers being faſtened at *C* and *D*, and moveable upon thoſe Points, interſect one another, as at *O*, or in *B*; and then a Square, as *L G E*, being ſo placed that *G E* and *L B* are coincident; as alſo the three Points *O*, *B* and *E*, if the two Rulers be moved upwards, ſo then the interſecting Point *O* begins to aſcend, and the Square at the ſame time moves upwards alſo, with its upper Leg *L G* always parallel to *C D*, the Interſection of the Point *H*, or Angle of the Square with the Rule *F D* ſhall, in its Aſcent, deſcribe the Curve *B H D*, which is the true *Ciſſoid.*

Propoſition.

If from any Point of the Diameter C D *(See* Fig. I. *above) as from* G, *you draw a Perpendicular, as* G E, *through the* Ciſſoid, *the Lines* C G, G E, G D *and* G H *will be continually proportionable.*

Demonſtration.

The Lines *G E* and *I F* being Right Sines, and alſo *G D* and *I C* being verſed Sines of equal Arks, will be equal; wherefore becauſe of the Circle, *D I : I F* (*i. e. C G : G E*) *: : I F : I C*; *i, e. G E : G D.* But by Similar Triangles, *D G : G H; : D I : I F* (that is, as *C G : G E*;) ſo is *C G, G E : : G E, G D : : G D, G H*; that is, thoſe Lines are all in continual Proportion. *Q. E. D.*

How by the Help of his Curve to find two mean Proportionals; ſee *Sturm. Math. Enucleat. Prop.* 21. *of Book* 2. *and Conſ.* 1.

CITADEL, is a Fort of 4, 5 or 6 Baſtions, built ſomewhere near a City, that it may command it in Caſe of a Rebellion; ſo that the City is not fortify'd on that Part againſt the *Citadel*, tho' the *Citadel* is againſt the City. The moſt uſual Form

Form for *Citadels* is that of a Pentagon, a Square being too weak, and an Hexagon too big.

CITTA, or *Pica*, is a depraved Appetite, when People long for those things which are not fit to be, nor never are eat, as Lime, Coals, Shells, Cloth, Hides, Sand, *&c.* *Blanchard.*

CIVIL-DAY: See *Day.*

CIVIL-LAW, is properly the peculiar Law of each State, Country or City: But what we usually mean by the *Civil-Law*, is a Body of Laws composed out of the best of the *Roman* and *Grecian* Laws, and which was in the main received and observed throughout all the *Roman* Dominions for above Twelve Hundred Years. The *Romans* took the first Grounds of this Law from the Twelve Tables, which were Abridgements of the Laws of *Solon* at *Athens*, and of other Cities in *Greece*, famous for Knowledge and Wisdom, to which they added their own ancient Customs of the City of *Rome*. These written Laws were subject to various Interpretations, whence Controversies arising, they were determined by the Judgment of the Learned; and these Determinations were what they first called *Jus Civile*, after their several *Cases* were composed, which, lest the People should make them at pleasure, were fixed certain and solemn; and this Part of their Law they called *Actiones Juris*, *Cases at Law*: And by the bye, the *Romans* had also their *Plebiscita*, which were Laws made by the Commons without the Authority of the Senate. The *Jus Honorarium*, which was an Edict of some particular Magistrate; the *Senatus Consultum*, which was an Ordinance made by the sole Authority of the Senate; and the *Principalis Constitutio*, which was Enacted by the Prince or Emperor. These Laws grew by degrees to a vast number of Volumes; and therefore the Emperor *Justinian* commanded his Chancellor *Tribonian*, with the Assistance of the other Eminent Lawyers of that Time, to reduce it to a perfect Body. *Suidas*, and some others reflect on *Tribonian*'s Learning and Integrity in this great Work; but no one can excuse his Haste and want of Care, for he did that in Three Years time, which the Emperor saith (in the Constitutions) he could not have imagin'd would be effected in less than Ten. For this Law had now been in practce above 1000 Years, and the Volumes of it were swelled to the prodigious Number of 2000, which 'twas impossible for *Tribonian* to read over in that time, much less to compare and digest them well. However this Body of Law is called the *Digests* or *Pandects*.

This Body of the *Civil-Law* is divided into three Volumes, which are still remaining; *viz.* the *Pandects* or *Digests*, the *Code*, and the *Institutes*: Which see. Afterwards to these were added the *Authenticks*, or *Constitutions of Justinian*, called also *Novellæ*: Which see, also under the Word *Authenticks.*

CIVIL-YEAR, is the Legal Year, or Annual Account of Time, which every Government appoints to be used within its own Dominions; and 'tis so called in contradistinction to the *Natural Year*, which is measured exactly by the Revolution of the Heavenly Bodies.

CLAMEA *admittenda in Itinere Atturnatum*, is a Writ whereby the King commands the Justices in *Eyre* to admit of one's Claim by *Attorney* that is employed in the King's Service, and cannot come in his own Person.

CLAMPS, in a Ship, are those thick Timbers which lie fore and aft, under the Beams of the first *Orlope*, bearing them up at either End; and are the same that the *Risings* are to the *Deck.*

CLARETUM, amongst the foreign Writers of Pharmacy, is an Aromatick Wine, impregnated with an Infusion, and sweetned with Sugar; it is otherwise called *Vinum Hippocraticum*, *Hippocras Wine*; also *medicated Wine*: It is so called because it's percolated and purified by a Wine Sack or Bag, through which it is drained from its Dregs. And this Bag is called *Manica Hippocratis.*

CLARIFICATION, is the way to make Juices or thick Decoctions become clearer and finer, which is done three ways; by letting the Dregs subside of themselves, by Fermentation, or by the Addition of Vinegar, White of an Egg, or Milk, *&c.* either to precipitate the Dregs to the Bottom, or gather them in a Skum.

CLARICATIO, so the *Civilians* call *Arestо facto super bonis mercatorium alienigenorum*: Which see.

CLARION, a bearing in Heraldry of the following Figure; *Ruby* 3 *Clarions Topaz*, being the Arms of the Earl of *Bath*, by the Name of *Greenvile*. *Guillim* takes these *Clarions* to be a kind of old fashioned Trumpet; but others think they rather represent the *Rudder* of a Ship; or as some say, the *Rest* for a *Lance.*

CLASPERS, the twisted Ligaments or Threads with which certain Herbs or Shrubs, such as *Briony* and *Vines* takes hold of Trees or Plants that grow about them.

These *Claspers* are of a Compound Nature, between that of a Root and a Trunk. Their Use is sometimes for *Support* only, as in the *Claspers* of *Vines*, *Briony*, &c. whose Branches being long, slender and fragile, would fall by their own and their Fruits Weight; but these *Claspers* taking hold of any thing which is at Hand (which they do by a Natural Circumvolution which they have, those of *Briony* have a Retrograde Motion about every third Circle in the Form of a double Clasp, so that if they miss one way, they may catch the other). Sometimes the Use of *Claspers* is also for *Supply*, as in the *Trunk Roots* of *Ivy*; which being a Plant that mounts very high, and being of a closer and more compact Substance than that of *Vines*, the Sap would not be sufficiently supplied to the upper Sprouts, unless these assisted the Mother Root; but these serve also for Support too. Sometimes they serve for *Stabiliment*, *Propagation*, *and Shade*; for the *first* of these serve the *Claspers* of Cucumbers; for the *second*, those, or rather the *Trunk Roots of* Chamæmil; and for all *three*, the Trunk Roots of Strawberries, which mightily seem to delight in Shade.

CLAUDENT *Muscles*, otherwise called *Semicircular*, are those that shut the Eye-lids; being placed between the *Inner Membrane* of that Part, and the *Fleshy Membrane*. These two *Muscles* being cantracted, shut up the Eye, the greater drawing down the upper Eye-lid, and the less pulling up the lower, which falls down again through its own Gravity, and the Relaxation of its Fibres.

CLAVICULÆ, or *Channel Bones*, are two little ones which are situated at the Basis of the Neck above the Breast, on each Side one: They

are

are pretty long and ſmall, and at one End are joined to the Production of the *Scapulæ*, called *Acromion*, by a peculiar Arciculation, which they call *Synchondroſis*; at the other End they are joined to the upper Part of the *Sternum*, by an *Articulation* which they call *Arthrodia*. They are in the Shape of a long (*ſ*) for the Paſſage of the Veſſels which paſs under them, and to facilitate the Motion of the Arms: Their Uſe is to ſuſtain the *Scapulæ*, to which the Arms are articulated; and becauſe the Pectoral Muſcle which pulls the Arm a-croſs the Breaſt, is inſerted near the upper End of the Shoulder-Bone; if the *Claviculæ* did not keep the *Scapulæ* to which the Head of the *Humerus* is always joined at an equal Diſtance from the *Sternum*, the upper Part of the Arm only, and not the Hand, muſt have been pulled forwards.

CLAVUS, is a Pain in a ſmall Part of the Head, commonly above the Eye in the Eye-brow, and ſeems as if that Part of the Head were bor'd through with a little *Augur* or Whimble. Dr. *Sydenham* calls ſuch a Pain in the Top of the Head of Hyſterical Perſons, *Clavus Hyſtericus*.

CLAUSUM *Fregit*, ſignifies as much as an Action of Treſpaſs; and is ſo called, becauſe in the Writ ſuch a one is ſummoned to anſwer, *Quare clauſum fregit*? that is, Why he did ſuch a Treſpaſs?

CLAYES or *Watles*, a Term in Fortification: See *Hurdles*.

CLEAR *Viſion*: See *Viſion*.

CLEAT, is a Piece of Wood faſtned to the Yard-Arm of a Ship, to keep the Ropes from ſlipping off the Yard.

CLECHE, a Term in Heraldry for any Ordinary being pierced through with the ſame Figure, as here. He beareth *Gules*, a *Saltier Cleche*, that is, one pierced through with another.

CLEIDION, the ſame with *Clavicula*.

CLEPSYDRA, an Inſtrument anciently uſed, eſpecially among the *Egyptians*, to meaſure Time, by the running of Water out of one Veſſel into another: Firſt invented by *Scipio Manſica*, or at leaſt brought firſt by him to *Rome*; for *Pierius* in his *Hieroglyphicks* tells us, The Prieſts of *Acanta*, a Town beyond the River *Nile* in *Egypt*, did uſe every Day to pour Water into a Veſſel, by the dropping of which through a ſmall Hole, they meaſured Time.

There were many kinds of them, but all had this in common, that the Water ran gently thro' a narrow Paſſage from one Veſſel into another; and in the lower was a Piece of Cork or light Wood, which as the Veſſel filled, roſe up by degrees, and ſo ſhewed the Hour.

Plutarch obſerves one Inconvenience in theſe *Water-Cocks*, *i. e.* that the Air, according to its different Temperature, as to Heat, Cold, Denſity or Rarity, had an Influence on the running of the Water, ſo that it muſt meaſure Time unequally. And another greater there was, which a good while was unheeded, *viz.* that the Water always ran ſlower out, according as its Quantity and Preſſure in the Veſſel abated; to remedy this, the *Orontes* invented a *Clepſydra* in the Form of a ſmall Ship floating on the Water, and which emptied it ſelf by Means of a Syphon, placed in the Middle of it; but which way the Hours by this Means were made equal, I cannot find, the Deſcriptions given of the thing being very obſcure.

Some of theſe *Clepſydræ* were ſo made, as that without changing the Dial, the Hours were ſometimes longer, and ſometimes ſhorter, by Means of an Inequality in the Index, or Hand, and which *Vitruvius* ſays, depended on the Management of the Water: for in the long Days they made the Hole narrower, and ſo the Water ran proportionably ſlower; and in the Winter, when the Days were ſhort, the Hole was made larger, which made the Water flow the faſter, and ſo the Index turned round alſo the faſter.

CLERICO *admittendo*, is a Writ directed to the Biſhop, for the admitting of a Clerk to a Benefice upon a *ne admittas*, tried and found for the Party that procureth the Writ.

CLERICO *capto per Statuum Mercatorum*, *&c.* is a Writ directed to the Biſhop, for the Delivery of a Clerk out of Priſon, that is in Cuſtody upon the Breach of a *Statute Merchant*.

CLERICO *convicto commiſſo Eccleſiæ in defectu Ordinarii deliberando*, *&c.* is a Writ for the Delivery of a Clerk to his Ordinary that formerly was convicted of Felony, by reaſon his Ordinary did not challenge him according to the Privileges of a Clerk.

CLERICO *infra Sacros Ordines conſtitutio non elegendo in Officium*, is a Writ directed to the Bayliffs, *&c.* that have thruſt a Bailiwick or Beadleſhip upon one in Holy Orders, charging them to releaſe him again.

CLERK *Controuler of the King's Houſe* (whereof there be two) is an Officer in Court, that hath Place and Seat in the *Counting-houſe*, and Authority to allow or diſallow the Charges or Demands of Purſuivants, and Meſſengers of the *Green-Cloth*, Purveyers or the like: He hath alſo the over-ſight and controuling of all Defaults, Defects and Miſcarriages of any of the Inferiour Officers; and ſits in the *Counting-Houſe* with the Superiour Officers, *viz.* the Lord *Steward*, *Treaſurer*, *Controuler* and *Cofferor*, either for correcting or bettering things out of Order, with ſeveral other Matters.

CLERK *of the Acts*, is an Officer of the Navy, who receives and enters the Commiſſions and Warrants of the Lord-Admiral, and regiſters the Acts and Orders of the Commiſſioners of the Navy.

CLERK *of Aſſize*, is he that writeth all things judicially done by the Juſtices of *Aſſize* in their Circuits.

CLERK *of the Check*, is an Officer in Court, ſo called, becauſe he hath the *Check* and *Controulment* of the Yeomen of the Guard, and all other ordinary Yeomen or Uſhers belonging either to the King, or Queen, or Prince, either giving leave, or allowing their Abſences or Defects, in Attendance, or diminiſhing their Wages for the ſame.

CLERK *of the Crown*, is a Clerk or Officer in the King's-Bench, whoſe Buſineſs is to read, frame and record all Indictments againſt Traitors, Felons and other Offenders there arraigned upon any publick Crime. He is otherwiſe called *Clerk of the Crown-Office*, or *Clerk of the Crown in the King's-Bench*.

CLERK *of the Crown in Chancery*, is an Officer there, that by himſelf or his Deputy, is continually

ally to attend the Lord-Chancellor, or Lord-Keeper, for ſpecial Matters of State, by Commiſſion or the like, either immediately from his Majeſty, or by Order of his Council, as well ordinary as extraordinary: Alſo all general Pardons upon Grants of them at the King's Coronation, or at a Parliament, the Writs of Parliament, with the Names of Knights and Burgeſſes, are returned into this Office. He hath alſo the making of ſpecial Pardons, and Writs of Execution upon Bonds of *Statute Staple* forfeited.

CLERK *of the Errors*, in the Court of Common-Pleas, does tranſcribe and certify into the King's-Bench, the Tenor of the Records of the Cauſe or Action, upon which the Writ of Error (made by the *Curſitor*) is brought there to be judged and determined.

CLERK *of the Errors* in the King's-Bench, does likewiſe tranſcribe and certify the Records of ſuch Cauſes in that Court into the *Exchequer*, if the Cauſe or Action were by Bill.

CLERK *of the Errors* in the Exchequer, does tranſcribe the Records certified thither out of the King's-Bench, and prepares them for Judgment in the Court of *Exchequer*, to be given by the Juſtice of the Common-Pleas and Barons there.

CLERK *of the Eſſoigns*, is an Officer belonging to the Court of *Common-Pleas*, who only keepeth the *Eſſoign-Roll*, and hath for entring every *Eſſoign* Six-pence, and for every *Exception* to bar the *Eſſoign*, in Caſe where the Party hath omitted his Time, Six-pence. He hath alſo the providing of Parchment, and cutting it into Rolls, and making the Number upon them, and Delivery out of all the Rolls to every Officer, and receiving them again when they be written.

CLERK *of the Eſtreats*, belongs to the *Exchequer*, and every Term receiveth the *Eſtreats* out of the Lord Treaſurer's Remembrancer's Office, and writeth them out to be levyed for the King: He alſo maketh Schedules of ſuch Sums *eſtreated* as are to be diſcharged.

CLERK *of the Hamper*, or *Hanaper*, or *Warden of the Hamper*, is an Officer in the Chancery, whoſe Buſineſs is to receive all Money due to the King's Majeſty for the Seals of Charters, Patents, Commiſſions and Writs; as alſo Fees due to the Officers for Enrolling and Examining the ſame. He is obliged to attend on the Lord *Chancellor* or the Lord *Keeper* daily in Term time, and at all times of Sealing.

CLERK *of the Juries*, or *Curata Writs*, is an Officer belonging to the Court of Common-Pleas, which maketh out the Writs called *Habeas Corpora*, and *Diſtringas*, for the Appearance of the Jury either in Court or at Aſſizes, after that the Jury or Pannel is returned upon the *venire facias*.

CLERK *of the King's Great Wardrobe*, is an Officer of the King's Houſe, that keepeth an Account or Inventory in Writing of all things belonging to the King's *Wardrobe*.

CLERK *of the King's Silver*, is an Officer belonging to the Common-Pleas, to whom every Fine is brought, after it has been with the *Cuſtos Brevium*, and by whom the Effect of the Writ of Covenant is entred into a Paper-Book, and according to that Note, all the Fines of that Term are alſo Recorded in the Rolls of the Court.

CLERK *of the Market*, is an Officer of the King's Houſe, whoſe Duty is to take Charge of the King's Meaſures, and to keep the Standards of them; that is, Examples of all the Meaſures that ought to be through the Land.

CLERK *Marſhal of the King's Houſe*, ſeems to be an Officer that attends the Marſhal in his Court, and Recordeth all his Proceedings.

CLERK *of the Nichils* or *Nihils*, is an Officer in the *Exchequer*, that maketh a Roll of all ſuch Sums as are *nihiled* by the Sheriff upon their *Eſtreats of Green Wax*, and delivereth the ſame into the *Lord Treaſurer's Remembrancer's Office*, to have Execution done upon them for the King.

CLERK *of the Outlawries*, is an Officer belonging to the Court of *Common-Pleas*, being a Deputy to the King's *Attorney-General*, for making out the Writs of *Capias utlegatum* after *Outlawry*; and the King's *Attorney*'s Name is to every one of thoſe Writs. And whereas Seven-pence is paid for the Seal of every other Writ betwixt Party and Party, there is but a Penny paid for the Seal of this, becauſe it goes out of the King's Suit.

CLERK *of the Parliament*, is he that recordeth all things done in the High Court of Parliament, and engroſſeth them fairly into Parchment Rolls, for their better keeping to Poſterity. Of theſe there be two, one of the Higher, the other of the Lower, or Houſe of Commons.

CLERK *of the Peace*, is an Officer belonging to the Seſſions of the Peace; his Duty is at the Seſſions to read the Indictments, to enroll the Acts, and draw the Proceſs, to enroll Proclamations of Rates for Servant's Wages, to enroll the Diſcharge of Apprentices, to keep the Counterpart of the Indenture of Armour, *&c.* alſo to certify in the King's-Bench, Tranſcripts of Indictments, Outlawries, Attainders and Convictions had before the Juſtices of the Peace within the time limited by Statute.

CLEKK *of the Pell*, belongs to the *Exchequer*, whoſe Buſineſs it is to enter Teller's Bills into a Parchment-Roll, called *Pellis receptorum*, and alſo to make another Roll of Payment, called *Pellis exituum* wherein he ſetteth down by what Warrant the Money was paid.

CLERK *of the Petty Bag*, is an Officer in *Chancery*, whereof there are three, and the Maſter of the Rolls their Chief: Their Office is to Record the Return of all Inquiſitions out of every Shire, all Liveries granted in the Court of Wards, all *Oſter les marnes*, to make all Patents of Cuſtomers, Gaugers, Controulers and Aulnagers, Summons of the Nobility, Clergy and Burgeſſes to the Parliament; Commiſſions directed to Knights and others of every Shire for ſeiſing of Subſidies; Writs for Nomination of Collectors for the Fifteenths, and all Traverſes upon any Office, Bill, or otherwiſe, and to receive the Money due to the King for the ſame.

CLERK *of the Pipe*, belongs to the *Exchequer*, who having all Accounts and Debts due to the King, delivered and drawn out of the Remembrancer's Office, chargeth them down into the great Roll; who alſo writeth Summons to the Sheriff to levy the ſaid Debts upon the Goods and Chattels of the ſaid Debtors; and if they have no Goods, then doth he draw them down to the Lord Treaſurer's Remembrancer, to write Eſtreats againſt their Lands.

CLERK *of the Pleas*, is an Officer in the *Exchequer*, in whoſe Office the Officers of the Court upon ſpecial Privileges belonging to them, ought to ſue, or be ſued upon any Action.

CLERK *of the Privy-Seal* (whereof there be four) that attendeth the *Lord-Keeper of the Privy-Seal*; or if there be none ſuch, upon the Principal Secretary, writing or making out all things that be ſent by Warrant from the Signet to the *Privy-Seal*, and are to be paſs'd to the *Great-Seal*; as alſo to make out *Privy-Seals* upon any ſpecial occaſion of his Majeſty's Affairs; as for Loan of Money, and ſuch like.

CLERK *of the Sewers*, is an Officer belonging to the Commiſſioners of the *Sewers*, writing all things that they do by vertue of their Commiſſion: See *Sewers*.

CLERK *of the Signet*, is an Officer continually attending upon his Majeſty's Principal Secretary, who always hath Cuſtody of the *Privy-Signet*, as well for Sealing his Majeſty's Private Letters, as alſo ſuch Grants as paſs his Majeſty's Hand by Bills ſigned. Of theſe there be four that attend in their courſe, and have their Diet at the Secretary's Table.

CLERK *of the Treaſury*, belongs to the *Common-Pleas*, and hath the charge of keeping the Records of *Niſi prius*, hath the Fees due for all Searches, and hath the certifying of all Records into the *King's-Bench*, when a Writ of Error is brought, and maketh out all Writs of *Superſedeas de non moleſtendo*, which are granted for the Defendants, while the Writ of Error hangeth. Alſo he maketh all Exemplifications of Records being in the *Treaſury*.

CLERK *of the Warrants*, is an Officer belonging to the Court of *Common-Pleas*, which entreth all *Warrants* of Attorney for Plaintiff and Defendant, and enrolleth all Deeds of Indentures of Bargain and Sale, which are acknowledged in Court, or before any Judges out of the Court.

CLEW, of the Sail of a Ship, is the lower Corner of it which reaches down to that Earing, where the *Tackles* and *Sheets* are faſtned; ſo that when a Sail is made *goaring*, or ſloping by degrees, ſhe is ſaid to have a *great Clew*: And a Ship is ſaid to *ſpread a great Clew*, when ſhe hath a very long Yard, and ſo hath much Canvaſe in her Sails.

CLEW-GARNET, is a Rope faſtned to the Clew of the Sail, and from thence runs in a Block ſeized to the middle of the *Main* and *Fore-yard*; its Uſe is to hale up the Clew of the Sail cloſe to the middle of the Yard, in order to its being furled.

CLEW-LINE, is the ſame to the *Top-ſails*, *Top-gallant-ſails*, and *Sprit-ſails*, that the *Clew-garnet* is to the *Main-ſail* and *Fore-ſail*, and has the very ſame uſe. In a guſt of Wind, when a *Top-ſail* is to be taken in, firſt hale home the *Lee Clew-Line*, and then the Sail will be taken in the eaſier.

CLIFF or *Cleff*, a Term in Muſick, ſignifying a certain Mark from the Poſition whereof the proper Places of all other Notes in any Song or Leſſon are underſtood, by proving the ſaid Notes from thence according to the Scale of the *Gamut*; wherein are contained three Septenaries of Letters, *viz.* *G*, *A*, *B*, *C*, *D*, *E*, *F*; which ſeven Letters of the Alphabet ſet at the beginning of every Rule and Space repreſents as many *Cliffs*; But of theſe four are only uſed, and generally placed at the beginning of the Staves of every Leſſon, either Vocal or Inſtrumental.

The Firſt is called *F-a-ut Cliff*, and appropriated only to the *Baſs* or loweſt Part.

The Second is *C-ſol-fa-ut Cliff*, peculiar to the inner Parts, as the *Tenor* and *Counter-Tenor*.

The Third is *G-ſol-re-ut Cliff*, which is only ſet for the *Treble* or higheſt Part.

The Fourth is *B-Cliff*, or *B-fa-b-mi Cliff*, which is proper to all Parts, and ſerves for the *Flatting* and *Sharping* of *Notes*.

CLIMACTERICAL *Years*, are certain obſervable Years, which are ſuppoſed to be attended with ſome grand Mutation of Life or Fortune; as the 7th Year, the 21ſt, (made up of three times ſeven) the 49th (made of 7 times 7) the 63d, (being 9 times 7) and the 81ſt, (which is 9 times 9) which two laſt are called *the Grand Climacterick*. *Aulus Gellius* ſaith, This Whim came from the *Chaldeans* firſt, and 'tis probable *Pythagoras* had it from them, who uſed to talk much of the Efficacy of the Number 7, with which he was mightily in love.

CLIMATE, is a Space on the Terreſtrial Globe comprehended between two Circles parallel to the Equator, ſo that from the beginning of the *Climate* to that of another next to it, there is half an Hours difference in the longeſt *Summer-day*. Each *Climate* alſo is divided into two half *Climates* by a parallel Circle, which half *Climate* is call'd a *Parallel*; wherefore theſe Parellels muſt differ from one another $\frac{1}{4}$ of an Hour in the longeſt Days.

CLINCH (of a Cable) is that part of it which is bended about the Ring of the Anchor, and then ſeiz'd or made faſt.

CLINCHING, is a kind of ſlight Calking uſed at Sea, in a Proſpect of foul Weather, about the Ports; which is, to drive a little *Oakam* into their Seams, that the Water may not come in at them.

CLINOIDES, are four Proceſſes in the inſide of the *Os Sphenoides*, forming a Cavity called *Cella Turſica*, in the middle of that Bone, in which lies the *Glandula Pituitaria*.

CLITORIS, is a Part in the *Pudendum Muliebre* ſeated before; 'tis a long round Body naturally about the bigneſs of the *Uvula*: It lies within the Skin, nor doth any part of it appear outwardly, but juſt its Extremity; which is covered with a folding of the Skin made by the union of the *Nymphæ*, and is called its *Præputium*. The Subſtance of it conſiſts of two ſpongy Bodies like thoſe of the *Penis*. They riſe at two different places, in the lower Part of the *Os Pubis*, and approaching on to the Body of the *Clitoris*, whoſe Extremity, which is of an exquiſite Senſe, is called its *Glans*. The two ſpongy Bodies before they unite are called by ſome the *Crura Clitoridis*, and they are twice as long as the Body of the *Clitoris*. It hath two Muſcles ariſing from the Protuberance of the *Iſchium*, and are inſerted in its ſpongious Bodies; they are called *Erectores Clitoridis*, becauſe they have the ſame Uſe as the *Erectores Penis*. The *Clitoris* hath Veins and Arteries from the Hæmorrhoidal Veſſels and the *Pudenda*, and Nerves from the Intercoſtal Pair.

CLOATHED, the Seamen ſay a Maſt is cloathed, when the Sail is ſo long as to reach down to the Gratings of the Hatches, ſo that no Wind can blow below the Sail; and they ſay a Ship ſpreads much Cloth, when ſhe hath broad Sails.

CLOCKS and *Clock-work*: How to calculate all the Numbers and Proportions for any Movement, *&c.* ſee under *Watch-work*.

CLOSE, in Muſick: See *Cadence*.

CLOSE, when any Bird is drawn in a Coat of Arms with its Wings close down about it (*i. e.* not displayed) and in a standing posture, they Blazon it by this word *Close*; but if it be *Flying* they call it *Volant*.

CLOSETT, a Term in Heraldry, signifying the half of a Barr, and the Barr ought to contain one fifth part of the Escutcheon, as the *Fesse* doth the third: See *Fesse*.

CLOUDS, are a Congeries of (chiefly) watery Particles, drawn or sent out of the Earth in Vapour; which, when these Particles are very nearly placed to one another, appear dense and thick; but when they are more remote, are clear and bright, and sometimes almost transparent.

It hath been frequently Matter of dispute amongst Naturalists, how these *olouds* are suspended in a *Medium* which must be lighter specifically than themselves. But 'tis easy to conceive that the Parts which compose *Clouds* are so many little Bubbles, having a watery Skin over a little Sphere of fluid Matter lighter than Air, and therefore may easily, like the Bubbles of Soap and Water which the Children blow up with a little Pipe, be supported by the Air: but whenever they are broken by the violent Agitation of Winds, or are driven against the sides of Hills, *&c.* they must change their form of Bubbles and fall down in Rain: See the word *Vapour*.

Mr. *Boyle* saith, An excellent Astronomer assured him, That tho' he had many times accurately measured the Height of the *Clouds*, yet he could never find any (even white ones) to be $\frac{3}{4}$ of a Mile high, and few did exceed $\frac{1}{2}$ a Mile.

CLOYED; the Seamen say, when any thing is got into the Touch-hole of a Great Gun, so that they cannot with a *Priming-Iron* make way for the Powder to be put in to prime her, they say *the Touch-hole is cloyed*; wherefore when Guns are *nailed*, &c. they say they are *Cloyed*.

CLYDON, is a Fluctuation of the Ventricle.

CLYPEAL *Cartilage*: See *Thyroides*

CLYPEI-FORMIS, a sort of Comets resembling a Shield: See *Discus*.

CLYSMA, the same with *Clyster*.

CLYSSUS, among some Chymists, is a long Digestion and Union of Oily Spirits (especially Mineral ones) together, in order to make a Composition or accurate Mixture of them. Sometimes 'tis taken for an Extraction and Union of the more subtle Parts of any Plant, *Vid. Rolfink. Chym. Lib.* 3. *Sect.* 2. *Schroder. Lib.* 3. *c.* 17. Sometimes for a Medicine made of the most active and energetical Parts of any Ingredients.

COACERVATE *Vacuum*: See *Vacuum*.

COACH, the Council-Chamber on board a Flagg-ship.

COAGULATE, signifies in Chymistry to give a Consistence to Liquors by evaporating some part of them over the Fire, or else by mixing Liquors together, which are of different Natures, to effect the same thing; by either of which, and many other ways a *Coagulation* may be effected.

COALITION, is the gathering together and uniting into sensible Masses the minute Corpuscles which compose any Concrete or Natural Body. *Coalescency* is commonly taken for the same.

COAMINGS, aboard a Ship, are those Planks or that Frame which raises up the *Hatches* higher than the rest of the Deck, in which Loop-holes for *Muskets* to shoot out at are usually made, in order to clear the Deck of the Enemy when a Ship is Boarded.

COASTING, is that Part of Navigation where the Places assign'd are not far distant, so that a Ship may Sail in sight of Land, or within Soundings between them.

For the Performance of which there is only required good Knowledge of the Land, the Use of the Compass, and Lead or *Sounding-Line*; such are the Voyages on the Narrow or *British* Seas, between *England*, *Holland* and *France*, also all about the *Baltick* Seas, and those in the *Mediteranean* are little else.

COAT, by Anatomists, is taken for a Membranous Cover of any part of the Body; as the Coats of the Eye, Nerves, Arteries, *&c.*

COATS, in a Ship, are pieces of tarr'd Canvase which are put about the Masts at the Partners; they are also put about the Pumps at the Decks, that no Water may go down there; and these are also used at the Rudders's Head.

COCCYGIS OS, is a Cartilaginous kind of Bone joined to the Extremity of the *Os Sacrum*; it is composed of 3 or 4 Bones, of which the lower is still less than the upper, till the last end in a small Cartilage, and it resembles a little Tail turn'd inwards: Its Use is to sustain the *Rectum Intestinum*; it yields to the pressure of the *Fœtus* in Women in Travail, and therefore Midwives use to thrust it backwards; but sometimes they do it so rudely and violently, that it occasions very great Pain, several bad Effects. It's called *Os Coccygis*, and because it is in shape something like a *Cuckow's* Bill; its Bones are spongy and soft, and have neither Process nor Cavity, for the Spinal Marrow descends no farther than the bottom of the *Os Sacrum*, which terminates in the first Bone of the *Os Coccygis*.

COCCYX, the same with the *Coccygis Os*: Which see.

COCHLEA, is a Cavity of the inner part of the Ear, so called from its Windings and Turnings, for it has 3 or 4 Rings which mutually succeed one another; it is girt about with a very soft and thin Membrane: See *Ear*.

COCKPIT, in a Man of War, is a place on the lower Floor or Deck abaft the main Capstan, lying between the Platform or Orlop and the Steward's Room, where are Subdivisions or Partitions for the Purser, the Surgeon, and his Mates.

COCK-SWAIN or *Cockson*, is an Officer aboard a Man of War who hath the care of the Barge or Shallop, and all things belonging to it, to be always ready with his Boat's Gang or Crew, and to Man the Boat on all occasions: He sits in the Stern of the Boat and Steers; and he hath a Whistle to call and to encourage his Men.

CONCOCTION or *Digestion*, is the Fermentation of the smallest Particles which our Nourishment consists of, that they may be made fit and proper for the Nourishment and Increase of a living Body; the first *Concoction* is made in the Stomach by a kind of Ferment, as most suppose, which partly remains there, from the Relicks of the former Meats, and partly flows thither from the *Cœliack Arteries*: The second is made in the Guts by the Gall and *Pancreatick Juice*; the third is in the *Glandules* of the *Mesentery* from the *Lympha* or Water which mixes it self with the *Chyle*: the fourth is in the Lungs, from the mixing the Air in some measure with the Blood there: The fifth is in the Vessels and Bowels, as in the Spleen, Liver, Testicles, *&c.*

CODE; from the Latin word *Caudex*, the Trunk or Timber of a Tree, comes *Codex*, which ſignifies a Volume or Book, becauſe anciently their Books were made of Wood, and the Leaves were almoſt like thoſe of our preſent Table-Books. The Emperor *Juſtinian* collecting together all the Pleas and Anſwers of the ancient Lawyers, (which in thoſe Days were in looſe Scroles or Sheets of Parchment or Paper) compiled them into a Book, which therefore he called *Codex*; and this Book of the Empeperor hath ever ſince, by way of Eminence, been called the *Code*; which is accounted the *Second Volume* of the *Civil Law*, and contains Twelve Books; the Matter of which is nearly the ſame with that of the *Digeſt*, eſpecially the firſt Eight Books; but it differs from it in this, that its Stile is by no Means ſo pure, nor its Method ſo accurate as that of the *Digeſt*; and that it determines Matters of daily uſe, whereas the *Digeſt* diſcuſſes the more abſtruſe and ſubtil Queſtions of the Law, giving you the various Opinions of the Ancient Lawyers thereupon; and therefore hath more of polite, fine and witty Arguing in it, than things of benefit and uſe to the generallity of Mankind.

The *Code* is compiled from the Anſwers and Determinations of 56 Emperors and their Councils, whereof many Perſons were learned and skilful Lawyers; as the famous *Papinian* and ſome others, eſpecially from the Time of *Adrian* to *Juſtinian* himſelf. And the Reaſon why this Emperor gave himſelf this new trouble was, becauſe he found the *Digeſt* in many Places too fine and ſubtile for common uſe, and alſo very imperfect in that reſpect, as by no means deciding abundance of Caſes that do every Day occur: Theſe Defects he deſign'd to Remedy by ſetting our the *Code*, where abundance of things before omitted, or too briefly handled, are there fully and diſtinctly determined.

There is another *Code* called the *Theodoſian Code*, of good uſe to this Day, for there is no underſtanding the former *Code* without its help; and this was formerly of ſuch Authority, that as Mr. *Selden* and others tell us, it was for ſeveral hundred Years in uſe in the Weſtern parts of *Europe*, when that Law was in manner diſuſed and forgotten. But now the *Theodoſian Cude* as a much antiquated.

CODIA, are the tops of Poppies, of which they make Syrup; whence the word *Diacodium* or *Syrupus de Meconio*.

COECUM *Inteſtinum*, the Blind Gut, is the 4th in order from the Stomach, and the firſt of the *Inteſtina Craſſa* or Thick Guts: In Children new born, and in Quadrupeds its found full of Excrements; but in adult and ſound Perſons its Cavity often diſappears, and it only hangs like a Worm; and 'tis in ſuch about the bigneſs, and half the length of a large Earth-worm; its Mouth which opens into the *Colon* is pretty large: It takes its Original rather from the *Colon* than the *Ilium*, to the former of which it ſeems to be a kind of Appendage. It is larger in Children than in Men: 'Tis not tied to the Meſentery at all, but being placed in the Cavity of the *Os Ilium*, by its End it is joined to the right Kidney, the *Peritonæum* coming between. In Apes it is pretty large, but larger in Dogs; and in Conies, Squirrils, and Rats largeſt of all, in proportion to the bulk of their Bodies. It's uſe in dult Perſons very much undiſcovered; but in the *Fœtus*, or an Infant newly born, in which 'tis found full of Excrement, it ſeems to be a kind of Receptacle for the *Fæces* of the Inteſtines before the Birth or during the time that the *Fœtus* doth not exonerate *per Alvum*. Dr. *Gliſſon* thinks alſo that it ſerves in ſuch Animals as have it large, for a kind of ſecond Ventricle or Bag, wherein the prepared Aliments may be ſtored up, and ſo long retained, till a richer, thicker, and more nutritious Juice may be drawn from them. Others ſay, it contains a Ferment; and others the Flatuoſity of the Inteſtines; and others, that it ſeparates a Liquor by ſome Glands which are in its Cavity, which Liquor ſerves to harden the Excrements as they paſs through the *Colon*.

CO-EFFICIENT *of any generating Term in Fluxions*, is the Quantity which ariſes by dividing that Term by the generated Quantity.

CO-EFFICIENTS *in Algebra*, are ſuch Numbers as are prefixed before any Letters or Species, into which Letters they are ſuppoſed to be multiplied, and therefore with ſuch Letters, or with the Quantities repreſented by them, do make a Rectangle or Product, (*conficiunt Productum*) whence they take their name. Thus *C b* implies that the Quantity repreſented by *a b* is multiplied into the *Co-efficient C*, and that out of theſe two the Rectangle or Product *C b* is formed. If a Letter have no Number prefixed, 'tis always ſuppoſed to have to *Co-efficient* 1, becauſe every thing is once it ſelf.

The *Co-efficient* in a Quadratick Equation is, according to its Sign, either the Sum or Difference of the two Roots. And in any Equation of an higher nature, the *Co-efficient* of the ſecond Term is always the *Aggregate of all the Roots*, retaining their proper Signs; ſo that if all the Negatives be equal to all the Affirmatives, the ſecond Term will vaniſh; and where the ſecond Term is thus wanting, 'tis a ſign that the Quantities under contrary Signs were thus equal.

The *Co-efficient* of the Third Term is the *Aggregate of all the Rectangles*, ariſing by the Multiplication of every two of the Roots, how many ways ſoever thoſe Combinations of Two's can be had, as three times in a Cubick, ſix in a Biquatick Equation, *&c.*

The *Co-efficient* of the Fourth Term is the *Aggregate of all the Solids* made by the continual Multiplication of every 3 of the Roots, how often ſoever ſuch a Tenary can be had, as there can 4 be had in a Biquadratick, Ten in an Equation of Five Dimenſions, *&c*, And thus it will go on infinitely, *&c.*

COELIA, κοιλία τὸ κοῖλον, in an Anatomical Senſe ſignifies any kind of Organical Cavity in an Animal Body; and hence Diſeaſes ſeated in the Venters or Cavities of the Body are ſometimes called *Cæliack Affections*: See *Cæliack*.

COELIACK *Artery*, that which ariſes from the Trunk of the great Artery after it enters the *Abdomen*, and ſpreads into two Branches; the firſt on the Right-hand is the *Gaſtrica Dextra*, which goes to the Stomach, the *Ciſtica* to the Gall-Bladder, the *Epiplois Dextra* to the *Omentum*, the *Inteſtinalis* to the *Inteſtinum Duodenum*, and to a part of the *Jejunum*, the *Gaſtro-Epiplois* to the Stomach, to the *Omentum*, and ſome Branches to the Liver, which enter the *Capſula Communis* to accompany the Branches of the *Porta*.

The left Branch of the *Cæliack Artery* (which is called by ſome *Splenica*, becauſe is goes toward the

the Spleen) on its upper ſide ſends forth the *Gaſtrica Major*, which dividing into two parts after it hath ſent a little Twig to the Stomach, makes the *Coronaria Stomachica* and the *Gaſtrica Siniſtra*. And out of its loweſt ſide ſpring the *Epiplois Poſtica*. which runs to the hinder Leaf of the *Omentum* and the *Colon* annexed to it, and the *Epiplois Siniſtra* which goes to the loweſt and left ſide of he *Omentum*.

COELIACK *Paſſion* or *Affection*, is a kind of Flux or *Diarrhæa*, wherein the Aliments either wholly changed, or only in part, paſs by Stool without any Chylification, and it is two-fold; the firſt, in which the Meat is only digeſted in the Stomach; the other when Concoction or Fermentation is performed in the Stomach and Inteſtines both at once; but by reaſon that the *Lacteal Veſſels*, or little Seats of the Guts, are obliterated through long faſting, a *Parulent Dyſentary*, or the like, the *Chyle* is not diſtributed. *Blanchard*. 'Tis called alſo *Lienteria*.

COELONIA, is a hollow and round Ulcer in the *Horny Tunick* of the Eye.

COELUM, is the Cavity of the Eye towards the Corners. The Palate is alſo called *Cælum* by ſome. *Blanchard*.

COFFER, in Fortification, is a hollow Lodgment athwart a dry Moat from ſix to ſeven Foot deep, and from ſixteen to eighteen broad, the upper part being made of pieces of Timber raiſed two Foot above the level of that Moat; which little Elevation hath Hurdle laden with Earth for its covering, and ſerves as a Parapet with Embraſures. The Beſieged generally make uſe of theſe *Coffers* to repulſe the Beſiegers when they endeavour to paſs the Ditch, and they are diſtinguiſhed only by their length from the *Caponniers* which are likewiſe ſomewhat leſs in breadth: And it differs from the *Traverſe* and *Gallery*, in that theſe are made by the *Beſiegers*, and the *Coffer* by the *Beſieged*.

To ſave themſelves from the Fire of theſe *Coffers*, the Beſiegers *Epaule* or throw up the Earth on that ſide towards the *Coffer*.

COFFRE, is alſo ſometimes uſed for *Caiſſors*: Which ſee.

COGITATION, properly is the Action of Thinking; but the *Carteſians* underſtand by it whatever we experience in our ſelves, and whereof we are conſcious, as all the Operations of our Underſtanding, Will, Imagination and Senſes.

COGNATION: See *Agnation*.

COGNATIONE: See *Coſenage*.

COGNIZANCE, in Heraldry, is the ſame with the *Creſt*, which in any Atchievement helps to adorn and marſhal a Coat of Arms;

Alſo a Badge on a Serving-man, or Waterman's Sleeve.

In the Law, 'tis the Acknowledgement of a Fine, or Confeſſion of a thing done; as alſo a Power or Juriſdiction: Thus *Cognizance of Pleas* is an Ability to call or cauſe a Plea out of another Court; which no one can do but the King, unleſs he can ſhew a particular Charter for it.

COGNISEE or *Connuſee*, is he to whom the Fine is acknowledged.

COGNISOR or *Connuſor*, is he that paſſeth or acknowledgeth a Fine of Lands and Tenements to another.

COGNITIONIBUS *Mittendis*, is a Writ to a Juſtice or other that hath power to take a Fine, who having taken acknowledgment thereof, deferreth to certify it into the Court of *Common-Pleas*, commanding him to certify it.

COGITCAL *Line*: See *Line*.

COHESION *of the Parts of Matter*, is that Quality, from whenceſoever ariſing, by which the Parts of all ſolid Bodies ſtick or adhere to one another. Some will have this to be effected by a certain Glue or Cement; others by the Particles being hooked and branchy, and ſo to catch hold of one another: Others will have it to be occaſion'd by an imaginary Funiculus or inviſible Rope or String which holds the Parts together; others by bare Reſt only; all which the famous *James Bernoulli* in his Book *de Gravitate Ætheris*, endeavours to refute, and thinks 'tis occaſion'd by the Preſſure of the incumbent Air or Æther, and near the Earth of the whole Atmoſphere. This ſeems to be confirmed by the known Experiment of the *Cohesion* of two well poſited Marbles together, which yet will eaſily and ſpeedily fall aſunder, when put into the exhauſted Receiver, where the external Preſſure of the Air is taken off; and *Bernoulli* ſuppoſes the whole Body of the Æther, as well as of the lower Air to gravitate continually upon the Earth, and by that means to keep all its Parts together: See *Vol.* II.

COHOBATE, a Term in Chymiſtry, implying a repeating the Diſtillation of the ſame Liquor, having poured it again on the Matter which remains in the Veſſel. This Operation is uſed to open Bodies, or to volatilize the Spirits, and is called *Cohobation*.

COILE: See *Quoile*.

COINDICATIONS, are Signs which do not indicate by themſelves alone, but together with other Things, Circumſtances, *&c.* help the Phyſician to form a Judgment.

COINS or *Quoins*, belonging to a Great Gun, are thoſe Wedge-like pieces of Wood which ſerve to raiſe or lower her Breech on occaſion.

There are alſo a ſort of *Coins* called *Canoique Coins*, which are ſhort, and having three Edges, they are uſed in a Ship to put between Casks and to keep them from rowling one againſt another in the Hold: For the ſame uſe almoſt ſerve a third ſort of *Coins* called *Standing Coins*, which are made of Barrel Boards, and are about 4 Inches broad, and of a fit length to be driven in between the Ends of the Cask about two or three Hoops from the Chine-hoops, to keep the Butts from jogging.

COINS. I thought it would be very uſeful to give the Reader a *Table* of the Ancient and Modern *Coins* uſed in moſt Countries, which as I had opportunity I collected, and are as followeth:

I. The *Hebrew* or *Jewiſh Coins*, their Weight and Value according to Dr. *Cumberland*.

	Value.
Shekel, was $\frac{1}{2}$ Oz. Averdupois,	2 *s.* 4 *d.* 1 *q.* $\frac{1}{3}$
Bakah, was $\frac{1}{2}$ a *Shekel*.	
Zuza, was $\frac{1}{4}$ *Shekel*. This is mention'd by the *Talmudiſts*.	
Gerah, *Lgurah*, or *Keſhitah* is the $\frac{1}{20}$ *Shekel*.	
Talent, was in Weight 3000 *Shekels*.	
Valued, if { Silver	353 *l.* 11 *s.* 10 *d.* $\frac{1}{2}$.
{ Gold	5064 3 10
Manah, in Weight 100 *Shekels*, value 60 *Shekels*.	
The *Perſian Darchmons*, or *Golden Daries*, were equal to 12 *Gerahs*.	

The

The *Roman Silver Denarius* was $7\frac{1}{4}$ *d.*
The *Roman Gold Denarius*'s were double in weight.
The *Roman Brazen As* weighed $\frac{1}{2}$ Ounce; valued 3 *Farth.* $\frac{1}{10}$.
The *Assarium* was $\frac{1}{2}$ of the *As*.
Quadrans $\frac{1}{4}$ part.
The *Mitre* was $\frac{1}{8}$ of the *As*, or about $\frac{1}{2}$ of our Farthing.

Sestertius (mark'd thus IIS) was 2 *Asses*, and $\frac{1}{2}$ of the *As*, in Value 7 Farthings and $\frac{1}{10}$ of a Farthing.
Denarius (mark'd thus, X) was 10 times the *As*, and therefore was of our Money 7 Pence 3 Farthings.
Sestertium was 8 *l.* 1 *s.* 5 *d.* 2 *f.*

An Account of the Hebrew Coins *from Mr.* Jeak's Arithmetick.

				l.	*s.*	*d.*
Hebrew. Money. Silver.	(a) *Shekel*, of the *Sanctuary*, in	Weight $\frac{1}{2}$ *Oz. Troy*		00	02	06
		Value to Sterling Money				
	(b) *King's Shekel*, half the *Sanctuary Shekel*, called *Bekah*			00	01	03
	(c) Third Part of the *Shekel*			00	00	10
	(d) *Zuz*, Fourth Part of the *Shekel*			00	00	$07\frac{1}{2}$
	(e) *Gerah*, *Agurah*, *Keshitah*			00	00	$01\frac{1}{3}$
Gold	(f) *Zahab* *Golden Siculus* or *Shekel*	each $\frac{1}{2}$ *Oz. Troy*, in Value	12 *Silver Shekels* of the *Sanctuary*	01	10	00
	(g) *Adarkon* *Dracmon*, or *Darcon*	each half so much		00	15	00
Sums of Money	(h) *Maneh*, or *Mina*, or a Pound, valuable in	Gold	100 *Shekels* 25 *Oz. Troy*	75	00	00
		Silver	60 *Shekels* 30 *Oz. Troy*	07	10	00
	(i) *Chichar* or *Talent* in Weight	3000 *Shekels* 123 *lb. Troy*	valuable in Gold	4500	00	00
			Silver	375	00	00

(a) This piece of *Coin* is often mentioned in Sacred Writ, and looks like the Standard of all the reſt. On the one Side was ſhew'd the Veſſel in which the *Manna* was, inſcribed in this Perigraph *Shekel Iſrael*; on the other Side the Rod of *Aaron* that budded, with this Inſcription, *Jeruſalem Kodſhaſh*, in *Engliſh*, *The Holy Jeruſalem*, called *Shekel* from *Shakal* to weigh: For Money, at the firſt, ſeems to be a Merchandiſe, exchanged or given for other Commodities, as *Gen.* 23. 16. after the *Chaldee* called *Silgha*, and commonly with the *Hebrews*, *Keſeph*, *i. e.* Silver; and being put abſolutely, rendered a *Silverling* or Piece of Silver, by Expoſitors, as uſually as a *Shekel*, when the Quality is not mentioned, is taken for a Silver *Shekel*.

(b) Firſt mentioned, *Gen.* 24. 22. paid by all as a Yearly Tribute, *Exodus* 30. 13, 15. 2 *Chron.* 24. 6, 9. towards the Repair of the Tabernacle firſt, and after of the Temple. Between this and the *Sanctuary Shekel* ſome mentioned a third ſort of *Shekel*, called the *Common Shekel*, valued at 20 *d.* of our Money, of which I find nothing but uncertainty.

(c) In *Nehem.* 10. 32. noted as a Yearly Tribute given to the *Jews* by a Civil Decree to the Second Temple.

(d) 1 *Sam.* 9. 8. ſpoken of and equal to the old *Attick Dram* and *Roman Penny*, as ſeveral ſay, and by ſome called *Zuz*, *Zuza*, *Zur* and *Zura*.

(e) *Agurah*, render'd *Gerah* by the *Chaldee* Paraphraſe, and alſo *Megna* or *Megha* in that Tongue; by the *Arabians*, *Mega*; *Greeks*, *Obolus*; and in *Engliſh*, *a Piece of Silver*, 1 Sam. 2. 36. called alſo in the *Hebrew*, *Keſhitah*, becauſe Signed with the Image of a Lamb; ſee *Gen.* 33. 19. *Joſhua* 24. 32. Twenty of theſe made a *Shekel*, *Exod.* 30. 13.

(f) The *Zahab*, and Golden *Shekel* in *Rider*'s *Dictionary* undervalued at 15 *s.* for tho' *Hunt* in his *Handmaid to Arithmetick* out of *Breerwood de Nummis*, mentioneth the Weight but two *Attick Drams*, yet he valueth it at 30 Shill. *Alſted* in his *Encyclopædia* of *Arithmetick* makes it 4 Drams, which accounted $\frac{1}{4}$ *Ounce Troy*, muſt yield double the Value of 15 Shill. And moſt Authors agree that the Gold *Shekel* was equal in Weight with the Silver *Shekel*, ſo the Difference muſt be only in the Value of the Metal. Some to keep up the Credit of differing Authors, conceive there were two ſorts of *Golden Shekels* as well as *Silver*, the one double to the other.

(g) Theſe Golden *Adarkons* and *Drackmons* ſeem to be *Perſian*, or Coins of ſome other *Nations*, and Current, not Coined in *Judea*, nor read of till after the *Captivity*; for tho' the Word be uſed 1 *Chron.* 29. 7. yet both Books of the *Chronicles*, as moſt take it, were penn'd by *Ezra* after his return from *Babylon*, in whoſe Book mention is made thereof, as in *Ezra* 2. 69. and 8. 27, *&c.* in *Greek* called *Drachme*, and in *Engliſh* rendred *Drams*. *Alſted*, in his *Encyclopædia* of *Arithmetick*, makes the Value equal to a Ducat of *Hungary*: But *Hunt*, who throughout his Book hath much loſt himſelf in valuing 2 *Attick Drams* in the *Zahab* at 30 *ſh.* and 2 *Attick Drams* in the *Adarkon* (which he ſaith is the Weight thereof) at 15 *s.*

(h) The *Maneh* in Gold, by comparing 1 *King.* 10. 17. with 2 *Chron.* 9. 16. is found to be 100 *Shekels*, which *Buxtorf* and others underſtand not of the *Holy* but the *Royal Shekel*. The *Maneh* in *Ezek.* 45. 12. ſeems to be 60 *Shekels*, and hereto ſeveral agree, but ſome think it was now encreaſed 19 *Shekels* more than of old, and call it *the new Maneh*, valued nevertheleſs with moſt after the *Holy Shekel*, in Silver at 7 *l.* 10 *s.* *Buxtorf* tells us alſo of a *Maneh* of 25 *Holy Shekels*. The *Aſſembly*'s *Annotations* on *Ezek.* 45. 12. make 3 ſorts of *Manehs*, *viz. Common* 15, the *King*'s 20, and the *Holy* 25 *Shekels*; but the Word *Maneh* is Singular and not Plural in the *Hebrew* Text there, as noting all thoſe Diviſions to make but one *Maneh*.

(i) The

(i) The *Chichar*, by ſome wrote *Kichar*, and commonly tranſlated *Talent*, contained 3000 *Shekels*, as may be collected from *Exodus* 38. 25, 26. where the Silver collected is expreſſed to be 100 Talents, and 1775 Shekels, *v.g.* and the Perſons that paid it at half a Shekel a Piece, *v.* 26. numbred to be 603550, whereof the Half is 301775, which divided by 3000, the Shekles in one Talent, makes 100 Talents, and leaves the odd Shekels remaining 30) 1775 (100

3 000

The *Talent* thus valued after the *Holy Shekels*, makes the number of Talents mentioned in ſome Texts of Scripture, eſpecially 1 *Chron.* 22. and 29 *Chapters*, amount to ſuch Maſſy Sums, that ſome think the Talents are to reckoned at the Rate of the other Shekel; and others, not improbably, that the *Jews* had a Piece of Money or Plate of Gold of ſmall Value (as may be obſerved anciently in *Homer Iliad lib.* 23.) called a *Talent*. And *Fuller* in his *Piſgah ſight of Paleſtine*, *Book* 3. *P.* 356, 357. ſhews whereon ſuch an Opinion may be ſtrengthned; and that the Talent mentioned in ſome Scriptures may be rather this than the other.

The Account both of the Hebrew Weight *and* Money, *with their Value in* Sterling-Money *and* Troy-Weight, *is Contracted into the following Table.*

Hebrew Gold and Weights.

Chichar or *Talent*	1	*Month.*				
Maneh or *Pound*	*Old* 60	*New* 50	1 *New*	*Old*	*Zahab.*	
Zahab or *Shekel*	3000	60	50	1		*Adark.*
Adarkon or *Dram*	6000	120	100	2		1
Troy-Weight	125 *l.*	2½ *l.*	1 *l.* 13⅓	½ *Oz.*		¼ *Oz.*
Sterling-Money	4500	90 *l.*	75 *l.*	1 *l.* 10 *s.*		15 *s.*

Hebrew Silver and Weights.

| *Chichar* or *Talent.* | 1 | | | |

** *Bes*, is the Mark Weight, two Thirds of the Pound, *Malines*, P. 24. aforesaid, makes the *Bes* or Old Mark of the *Romans* to be divided into

16 *Loos*, or *Tetradrams*.
23⅓ *Tridrams*.
32 *Didrams*.
64 *Drams*.
96 *Obolos*, or *Treobolus*.
128 *Triobulos*.
384 *Obolos*.
768 *Miobolos*.
3840 *Moments*.

b. *Semiuncia*, or the Half Ounce, is sometimes called *Assarion* and *Assarius*; and by *Alsted*, *Lotho*, answering to a *German* Weight of that Name.

c. *Duella*, being double the Weight of the *Sextula*, is sometimes called *Binæ Sextulæ*.

d. *Sicilicum*, or *Silicus*, and by Abreviation *Siclus*, is ¼ of an Ounce.

e. *Sextula*, used promiscuously with *Sextans* and understood, by import of the Name, to be the Sixth Part.

f. *Denarius*, a Penny Weight, the seventh Part of the Ounce, whether used to Weigh any thing but Money as the other Divisions thereof, somewhat questionable, see among the Money, *Alsted* compares the *Drachmal Denarius* to the *German* Weight *Quintlein*.

g. *Quinar*, was half the Penny Weight, and a Piece of Money set afterward among the *Roman* Coins.

*, Between the *Quinar* and *Scruple* some mention a Weight called *Termissis*, containing 32 Grains, being the 18th Part of an Ounce.

h, *Quadrane*, here, is ¼ of the Penny Weight; and so called *Quadrans Denarii*, to distinguish it from *Quadrans Libræ*, which was 3 *Ounces*.

i. *Sextans*, called *Sextans Denarii* to difference it from *Sextans Libræ*, was the sixth Part of the Penny-Weight, and sometimes called *Sextula*.

k. *Obolus*, or half a *Scruple*, called sometimes *Simplium*, weigheth 12 Grains. If there be another *Obolus*, as some say, which was the Third Part of a *Quinar*, it seems to be a Piece of Coin, and must weigh 13⅓ Grains, and so is all one with the *Sextans*, according to the *Tabulary* Divisions; yet this sort of *Obolus* they make to contain but 10 Grains.

Between the *Obolus* and the *Siliqua* some mention a *Cerates*, which they say contains 6 Grains, and so is ⅓ the *Obolus*, or ¼ of the *Scruple*.

Roman

Roman *Monies, and their* Engliſh *Values.*

					l.	s.	d.
Roman	*Money before the Tranſlation of the Imperial Seat to* Bizantium.	Braſs	*Leſs than the* As.	Sextula, $\frac{1}{6}$ Unicæ	00	00	00 $\frac{1}{24}$
				Semiuncia, $\frac{1}{2}$ Unicæ	00	00	00 $\frac{1}{12}$
				Unica, $\frac{1}{12}$ Aſſis.	00	00	00 $\frac{1}{16}$
				Sextans, $\frac{1}{6}$ Aſſis	00	00	00 $\frac{1}{8}$
				Quadrans, Triunx, Teruntius } $\frac{1}{4}$ Aſſis	00	00	00 $\frac{3}{16}$
				Triens, $\frac{1}{3}$ Aſſis	00	00	00 $\frac{1}{4}$
				Semiſſis, $\frac{1}{2}$ Aſſis	00	00	00 $\frac{2}{8}$
			As *or* Libra $\frac{1}{10}$ Denarii		00	00	00 $\frac{2}{4}$
			Greater than the As.	Deciſſis, 10 Aſſes	00	00	07 $\frac{1}{2}$
				Viceſſis, 20	00	01	03
				Triceſſis, 30	00	01	10 $\frac{1}{2}$
				Quadraceſſis, 40	00	02	06
				Quinquaceſſis, 50	00	03	01 $\frac{1}{2}$
				Sexaceſſis, 60	00	03	09
				Septuaceſſis, 70	00	04	04 $\frac{1}{4}$
				Octaceſſis, 80	00	05	00
				Nonaceſſis, 90	00	05	07 $\frac{1}{2}$
				Centuſſis, 100	00	00	03
		Silver	*Nummi*	Teruntius, $\frac{1}{40}$ Denarii	00	00	00 $\frac{1}{16}$
				Sembella, $\frac{1}{2}$ Libellæ	00	00	00 $\frac{3}{8}$
				Libella, $\frac{1}{10}$ Denarii	00	00	00 $\frac{3}{4}$
				Obolus, $\frac{1}{8}$ Denarii	00	00	01 $\frac{1}{4}$
				Seſtertius, $2\frac{1}{2}$ Aſſes	00	00	01 $\frac{7}{8}$
				Victoriatus, Quinarius } $\frac{1}{2}$ Denarii	00	00	03 $\frac{3}{4}$
			Nummuli	Bigatus	00	00	07 $\frac{1}{2}$
				Denarius { New, 10 Aſſes, $\frac{1}{8}$ *Oz.*	00	00	07 $\frac{1}{2}$
				Denarius { Old, $\frac{1}{7}$ *Oz.*	00	00	08 $\frac{4}{7}$
		Gold		Tremiſſis, *or* Golden Triens	00	05	00
				Semiſſis, or Golden Drachmal	00	07	06
				Imperatorius	00	15	00
				Amient, *or* Conſularis	00	15	00
	Money after the Tranſlation of the Imperial Seat to Bizantium.	Braſs		Follis	00	00	00 $\frac{3}{12}$
		Silver		Siliqua, *or* { Ceratium Simple	00	00	05
				Ceratium Magnum	00	00	07 $\frac{2}{4}$
				Milliaraſium	00	01	03
		Gold		Conſtantine's Piece	00	08	06 $\frac{6}{9}$
				Valentinian's Piece	00	10	00
				Semiſſis, *or* Halt Piece	00	05	00
				Triens, *or* $\frac{1}{3}$ of that Piece	00	03	04
				Scruple, *or* $\frac{1}{4}$ of that Piece	00	02	06
				Quadrantes. Seſtertios.			
Roman *Sums of Money*				Sportula, containing 100, or 10	00	01	06 $\frac{3}{4}$
				Libra, a Pound of 96 Drams	03	00	00
				Seſtertium (in the *Neuter Gender*) containing 1000 Seſtertio's (in the *Maſculine Gender*)	07	16	03
				Talent, containing 24 Seſtertio's, or 6000 Denario's	178	10	00

The Braſs *Unica*, miſprinted in *Rider*, at $\frac{1}{10}$ *Aſſis*; for $\frac{1}{10}$ Part of three Farthings, cannot be $\frac{1}{10}$ of our Penny, counting 4 *Cees* to a Farthing as they do.

So alſo is *As*, as *ob. q.* for *ob. qa.* for *As* being the 10th Part of the *Denarius*, muſt be 3 Farthings, 10 times 3 making 30 Farthings, which is 7 $\frac{1}{2}$ *d.* the Value of the *Denarius*. To the Braſs *As* was the Silver *Libella* equal in Value.

Obolus, being $\frac{1}{8}$ of the *Roman* Penny, is called by *Celſus*, *Sextans*.

Seſtertius, Engliſh'd a *Seſtertian*, was $\frac{1}{4}$ of the *Roman* Penny, and being of the *Maſculine Gender*, was differenced from the other being of the *Neuter Gender*, and in Numbring by theſe *Seſtertias*'s, theſe 3 Rules are to be obſerved.

1. If the Numeral Noun agree in *Caſe*, *Gender* and *Number* with the *Seſtertian*, it ſignifieth barely juſt ſo much as was pronounced, as *Decem Seſtertii* is 10 *Seſtertians*.

2. If the Numeral Noun of another *Caſe* be joined with the *Genetive Caſe Plural* of *Seſtertius*, it noteth ſo many Thouſands, as *Decem Seſtertium* (for *Seſtertiorum*) is Ten Thouſand *Seſtertians*.

3. If an *Adverb* be put without any Numeral joined, as *Decies*, *Vigeſies*, &c. or joyned with *Seſtertium* the *Genitive Caſe Plural*, there is underſtood by it ſo many Hundred Thouſand, as *Decies Seſtertium* is Ten Hundred Thouſand *Seſtertians*, Alſted *delivers it thus*;

From 1 *Seſtertian* to 1000 in the *Maſculine Gender*, as *Unus Seſtertius*, *Decem Seſtertii*, &c. is 1 Seſtertian, 10 Seſtertians, *&c.*

From 1000 to 100000 in the *Neuter Gender* and *Plural Number*, as *Singula Siſtertia* 1000 Seſtertians, *Bina Seſtertia*, 20 Seſtertians, *&c.*

From 100000 upward, all expreſſed adverbially and in the *Genitive Plurul*, as *Semel Seſtertium* 100000, *Decies Seſtertium* 1000000, *&c.*

Victoriatus was ſo called, becauſe ſtamped with the Image of *Victory*; and *Quinarius*, becauſe equal in Value to 5 Braſs *Aſſes*, or half the *Denarius*.

Bigatus, ſome call *Quadratus*, had the Print of a *Cart* or *Chariot* on it, and was of Value equal with *Denarius*.

Denarius, q. d. *Dena æris*, becauſe it containeth 10 *Aſſes*, rendred a Penny. *Mat.* 18. 28. and 22. 19. at the Old Rate was $\frac{1}{7}$ of an Ounce, and at the new $\frac{1}{8}$, and at this Rate all the other Coins are valued in the Table. This is ſometimes called the *Drachmal Denary* for Diſtinction ſake. Some make 3 ſorts of Pence, the heavier weigheth $1\frac{1}{3}$ *Attick Dram*, the Mean of one *Dram*, and the leaſt lighter than 1 *Dram* by $\frac{1}{24}$ of an Ounce, or thereabouts. Some ſay one was $\frac{1}{7}$ of the *Roman Unica*, the Mean $\frac{1}{7\frac{1}{2}}$, and the Lighter $\frac{1}{8}$. *Budeus* makes the *Attick* Dram and *Roman* Penny of the ſame Weight and Worth, wherewith moſt agree, and accordingly each in the foregoing Tables are valued at $7\frac{1}{2}$ *d.* after 5 Shillings the Ounce.

The Golden *Denaris* mentioned in *Holyoke* at 2 *s.* $4\frac{1}{2}$ *d. Sterling*, I have omitted, as not ſatisfied in the Weight, nor certain of ſuch a Coin.

The Golden *Amient* ſeems the Eldeſt and Greateſt, a Piece Coined by the *Conſuls*, therefore called *Conſularis*, weighed $2\frac{1}{7}$ Drams.

The *Imperatorius*, or Piece of the Emperor's Coin 2 Drams.

The *Drachmal* 1 Dram, and the *Triens* of the *Imperatorius*.

After *Conſtantine* removed his Seat to *Bizantium*, now called *Conſtantinople*, a City after his own Name, we read of *Follis* in *Euſebius*, a Braſs Piece, as *Lampridius*, or of *Iron*, as *Euſtathius* ſaith, ſo called becauſe it repreſenteth a Leaf, in Latin *Folium*, and was $\frac{1}{72}$ of the Silver ſimple *Siliqua*.

The Silver *Siliqua* or *Ceratium* was double: The Simple $\frac{1}{3}$ of the *Millieriſium*, value 5 *d.* The Great called *Cerates*, 1 Dram equal to the Penny $7\frac{1}{2}$ *d.*

Milliariſium, weighed 2 Drams.

Conſtantine's Piece of Gold was called *Romanus Solidus*, at the Proportion of 7 *s.* 5 *d.* for a Dram of Gold muſt weigh $1\frac{1}{2}$ Dram.

Theſe continued currant till *Valentinian*, who made his Coin ſomewhat heavier.

Valentinian's Piece of Gold by ſome is called *Sextula*. and being valued at 10 *s.* Sterling, muſt weigh $1\frac{1}{3}$ Dram.

Of which the { *Semiſſis* / *Tremiſſis*, or *Triens* / *Scruple.* } being { $\frac{1}{2}$ / $\frac{1}{3}$ / $\frac{1}{4}$ } was { $\frac{12}{24}$ / $\frac{8}{24}$ / $\frac{6}{24}$ } of a Dram.

Sportula, ſay ſome, was a Lawyer's Fee, or an Alms diſtributed by Princes among the People. See *Selden's Hiſtory of Tythes*, Chap. 4. P 37, 38.

Accounts of Exchange of Money at ſeveral Places.

2. 11. *A Leppo*, the Exchange is made by *Sultanies* of 120 *Aſpers*, or *Dollars* of 80 *Aſpers*, every *Aſper* 10 *Marcherines*.

3. 1. *Alexandria*, they account by *Ducats*, either *Ducat de Pargo*, of 120 Maids, Ducat of *Venice* of 40 Maids, or *Italian* Ducat of 35 *Maids*.

1. 7. *Ancona*, Exchange is made on the Ducat of 21 Groſs (which is in Specie 23 Groſs) which Ducat alſo is 14 *Carlina*, and every *Carlina* 6 *Bollidini*; ſo in the Ducat of 84 *Bollidini*.

1. 4. *Arragon*, the Rial or Ryal of the Plate is 23 *Dinero's* (*Hunt* ſaith 13) and the Ducat is 12 Ryals, whereon they make Exchange; and they account by Pounds of 20 *s.* and 12 *d.* And the Ducat of 12 Ryals, every Ryal of 1 *ſh.* or 12 *d.*

1. 8. *Artois*, and in ſeveral other Places they Account and Exchange by Pounds or *Livres*, *Tournois* of 20 Stivers, or 40 Pence *Flemiſh*, whereof 6 called *Guilders* or *Florins* makes the Pound *Flemiſh* in all the 17 Provinces of the *Netherlands*; which Pound is divided into 20 *s.* and every Shilling into into 12 *d. &c.*

Some reckon by the Pound *Paris*, which is but 20 Pence, whereof 12 make 1 Pound *Flemiſh*, but their Accounts, as alſo the Finances of the Princes, are kept by Pounds *Tournois*, and both Pounds divided in 20 *s.* and every Shilling into 12 Pence, admitting alſo the Subdiviſions of Obolo's, Maille, Heller, Hallnick, Corte, Mites, Points, Engevin, Poot, and ſuch like Copper Monies.

Alſted mentions the *Florin* in *Germany* to be 15 Batz, every Batz 2 Albes, every Albe 8 Oboli or Nummos: ſo ſhall the *Florin* be 30 Albes or 240 Oboli.

1. 4. *Auguſta* or *Ausburgh*, Accounts on the Dollar Coined at 65 Creutzers, riſen ſince to 72. Exchange is made on the imaginary Rate of 65 Creutzers.

A Creutzer is ſometimes called a *Schreikenborger*, and in Latin *Crucigerus* and *Cruciatus*, being Pieces ſtamped with a Croſs: Their Groſs make 12 Creutzers; their Lyon Piece half a Creutzer. They have their Snubourgh, Blaphart or Bohemico's of 3 and $3\frac{1}{3}$ Creutzers. The Rix or Rycks Doller is 30 Albes of 8 *d.* every Albe, or 72 Creutzers every Dollar as before. See the following Table, and afterwards in *Germany*.

	Groſs.	*Batz.*	*Albes.*	*Creutzers.*	*Lyon.*	*Pence.*	*Black-pennies.*
Dollar	6	18	30	72	144	240	288
		3	5	17	24	40	48
		Batz.	$1\frac{3}{5}$	4	8	$13\frac{1}{3}$	16
			Albes.	$2\frac{3}{5}$	$4\frac{4}{5}$	8	$9\frac{3}{5}$
				Creutzers.	2	$3\frac{1}{5}$	4
					Lyons.	$1\frac{2}{3}$	2
						Penny.	$1\frac{1}{5}$

3. 2. *Barbary*,

3. 2. *Barbary*, generally Accounts are kept, and Commodities sold by Ducats of 10 *Oz.* each Ounce divided into 8 Parts, which 8 Part is in Value 12 *d.* Sterling.

1. 14. *Barcelona*, as at *Arragon*.

1. 4. *Bavaria*, Accounts and Exchanges both are by Guilders of 7 *s.* and 30 *d.* to the Shilling.

1. 4. *Bohemia*, as in *Germany*, generally by the Dollar of 24 Behemico's, called also *White Grosi*, each of 3 Creutzers: Other Divisions see in the Table following.

Scoc.	Marks.	Dollars.	Angsters.	Bohemico's.	Creutzers.	Pence.
1½	2½	1⅔	12	2	3	10
1	2	1⅓	8	1⅓	2	6⅔
¾	1½	1	6	1	1½	5
½	1	⅔	4	⅔	1	3⅓
⅜	¾	½	3	½	¾	2½
¼	½	⅓	2	⅓	½	1⅔
1/12	1/6	1/9	⅔	1/9	1/6	½

1. 7. *Bologna*, they account by Piastra or Pounds (called also Piastri) each containing 20 Bolognesi; and exchange on the Ducat of 4 Piastri.

1. 8. *Brabant*, and in most Places of the *Low Countries* Monies are accounted by the Pound *Flemish*, containing 20 *s. Flemish*, and every Shillings 12 *d.* or Deniers, called single Stivers, two of which make one double Stiver. See *Flanders*.

1. 4. *Breshaw*, they reckon by Marks of 32 Grosi of 12 Hellers to the Grosi; and exchange by 30 Florins, to have at *Norenborgh* 32 Florins, and at *Vienna* 34 Florins.

1. 7. *Calabria*, Exchanges are made by the *Naples* Ducat of 10 Carlini.

1. 14. *Castile*, Exchanges are made on the Ducat of 375 *Marvedies*, which they call in the Bill of Exchange *Ducadas d'oro*, or *de Peso*: to be paid out of the Bank is better by 6 or 8 *pro Miliar*. See *Spain*.

1. 14. *Cataloni*a, as at *Arragon*.

1. 4. { *Cleves*, / *Collen*, } both Accounts and Exchanges are made by Dollars of 72 *Creutzers*.

Their *Guilders* is

Marks.	Morkens.	White Pennies	Shillings, or Stivers.
4	12	24	48
Mark.	3	6	12
	Morken.	2	4
		White Penny.	2

1. 5. *Constantinople*, as *Aleppo*.

1. 9. *Dantzick*, they account by *Polish* Guilders of 30 Grosi, every Grosi 18 *d.* They buy with the great Mark of 60 Grosi, or the little Mark of 15 Grosi; also by the Scoc. of 3 great Marks: And exchange upon the *Florin Polish*, or the Pound *Flemish*. They have Dollars of 35 Grosi of 3 Shillings, and new Dollars of 24, 26 or 30 Grosi. Their Gilden is 80 Grosi, so is

Scoc.	Gilden.	Great Marks.	Dollars.	Guilders.	Little Marks.	Grosi.	Pence.
2¼	1⅔	3	5⅓	6	12	180	3240
1½	1	2	3⅓	4	8	120	2160
¾	½	1	1⅔	2	4	60	1080
½	⅓	⅔	1	1⅓	2⅔	40	720
⅜	¼	½	⅚	1	2	30	540
¼	1/6	⅓	½	⅔	1⅓	20	360
1/12	1/18	1/9	1/6	⅙	⅓	5	90

Great Mark.	Guilder.	Little Mark.	Grosi.
1	1⅓	2	30
¾	1	1½	22½
½	⅔	1	15
⅜	½	¾	11¼
¼	⅓	½	7½
1/12	1/9	⅙	2½

1. 1. *Denmark*, they account by Marks of 20 Shillings, and exchange upon the Dollar.

1. 6. *Dublin* See *Ireland*.

1. 12. *Edinburgh*: See *Scotland*.

1. 4. *Embden*, they reckon by Gilders, and exchange on the Rix-Dollar, but from *London* hither and thither, upon the Pound *Sterling*.

1. 8. *Flanders*, as before in *Brabant*. See a more particular Division of the *Flemish* Money in the following Table.

Flemish Pound.	Guilders.	Shillings.	Pound.	Double Stivers	Single Stiver.	Groats.	Ortgens.	Negen-Manneken.	Copper Mites. Pence.
0	20	60	120	240	480	960	1920	2880	
	3⅓	10	20	40	80	160	320	480	
		3	6	12	24	48	96	144	
			2	4	8	16	32	48	
				2	4	8	16	24	
					2	4	8	12	
						2	4	6	
							2	3	
								1½	

Ortragen or Oriken.	Negen-Manneken.	Copper Penny.
2	4	6
	2	3
		1½

Five single Stivers are currant in several Places of the *Low Countries* for six Pence *Sterling*; Ort-

kens in ſome Places are called Duyts; Mites in ſome Places of *Flanders* are called Cortes, Engcuni, Points, Pites, Poots.

1. 7. *Florence*, they account by Crowns of 20 *s.* 12 *d.* to the Shilling; and exchange by a Ducat called *Largo*, or *Scripto in Banco*. A Florin there is 24 Quatrini.

1. 3. *France* generally they uſe Livres, Sols, and Deniers, and commonly account by them, as the *Engliſh* by Pounds, Shillings and Pence; but by an Edict made 1577, their Accounts are to be kept in *French* Crowns of 60 Sols to the Crown, or 3 Livres, that is, Pounds *Tournois*; and Exchange is made thereupon, unleſs for ſome Places in *Italy*, where they exchange for number, to have ſo many Ducats for ſo many Crowns of the Sum, not *in ſpecie*, but imaginary, yet repeating the Value or Par. See further in the Table and Notes thereupon.

	Livres.	*Sols.*	*Liarts.*	*Doubles.*	*Deniers.*
French Crown A	3	60	240	360	720
	Livre.	20	8	120	240
B		*Sols.*	4	6	12
C			*Liart.*	1½	3
D				*Double.*	2
E					

There are alſo Petit Deniers and Mailles, but not conſiderable. *A*. This Crown here to make exchange by is equivalent to the Silver Coins of *Lewis* 13th and 14th, called *Lewiſes*, and imaginary, and not to be accounted for the *French Gold* Crown, which is a real Coin and of great Value now, being worth about 8 *s. Sterling*. The Account and Exchange agreed in reality 10 Sols then, and yea commonly reckoned for an *Engliſh* Shilling. Of this Gold Crown was the Cardecue a Quarter, and ſo valued in *Sterling* Money at 18 *d.* and ſhould be wrote *Quartid eſcue*, *Eſcue* being *French* for a *Crown*.

B and *C*, the Livres (or Pounds, ſometimes called Franks) and Sols (wrote ſometimes Soulx) derived from the *Latin*, *Solidus*, as *Livre* from *Libra*, are different. Thoſe commonly uſed are called *Tournois*, and valued with *Sterling* Money as above. Of the Sols *Barrois* 14 make 20 Sols *Tournois*. The Sols *Mauſais* is 2 Sols *Turnois*: The Sols *Paris* is 1¼ Sols *Tournois*. The Sols *Bourdelois* is half the Sols *Paris*, and ſo accordingly is the Livre to be accounted.

D and *E*; neither the Liarts nor Doubles, though both Copper Coins, are uſed in common Accounts.

1. 4. *Franckfort*, their Guilder or Florin by which they reckon is 60 Creutzers divided by 20 *s.* and every Shilling in 12 Hellers according to the Pound. But they exchange by the Dollar of 65 Creutzers, payable in the two Yearly Fairs or Marts, one the Week before *Eaſter*, and the other all the Month of *September*.

1. 7. *Genoa*, all Accounts and Exchanges are made by Crowns of 60 *s.* divided into 20 *s.* and every Shilling into 12 Pence.

1. 4. *Germany*, every Batz, by which generally they keep Accounts, is 4 Creutzers: They exchange on the Dollar, imaginary at 65 Creutzers, and ſo coined, as was noted before at *Auguſta*, though riſen to 72 in Value.

They have Pieces of 3, 6, and 12 Creutzers, and by them and their Batz they value their own and *Exotick* Coins; as the *Hungarian* Ducat is 27 Batz; the Gold Guilder is 18 Batz; the *Poliſh* Guilder or Dollar is 15 Batz; *Teſton* 5 Batz, *&c.* A Guilder was the Name the ancient *Romans* gave to an Ounce, and 8 Ounces made a Mark, and 12 Ounces of Guilders a Pound; and there were coined Pieces called *Nummi Dragmi* or *Groſſen*, the 8th Part of a Dollar. *Anno* 1520 was the Gold Guilder coined for a general Coin, and valued in *Holland* at 28 Stivers, but now in *Specie* at double the Price: Nevertheleſs Corn brought from *Poland* and the *Eaſt Countries*, is bought and ſold by the ſame at the old Value of 28 Stivers.

Angelicies was the ſixth Part of a Dollar, making 3 Batz or 12 Creutzers. Theſe Angelici becoming Tribute Pennies were allayed, and ſo being made worſe, did obtain the Name of Batz or Bats (ſometimes wrote Batſes) *quaſi* Baſe: And in *Thuringia* they are called Gulielmi, and in *Bohemia*, Bohemici, whereof they have alſo 12 Pieces dividedly for for 12 Pence, which Penny is 2 Hellers in Account all over *Germany*.

2. 6. *Goa*, their common Account is by their ordinary Silver Coin a *Pardaune Xeraſin*, having the Image of St. *Sebaſtian* on one Side, and 3 or 4 Arrows bound together at the other, which is worth 3 Teſtons, or 300 Res of *Portugal*, but varieth as the Exchange riſeth or falleth; and accordingly their other Coins and Accounts, of which ſome are imaginary and ſome real. They have alſo ſome good and ſome bad Monies; for 4 good Tanga's or 5 bad Tanga's are reckoned to value 1 Pardaune Xerafin, and 1 Tanga is 75 Baſarves. Of theſe Baſarves 375 make 1 Pardaune Xerafin, and 15 good Barſarves are valued with 18 bad, which are made of bad Tin. By theſe other Country Coins are rated, as the *Larin* of *Perſia* is worth 105, and 108 Baſarves, as the Exchange goes. A Pardaune of *Larins*, is 5 *Larins*, and the Crowns of *Venice* or *Turkey* are almoſt worth 2 Pardaune Xerafins. They have alſo a *Pagod*, or Gold Crown, on which is the Figure of their *Idol*, worth about 8 Tanga's; and Gold Crowns of St. *Thomas* with his Image on them, eſteemed at 7 or 8 Tanga's.

1. 1. *Hamborough*, their Dollar was firſt coined at 31 Shillings Lups, and many Years currant for 33, is now haunced to 54 *s.* Lups, of 3 white Penny, and every Shilling is 12 *d.* and every Penny 2 Hellers. They account by Marks of 16 *s Lubiſh*, and 12 *d.* to the Shilling; but exchange for *London* upon the Pound *Sterling*, and for other Places on the Rix Dollar of 33 *s.* now by them inhaunced to 54 *s. Lubiſh*, or ſo many Stivers *Flemiſh*.

1. 8 *Henault*, as *Antois*.

1. 4. *Hungaria*, account by Guilders of 10 Shillings, of 33 *d.* to the Shilling: and exchange on the Ducat and Rix-Dollar, worth 8 Shillings, formerly but 7 *s.* 6 *d.*

1. 6. *Ireland*, they, as the *Engliſh*, account by Pounds of 20 Shillings *Sterling*, and Pence of 12 to the Shilling; only their Harper, valued in *England* but 9 *d.* was with them counted 1 *s.* ſo as their Pound is but ¾ of ours, or 15 *s. Sterling*; and thereon Exchanges are made.

1. 4. *Leipſick*, as *Breſla*.

1. 10. *Lisbon*: See *Portugal*.

1. 8. *Low Countries*, generally as before at *Brabant*.

1. 2. *London*, Exchanges are generally made for *Germany* and the *Low Countries* on the Pound *Sterling*; for *France* on the *French* Crown of 60 Sols *Tournois*; for *Italy*, *Spain* and other Places on the Ducat, Dollar or Florin, according to the Cuſtom of the Place.

1. 7. *Luca*,

17. *Luca*, for divers Places in *Italy*, and *Lyons* in *France*, Exchanges are made on the Ducat.

l. 3. *Lyons*, as before in *France*.

l. 14. *Madrid*: See *Spain*.

l. 7. *Milan*, Accounts are kept by Ducats Imperial, divided by 20 *s.* and 12 *d.* to the Shilling, and Exchanges made on the ſame, accounting 80 *s.* to the Ducat Imperial; but they buy by a Ducat currant of 120 *s.*

l. 7. *Naples*, they account by Ducats, Taries and Grains. The Ducat is 10 Carlini or 5 Taries, for the Tary is 2 Carlini or Royals; and hereupon Exchanges are made for moſt Places of *Italy*; but for *Lyons* they exchange by Number, as 125 Ducats for 100 Crowns.

l. 5. *Norembourgh*, the Exchange is made on the Dollar of 65 Creutzers, and many times on the Guilder of *Florin*, of 60 Creutzers, which they alſo divide into 20 *s.* and every Shilling into 12 *d.* to keep Accounts by; and ſome ſay the Creutzer is 4 *d.* every Penny is 2 Hellers, and 5 *d.* is called a *Fynfer* or 5 Pennick.

l. 7. *Palermo*, the Ducat is 13 Taries, 1 Tary 2 Carlini, 5 Ryals of *Spain* are 6 Taries. They account by Ounces of 30 Taries, to 20 Grains every Tary, and every Grain 6 Piccolie. And their Exchanges are made upon *Florins* of 6 Taries or Tarii.

l. 3. *Paris*, as before in *France*.

l. 9. *Poland*, they account by Marks, and exchange on the Dollar, and alſo on the Florin of 48 *s.* The Mark is one Third Part of it.

l. 4. *Pomerania*, they divide their Money as in the Next Table following, account by Marks of 16 Snudens, and Exchange upon the Rix-Dollar of 32 *s.* or 2 Marks Snudens, ſo called to diſtinguiſh them from Marks-Lups and Shillings-Lups.

	Marks-Snudens.	*Lups-Shillings.*	*Shillings. Snudens.*	*Pence.*	*Hellers.*
Rix-Dollar, *Mark-Lups.*	2	16	32	384	768
Mark-Snuden.		8	16	192	384
	Shilling-Lups.		2	24	84
		Shilling-Snuden.		21	24
			Penny		2

l. 10. *Portugal*, they account by *Milrais*, Ducats or Cruſado's, *&c.* as in the Table following, and exchange by the ſame Ducat of 400 Rais.

	Ducats, or *Cruſado's.*	*Teſtons.*	*Rials.*	*Vintaines*, or *Half Rial.*	*Raies.*
Mil-Raies.	2½	10	25	50	1000
Ducat, or *Cruſado.*	4	10	20	400	
	Teſton.	2½	5	100	
		Rial.	2	40	
			Vintaine, or *Half Rial.*	20	

Of theſe Ducats, Rials (or Royals) and Raies (wrote alſo Reas, Reyſe and Res) are moſt in uſe for Account. They have Teſtons alſo of 4 Vintaines; 40 Raies are commonly accounted for ſix Pence *Sterling*, and ſo accordingly were the other Coins valued till the late Advance, whereby the Teſton of 100 Raies were ſtamped and made currant for 120 Raies, and ſo rated at 1 *s.* 6 *d.* *Sterling*, when before but 1 *s.* 3 *d.*

l. 7. *Puglia*, as *Calabria*.

l. 9. *Riga*, they buy by Dollars or Florins *Poliſh* of 18 Farthings, whereof 11 make 10 Dollars, but they exchange upon the Rix-Dollar.

l. 3. *Roan*, as before in *France*.

l. 7. *Roan* Accounts and Exchanges are performed by Ducats *di Cameri*, of 13 July or *Guili*, every Ducat; which they divide into 20 *s.* and every Shilling into 12 *d.*

l. 11. } 2. 10. } *Ruſſia*, they have ſmall Coin of 11 *Oz.* 2 Penny Weight fine, called *Dengen*, whereof 320 Pieces weigh but a Mark of 8 *Oz.* They exchange upon the Dollar of *Germany*; but for *London* upon their Rubble, which is valued as a double Ducat, formerly accounted to a Mark *Sterling*, or 13 *s.* 4 *d.*

l. 14. *Saragoſſa*, as *Arragon*.

l. 12. *Scotland*, they account by Pounds, Shillings and Pence as in *England*, but one Pound *Scotch* is but 20 *d.* *Engliſh*. Their Mark is 13⅓ *s.* *Scotch*, currant in *England* at 13½ *d.* Their Noble or half Mark with them 6⅔ *s.* with us 6¼ *d.* their half Noble and third Part of their Noble proportionably. They have alſo Turnoners, Pence and Half-pence; and baſe Money of Bodles, Achiſons, Babees, Placks, *&c.* accounting 6 Bodles to 1 *d.* *Sterling*, or 12 *d.* *Scotch*; 4 Bodles to 1 *Achiſon*, 3 to 1 Babee, and 2 to 1 Plack; but they exchange upon their Mark.

l. 14. *Spain*, as in *Madrid*, *Sevil*, and other Places their Accounts are kept by *Malvedies*, or *Marvedies* (wrote alſo *Merveides* and *Meravides*) whereof 375 are eſteemed to make a Ducat of 11 Rials, tho' really every Rial is 34 *Marveides*, and ſo maketh but 374, as in the Table following; and ſo others keep Accounts accordingly. Exchange is made on this imaginary Ducat of 375 *Marveides*, to be paid in Bank with 5 on the 1000, which is the Salary of the Banker; or without the Bank to be paid without the ſame.

	Pieces of Eight.	*Rials.*	*Quartilio's.*	*Marveides.*	*Carnado's.*
Ducat.	1⅜	11	44	374	2244
Piece of Eight.		8	32	272	1632
	Rial.		4	34	204
		Quartilio.		8½	51
			Marveid		6

A Rial is about 6½ *d.* *Sterling*.

l. 4. *Strasborough* or *Strausburgh*, they have Blapharts, Groſs, Behemico's, all currant for 3 Creutzers apiece, 1 Creutzer at 2 *d.* one Penny at 2 Hellers, and 1 Heller at 2 Orthings.

l. 15. *Sweden*, they rekon by Marks, whereof 8 make a Dollar, whereupon they exchange: And 2 Marks make a Clipping of 9½ Stivers.

l. 4. *Tirol*, the Dollar is 72 Creutzers, and the Creutzer 5 Fynfers or *Hellars*.

2. 11. *Tripoli*, as *Aleppo*.

l. 14. *Valentia*, as *Arragon*.

l. 7. *Venice*, Thirty Bats make 1 Souldey, and 20 Souldeys 1 *Livre* of *Venice*. Their Gold Ducat is valued equal to 40 Maides of *Alexandria*. They have alſo Copper Money, 1 Seſſini make 2 Quatrini, and 1 Quatrine, 4 Bagatini, and ſo 3 Quatrini, or 12 Bagatini make an Half-penny *Sterling*, or thereabouts.

They account by Pounds *Flemiſh* of 10 Ducats of 20 Shillings, and divide the Ducat into 24 Groſs, and the Shilling into 12 *d.* and alſo by the Ducat 124 *s.* called *Ducato di Banco*, or Currant, and thereupon Exchanges are made.

2. 7. *Verona*,

1. 7. *Verona*, their Accounts are kept by 20 *s.* and 12 *d.* to the Shillings; and they exchange upon the Ducat of 93 *s.*

1. 4. *Vienna*, both Accounts and Exchanges are kept and made by *Guilders* or *Florins* of 8 *s.* a piece, 30 *d.* to the Shilling, and 2 Hellers to the Penny.

They esteem the Rix-Dollars at 8 *s.* and the Ducat at 12 *s.*

1. 4. *Ulm*, they reckon by Pounds of 20 *s.* and 12 Hellers to the Shilling; and exchange on the Dollar of 60 Creutzers.

Foreign Gold.	*Fine* Car. gr.	*Pieces to the* lb. Tr.	*Weight by* Malines. pwts. gr.	*Weight by others* pwts. gr.	*Old Value.* l. s. d.	*New Value.* l. s. d.
Albertines: See Ducats.						
Angels { with 3 Lions,	22 0	76	3 3¾	3 3¾	0 8 6	0 11 0½
Angels { with O,	23 0	72	3 8	3 6	0 9 0	0 12 2¼
Angels of: *Batenborgh*,	21 3	72	3 8	3 6	0 9 0	0 11 6¼
Angels of: *Flanders*, or beſt *Flemiſh* Angel,	23 0	72	3 8	3 6	0 9 0	0 12 2¾
Angels of: H. M.	17 0	72	3 8	3 6	0 9 0	0 9 0
Angels of: *Horne*,	23 1½	72	3 8	3 6	0 9 6	0 12 4¾
Angels of: *Thoron*,	22 1½	72	3 8	3 6	0 9 0	0 11 10¼
Angels of: *Vienna*,	18 3	72	3 8	3 6	0 7 6	0 9 11¼
Chaſtillion,	23 3	79¾	3 0 7/11/19	2 33	0 8 10	0 11 4¼
Croſs Daggers of *Scotland*,	22 0	72	3 8	3 6	0 11 0	0 11 8
The half thereof,	22 0	144	1 16	1 15	0 5 0	0 5 10
Crowns: *Flemiſh* Crown,	22 0	108	2 5⅓	2 5	0 6 6	0 7 9¼
Crowns: Floret Crown of *France*,	23 3	100½	2 9 2/6/7	2 9	0 7 0	0 9 8¼
Crowns: *Charles*'s *French* Crown,	23 3	100½	2 9 2/6/7	2 9	0 7 0	0 9 0¼
Crowns: Old *French* Crown,	22 0	108	2 5⅓	2 5	0 6 0	0 7 9¼
Crowns: New *French* Crown, { Some	22 0	107½	2 5 2/4/3	2 5½	0 6 0	0 7 9¾
Crowns: New *French* Crown, { Others	22 0	108	2 5⅓	2 5	0 6 0	0 7 9¼
Crowns: Half *Imperial* Crown,	22 1½	107⅓	2 6 2/4/3	2 6½	0 6 0	0 7 9¾
Crowns: *Italian* Crown,					1 6 0	0 7 11¼
Crowns: Four Crowns of *Portugal*,					0 6 2	0 10 0
Crowns: King *Philip*'s Crown of *Spain*,	22 1½	107½	2 5 2/4/3	2 5 1	0 6 0	0 7 11¼
Crowns: *Scotch* Crown,	22 0	108	2 5⅓	2 5	0 6 0	0 7 9¼
Crowns: Thiſtle Crown,	22 0	186	1 6 3/3/1	1 6¾	0 4 4¾	0 4 6
Cruſado's: or Ducat with the † of *Portugal*,	22 1	105	2 6 6/7	2 6½	0 6 0	0 8 1
Cruſado's: or Ducat with the -|- of *Portugal*,	22 3	105	2 6 6/7	2 6½	0 6 2	0 8 3¼
Cruſado's: Great Cruſado, or the *Portugueſe* of *Emmanuel* of *Portugal*,	23 3	10½	22 20 4/7	22 16	3 8 0	4 6 4¼
Cruſado's: *Joannes* great Cruſado,	22 3	10½	22 20 4/7	22 16	3 5 0	4 2 8½
Dublion of *Spain*,					0 14 6	0 15 2
Ducats of: Albertus or Albertines, { Single	23 3½	105	2 6 6/7	2 6½	0 6 6	0 8 8
Ducats of: Albertus or Albertines, { Double	23 3½	52½	4 13 5/7	4 13	0 13 0	0 17 4
Ducats of: Albertus of *Auſtria*, { Single	23 3	78¾	3 1 1/7	3 0	0 9 0	0 11 5¾
Ducats of: Albertus of *Auſtria*, { Double	23 3	52½	4 13 5/7	4 13	0 13 6	0 17 3¼
Ducats of: ⅔ parts of the ſame double Ducat,	23 3	70½	3 9 3/4/7	3 9	0 10 0	0 12 10¼
Ducats of: ⅓ part of the ſame double Ducat,	23 3	126	1 21 5/7	1 21½	0 5 7	0 7 2
Ducats of: *Arragon*,	23 3	105	2 6 6/7	2 6½	0 6 6	0 8 7½
Ducats of: *Barbary*, and elſewhere in *Turkey*, { Some	23 0½	106½	2 6 6/7/1	2 6	0 6 4	0 8 3½
Ducats of: *Barbary*, and elſewhere in *Turkey*, { Others	23 3	106½	2 6 6/7/1	2 6	0 6 6	0 8 6¼
Ducats of: *Batenborgh* with the †,	19 0	105	2 6 6/7	2 6½	0 5 2	0 6 11
Ducats of: Biſhop's Ducat,	23 0½	105	2 6 6/7	2 6½	0 6 3	0 8 5½
Ducats of: *Caſtile*,	23 3	105	2 6 6/7	2 6½	0 6 6	0 8 7½
Ducats of: *Denmark*,	20 0	106½	2 6 6/7/1	2 6	0 5 4	0 7 2
Ducats of: *Emanuel* of *Portugal*,	23 3	105	2 6 6/7	2 6½	0 6 6	0 8 7½
Ducats of: *Ferdinand* and *Carolus* of *Home*,	18 0	106½	2 6 6/7/1	2 6	0 4 10	0 6 5½
Ducats of: *Ferdinand* of *Batenborgh*,	19 0½	106½	2 6 6/7/1	2 6	0 5 2	0 6 10¼
Ducats of: *Florence*,	23 1	108	2 5⅓	2 5	0 6 4	0 8 2½
Ducats of: *George Rechem*,	21 3	106½	1 6 6/7/1	1 6	0 6 1	0 7 9½
Ducats of: *Guelders*,	23 1	106½	2 6 6/7/1	2 6	0 6 3	0 8 4
Ducats of: *Gulielmus* of *Batenborgh*,	21 3	52½	4 13 5/7	4 13	0 12 4	0 15 9¾
Ducats of: *Hamborough*,					0 7 2	0 8 9
Ducats of: *Holland*,	23 2	105	2 6 6/7	2 6	0 6 5	0 8 6¼
Ducats of: *Hungary*, or half Noble,	23 3 1/8	113½	2 2½ 7/2/7	2 2½	0 6 4	0 8 0
Ducats of: Other *Hungary* Ducats,	23 1	104½	2 7 3/5/2/9	2 7½	0 6 4	0 8 5¾
Ducats of: *Italy*, { Some as *Venice*.						
Ducats of: *Italy*, { Others	23 1	106⅖	2 6 6/7/5	2 6	0 6 3	0 8 4
Ducats of: *Majorca*,	23 1	52½	4 13 5/7	4 13	0 13 0	0 16 10¾
Ducats of: *Mary* of *Batenborgh*,	20 0½	106½	2 6 6/7/1	2 6	0 5 4	0 7 2½
Ducats of: *Navarre* & ſome others, as *Majorca*,						
Ducats of: *Nimmeghen* with *Stephen*,	21 1	52½	4 13 5/7	4 13	0 12 0	0 5 5½
Ducats of: *Nimmeghen* of 1665,	18 2	108	2 5⅓	2 5	0 4 10	0 6 6½

Ducats of	*Oſwald* Ducat *Cruſa*,	19	0½	106½	2	6 6/71	2	6	0	5	2	0	6	10¼
	Pancratius Alleb. H. as *Oſwald.*													
	Peter Rechem, as *Geo. Rechen.*													
	Portugal: See *Cruſado's*, *Milreys.*													
	Rome, Single, Some,	23	3	105	2	6 6/7	2	6½	0	6	6	0	8	7½
	Rome, Single, Ohters,	23	3	106½	2	6 6/71	2	6	0	6	6	0	8	6¼
	Rome, Double,	23	3	52½	4	13 5/7	4	13	0	13	0	0	17	3
	S. Victor Rancratius, as *Geo. Rechem*,													
	Spain, Single, Some,	23	1	105	2	6 6/7	2	6½	0	6	6	0	8	5¼
	Spain, Single, Others,	23	2	105	2	6 6/7	2	6	0	6	6	0	8	6½
	Spain, Double	23	2	52½	4	13 5/7	4	13	0	13	0	0	17	1
	Spain, Great	22	0	24	10	0	10	0	1	10	0	1	15	0
	States of the Un. Prov. with Letters,	22	0	52½	4	13 5/7	4	13	0	12	4	0	16	0
	The Half thereof,	22	0	105	2	6 6/7	2	6½	0	6	2	0	8	0
	Stephanus of *Batenborgh*,	19	0½	52½	4	13 5/7	4	13	0	10	5	0	13	10¾
	Suevia,	23	1	104½	2	7 25/209	2	7	0	6	3	0	8	5¾
	Valence,	23	3	105	2	6 6/7	2	6½	0	6	6	0	8	7½
	Venice,	23	3	106½	2	6 6/71	2	6	0	6	6	0	8	6¾
	Victor Batenborgh, as *Geo. Rechem*,													
	Victor H. B. as *Mary* of *Batenborgh*,													
	W. B. Margaret *Toren*,	21	3	106½	2	6 6/71	2	6	0	6	1	0	7	9½
	Water Ducats, as *Mary* of *Baten.*													
	Zeland, Single,	23	0½	105	2	6 6/7	2	6½	0	6	3	0	8	5½
	Zeland, Double,	23	0½	52½	4	13	4	13 5/7	0	12	6	0	16	11
	Ducat with the Chequer, as *Den.*													
	Floret of *France*,	22	0	100½	2	9 21/67	2	3	0	6	5	0	8	4¼
	The new *Floret*: See *Gilden.* St. *And*													
	Golden Fleece, or *Toyſon d'Or*,	23	3¼	81⅛	2	22 470/4607	2	22¾	0	9	2	0	11	3¼
	Golden Guilder, or *Guildren*,	18	3	112½	2	3 1/5	2	6	0	4	6	0	6	4¼
Guilders of	St. *Andrew*, Old,	18	1	108	2	5 1/3	2	3¼	0	4	10	0	6	5¼
	St. *Andrew*, New, or *Floret*,	18	3	108	2	5 1/3	2	3	0	5	0	0	6	7½
	Arnoldus,	12	0	138	1	17 1/23 7/23	1	17½	0	2	7	0	3	3¾
	Carolus,	14	0	126	1	21 6/7	1	21⅛	0	3	6	0	4	2½
	Clemmer,	13	0	114	2	2 19/19	2	2	0	3	6	0	4	4¼
	Collen,	17	3	114	2	2 19/19	2	2¾	0	4	8	0	5	11¼
	David of the *Harp*,	15	0	114	2	2 19/19	2	2	0	4	0	0	5	0¼
	David of Triers,	17	2	114	2	2 19/19	2	2	0	4	8	0	5	10¾
	David of *Utrecht*,	16	0	114	2	2 19/19	2	2	0	4	3	0	5	4¾
	Frederick of *Bavaria*,	14	0	117	2	1 3/13	2	1	0	3	8	0	4	6⅞
	Gulielmus,	18	1	108	2	5 1/3	2	5	0	5	10	0	6	5¼
	Horne,			158¾	1	12 36/127	1	12¼	0	4	11	0	6	4
	Joannes,	16	0	109½	2	4 44/72 10/19	2	4½	0	4	6	0	5	7
	Peter of *Louvaine*,	17	0½	114	2	2 10/19	2	2	0	4	5	0	5	8¾
	Philip,	15	3	111	2	3 33/37	2	3¼	0	4	2	0	5	5
	The Half thereof,	15	3	222	1	1 35/27	1	1⅝	0	2	1	0	2	8½
	Reniſh Guilder,	22	0	102¾	1	8 24/411	2	8	0	6	0	0	8	2
	Saxon,	17	3	113	2	2 110/113	2	2¼	0	4	8	0	5	11¾
	States of the United Provinces,	20	0	120¾	1	23 117/181	1	23½	0	4	8	0	6	3¾
	Lyons, Golden Lyon of *Flanders*,	20	0	89¼	1	16 64/119	2	16½	0	7	8	0	10	1¾
	⅔ Part thereof,	23	3	133⅞	1	19 3/119	1	19	0	4	11	0	6	9
	¼ Part thereof,	23	3	267¾	0	21 61/119	0	21⅓	0	2	5	0	3	4½
	Louiſſes of *Louis* 13 & 14 of *France*,	22	0	54	4	10 2/3	4	8	0	15	0	0	15	6½
	The Half thereof,	22	0	108	2	5 3/11	2	4	0	7	6	0	7	9¾
Marks and Milreys	Mark of *Bohemia*,								0	6	0	0	7	6
	20 Marks of *Scotland*,	22	0	36	6	16	6	10	1	2	0	1	3	4
	10 Marks of *Scotland*,	22	0	72	3	8	3	3	0	11	0	0	11	8
	5 Marks of *Scotland*,	22	0	144	1	16	1	14	0	5	6	0	5	10
	6 Marks of *Suevia*,								0	4	9	0	6	0
	Milreys or Ducan of *Portugal*,	22	1	48	5	0	4	20	0	13	4	0	17	8¼
	Half Milreys,	22	1	96	2	12	2	10	0	6	8	0	8	10
	Counterfeit Milreys,	21	0	48	5	0	4	20	0	12	6	0	16	8½
Nobles of	*Bridges*,	23	0	88½	2	17 5/97	2	17	0	7	4	0	9	11
	Half *Flemiſh* Noble,	23	0	108	2	5 1/3	2	5	0	6	0	0	8	1½
	Flanders, or *Flemiſh* Noble,	33	0	54	4	10 2/3	4	10	0	12	0	0	16	3
	Gaunt,	23	0	54	4	10 2/3	4	10	0	12	0	0	16	3
	Half Noble, as the *Hungary* Ducat.													
	½ Noble, with the Lion, as *Bridges.*													
	Henry Noble of *France*,	22	0	51	4	16 6/17	4	16	0	13	4	0	16	5½
	The Half thereof,	22	2½	108	2	5 1/3	2	5	0	6	8	0	7	7¼
	Holland,	23	2	48	5	0	4	20	0	14	3	0	18	10¾
	Overyſſel and *Utrecht* } as *Holland.*													
	Zeland, as *Gaunt.*													

Pezo of *Peru*, by *Heylin*, P. 1064,									0	6	6	0	8	0
Pistoles of: *De Lege* and *Legion*,	18	0	108	2	$5\frac{1}{3}$	2	5		0	4	9	0	6	$4\frac{1}{4}$
Italy, Some,	21	$2\frac{1}{2}$	108	2	$5\frac{1}{3}$	2	5		0	5	9	0	6	$7\frac{1}{2}$
Italy, Others,	22	0	108	2	$5\frac{1}{3}$	2	5		0	5	10	0	7	$9\frac{1}{4}$
Scotland,	19	$2\frac{1}{2}$	108	2	$5\frac{1}{3}$	2	5		0	5	2	0	6	$11\frac{1}{4}$
Spain, Single, Some,	21	$3\frac{1}{2}$	108	2	$5\frac{1}{3}$	2	5		0	5	10	0	7	$9\frac{1}{4}$
Spain, Single, Others,	22	0	108	2	$5\frac{1}{3}$	2	5		0	5	10	0	7	$9\frac{1}{4}$
Spain, Double,	22	0	54	4	$10\frac{2}{3}$	4	8		0	11	8	0	15	$6\frac{1}{2}$
Of 26 Ryals,	22	0	45	5	8	5	6		0	14	0	0	18	8
Portuguese: See great Crusado of *Portugal*.														
Bourbon,	12	$0\frac{1}{2}$	$136\frac{1}{2}$	1	$18\frac{8}{19}$	1	18		0	2	7	0	3	$4\frac{3}{4}$
Cleves,	9	$0\frac{1}{2}$	156	1	$12\frac{12}{13}$	1	$12\frac{3}{4}$		0	1	9	0	2	$2\frac{3}{4}$
Dog and Cat, as *Bourbon*,														
Fran. Frier,	9	0	156	1	$12\frac{12}{13}$	1	$12\frac{3}{4}$		0	1	8	0	2	$2\frac{1}{2}$
Horn,	10	$0\frac{1}{2}$	156	1	$12\frac{12}{13}$	1	$12\frac{3}{4}$		0	1	11	0	2	$5\frac{1}{4}$
Juliers, or *Guliers*,	9	3	156	1	$12\frac{12}{13}$	1	$12\frac{3}{4}$		0	1	10	0	2	$4\frac{1}{2}$
Pounds, 6 Pound *Scotch*,	22	0	80	3	0	3	0		0	10	0	0	10	6
Pounds, 12 Pound *Scotch*,	22	0	40	6	0	6	0		1	0	0	1	1	0
Ryders of: *Burgundy*,	23	$0\frac{1}{2}$	105	2	$6\frac{6}{7}$	2	$6\frac{1}{2}$		0	6	3	0	8	$5\frac{1}{2}$
Campen and *Swoll*,	12	3	114	2	$2\frac{10}{19}$	2	2		0	3	2	0	4	$3\frac{1}{4}$
Deventer, as *Campen* and *Swoll*,														
Flanders,	23	3	105	2	$6\frac{6}{7}$	2	$6\frac{1}{2}$		0	6	6	0	8	$7\frac{1}{2}$
Freesland, Guelders, } of the Year 1583.	21	0	108	2	$5\frac{1}{3}$	2	5		0	5	6	0	7	5
Guilders Ryder,	14	0	114	2	$2\frac{10}{19}$	2	2		0	3	6	0	4	$8\frac{1}{4}$
Guilders new Ryder,	23	3	105	2	$6\frac{6}{7}$	2	$6\frac{1}{2}$		0	6	9	0	8	$7\frac{1}{2}$
Phillip Clincart,	14	0	114	2	$2\frac{10}{19}$	2	2		0	3	6	0	4	$8\frac{1}{4}$
Ryder, with the Loaves,	10	$0\frac{1}{2}$	114	2	$6\frac{10}{19}$	2	2		0	2	7	0	3	4
Scotland, Some,	19	$2\frac{1}{2}$												
Scotland, Others,	22	0												
States of the United Provinces,	22	0	36	6	16	6	12		1	0	0	1	3	4
The Half thereof,	22	0	72	3	8	3	6		0	10	0	0	11	8
Ruble of *Muscovy*, by *Heylin* 13 *s.* 4 *d.*									0	10	0	0	13	4
Ruble of *Piland*,									0	13	4	0	13	4
Royals or Reals of: *Austria*, Single,	23	$3\frac{1}{2}$	$49\frac{1}{2}$	4	$20\frac{4}{11}$	4	20		0	14	4	0	18	5
Austria, Double,	23	$3\frac{1}{2}$	$24\frac{3}{4}$	9	$16\frac{8}{11}$	9	16		0	8	8	1	16	10
Campen and *Swoll*,	23	0	$40\frac{1}{2}$	4	$20\frac{4}{11}$	4	20		0	14	2	0	17	9
The Half thereof,	23	0	99	2	$10\frac{2}{11}$	2	10		0	7	1	0	8	$10\frac{1}{2}$
Flanders, or the Key,	23	0	$69\frac{3}{4}$	3	$10\frac{18}{31}$	3	$10\frac{1}{2}$		0	10	0	0	12	$6\frac{3}{4}$
The Half thereof,	23	0	$139\frac{1}{2}$	1	$17\frac{9}{31}$	1	$17\frac{1}{4}$		0	5	0	0	6	$3\frac{1}{4}$
Imperial Loyal,	23	$3\frac{1}{2}$	69	3	$11\frac{11}{23}$	3	11		0	11	0	0	13	$2\frac{1}{2}$
The Half thereof,	18	0	$105\frac{1}{3}$	2	$6\frac{54}{79}$	2	$6\frac{1}{2}$		0	4	11	0	6	$6\frac{1}{4}$
Philip with the *Spread-Eagle*,	18	2	$109\frac{1}{2}$	2	$6\frac{9}{71}$	2	6		0	5	0	0	6	$7\frac{1}{2}$
Phillip of *Spain*,	23	0	$69\frac{3}{4}$	3	$10\frac{18}{31}$	3	$10\frac{1}{2}$		0	10	0	0	12	$7\frac{3}{4}$
Ship of *Flanders*, or *Sohuytken*,	22	1	$109\frac{1}{2}$	2	$4\frac{44}{73}$	2	$4\frac{1}{2}$		0	6	3	0	7	9
Shock of *Bohem*, some say 8 *s.* some									0	9	0	0	9	0
Stiver Pieces, 9 Stiv. Pieces of *Batenborg* and *Frize*,	7	1	176	1	$8\frac{8}{11}$	1	$8\frac{1}{2}$		0	1	3	0	6	$6\frac{3}{4}$
Sultains of 120 *Aspers*,	23	1	90	2	15	2	16		0	7	0	0	9	$10\frac{1}{2}$
Table of *China*,									0	5	$4\frac{1}{2}$	0	7	2
Tomam of *Persia*, by *Heylin*, P. 839 valued at 20 Crowns, seemeth not to be any Coin, but a Denomination used in Account,									5	0	0	5	0	0
Unicorn of *Scotland*,	22	0	$99\frac{1}{4}$	2	$10\frac{14}{397}$	2	10		0	6	0	0	8	$5\frac{1}{2}$
Xeriffe of *Goa* in *India*, by *Heylin*									0	6	0	0	7	6
By *Grimstone*, P. 197, worth 300 *Res* of *Portugal*.														
Zechines, or, *Checkeenes* of *Venice*,	23	1	90	2	16	2	$15\frac{3}{4}$		0	7	6	0	9	10

Foreign Silver.

	Fine oz.	Fine pwts.	Pieces to the lb. Troy	Weight of the Pieces oz.	Weight of the Pieces pwts.	Weight of the Pieces gr.	Sterling Value s.	Sterling Value d.	Value by some Auth. s.	Value by some Auth. d.
Albi of — *Bambergh*,	4	18	273	0	0	$21\frac{9}{19}$	0	1 +	0	1
Albi of — *Collen*, Some	5	10	345	0	0	$16\frac{16}{23}$	0	1 +	0	1
Albi of — *Collen*, Others	5	10	342	0	0	$16\frac{16}{19}$	0	1 +	0	1
Albi of — *Collen*, Others	5	10	179	0	1	$8\frac{32}{179}$	0	2 —	0	2
Albi of — *Frankford*, as *Bambergh*.										
Albi of — *Mentz*, as *Collen*,										
Albi of — *Norembergh* and *Palatine* of the *Rhine*, as *Bambergh*.										
Albi of — *Trier*, as *Collen*.										
Alteen, or *Atten* of *Muscovia*,									0	4 +
Altine of *Poland*,									0	$4\frac{1}{2}$
Angel of *Scrikelborgh*,	10	$7\frac{1}{2}$	$78\frac{1}{4}$	0	3	$1\frac{5}{7}$	0	$8\frac{1}{2}$ +	0	8
Asper of *Turkey*,									0	$1\frac{1}{4}$
Babee of *Scotland*,									0	$0\frac{1}{2}$
Batz of 4 Creutzers — *Bavaria*,										
Batz of 4 Creutzers — *Brandenburgh*,										
Batz of 4 Creutzers — *Colmograve*,										
Batz of 4 Creutzers — *Cost* of 1530,										
Batz of 4 Creutzers — *Friburgh*,										
Batz of 4 Creutzers — *Ottinge*,	5	7	$109\frac{1}{2}$	0	2	$4\frac{44}{53}$	0	3 +	0	3
Batz of 4 Creutzers — *Raynsburgh*,										
Batz of 4 Creutzers — *Roy*,										
Batz of 4 Creutzers — *Scafhusen*,										
Batz of 4 Creutzers — *Taunte*,										
Kemptor half *Batz*,										
Munchien half *Batz*,	4	$12\frac{1}{2}$	$192\frac{1}{2}$	0	1	$5\frac{71}{77}$	0	$1\frac{1}{2}$ +	0	$1\frac{1}{2}$
3 *Batz*: See *Snaphane*.	4	$12\frac{1}{2}$	186	0	1	$6\frac{30}{31}$	0	$1\frac{1}{2}$ +	0	$1\frac{1}{2}$
Bemesh, or *Bemish* of *Switz*.										
Bianco, or *Biamco* of *Italy*,									0	$2\frac{1}{2}$
Blanks,									0	8
Half *Ruyters* Blank of *Holland*,	3	0	144	0	1	16	0	$1\frac{1}{4}$ +	0	$0\frac{3}{4}$
Boligneo,									0	$1\frac{1}{4}$
Carlini of *Italy*,									0	$0\frac{3}{4}$
Carolus Guilder, as $\frac{2}{3}$ of the *Philip*'s Dollar.									0	6
3 *Carolus* of — *Carolus* and *Salsburgh*,										
3 *Carolus* of — *Campidona*,										
3 *Carolus* of — *Ernestus*,										
3 *Carolus* of — *Frankford*,	9	0	$78\frac{3}{4}$	0	3	$1\frac{1}{7}$	0	$7\frac{1}{4}$ +	0	7
3 *Carolus* of — *Ottingus*,										
3 *Carolus* of — *Patavia*,										
3 *Carolus* of — *Reynsborgh*,										
Causleto or *Caveleto* of *Italy*,									0	$3\frac{1}{4}$
Cruciat of *John* of *Cleve*,	8	7	$39\frac{3}{11}$	0	6	$0\frac{48}{53}$	1	$1\frac{1}{2}$ +	1	1
Creutzers or Crosses, of *Ausburgh* and *Ulm*,	5	5	384	0	0	15	0	$0\frac{3}{4}$ +	0	$0\frac{3}{4}$
Creutzers or Crosses, of *Poland*,									0	$0\frac{3}{4}$
Creutzers or Crosses, 12 *Creutzers* of *Bavaria*, *Vienna*,	8	$7\frac{1}{2}$	57	0	4	$5\frac{9}{19}$	0	$9\frac{1}{2}$ +	0	9
Creutzers or Crosses, Other 12 *Creutzer* Pieces,	8	$7\frac{1}{2}$	$61\frac{1}{2}$	0	3	$21\frac{27}{41}$	0	$8\frac{3}{4}$ +	0	9
Creutzers or Crosses, And some	10	10	same	same,			0	11 +	0	11
Creutzers or Crosses, 10 *Creutzers* of *Frise*, *Ravenburgh*, *Salsburgh*, *Saxony*,	8	7	$64\frac{1}{2}$	0	3	$17\frac{23}{43}$	0	$8\frac{1}{4}$ +	0	8
Cruciats, Creutzers or Crosses, 6 *Creutzers* of *Insburgh*, *Vienna*,	10	10	$124\frac{1}{2}$	0	1	$22\frac{23}{83}$	0	$5\frac{1}{2}$ —	0	5
Cruciats, Creutzers or Crosses,	8	$7\frac{1}{2}$	114	0	2	$2\frac{10}{18}$	0	$4\frac{3}{4}$ +	0	5
Cruciats, Creutzers or Crosses, Other 6 Creutzer Pieces,	10	10	123	0	1	$22\frac{34}{41}$	0	$5\frac{1}{2}$ +	0	5
Cruciats, Creutzers or Crosses, 3 *Creutzers* of *Bavaria*,	4	8	375	0	0	$15\frac{15}{19}$	0	$0\frac{3}{4}$ +	0	$0\frac{3}{4}$
Cruciats, Creutzers or Crosses, *Vienna*,	4	$8\frac{1}{2}$	129	0	1	$20\frac{28}{43}$	0	$2\frac{1}{4}$ +	0	2
Cruciats, Creutzers or Crosses, Other 3 Creutzer Pieces,	5	10	$136\frac{1}{2}$	0	1	$80\frac{19}{192}$	0	$2\frac{1}{2}$ +	0	2
Cruciats, Creutzers or Crosses, 2 *Crosses* and *Harpe*,	4	0	180	0	1	8	0	$1\frac{1}{4}$ +	0	$1\frac{1}{4}$
Crowns of *France*: See *Louis*,									5	0
Crowns of *Italy*,									6	0
Crowns of *Turkey*,									1	0
Cupstoke,										
Deghen or *Denghen* of *Muscovia* and *de Narde Russia*,	11	13	$545\frac{1}{5}$	0	0	$10\frac{210}{295}$	0	$1\frac{3}{4}$ +	0	$1\frac{1}{4}$

Denier,

Denier, Petit Deneir of	Paris,	1	10	270	0	0	21 1/5	0	0 1/4 +	Not cur. in Engl.
	Tor,	1	10	337 1/2	0	0	17 5/15	0	0 1/4 +	
Dicken of a Wing,										1 8
Dollars or Ducats of: Albania,, or the Cross Dollar,										4 4
Basil of 6 Creutzers,		10	13 1/2	15	0	16	0	3	10 +	3 10
Batenburgh, Bohemia, Ne. Op.		7	15	13 1/2	0	17	18 2/3	3	1 1/4	3 1
Pommel,										
Brisgaw,		10	15	15	0	16	0	3	10 1/2 —	3 10
Cambray, the sixteenth Part,		6	10	123	0	1	22 3/4 1/1	0	3 1/4 +	0 3
Christopher, 45,		10	10	12 3/4	0	18	19 1/17 3/7	4	5 1/4 +	4 5
Friesland of 1601,		9	0	13 1/2	0	17	18 2/3	3	7 1/4 —	3 7
See Guelders.										
Germany, or	Rix Dollar Ouncia,	11	5	12 1/2	0	19	4 4/5	4	10 1/4 +	5 0
	Rix Dollar of 1567.	10	12	12 1/2	0	19	4 4/5	4	7 +	4 7
	Others	10	13	12 1/2	0	19	4 4/5	4	7 1/4 +	4 7
	Others	10	14	12 1/2	0	19	4 4/5	4	7 1/2 +	4 7
	Others	11	0	12 1/2	0	19	4 4/5	4	2 +	4 9
	Others	11	3	12 1/2	0	19	4 4/5	4	9 3/4 +	4 10
Guelders and Friesland,	Some	10	4	14 1/2	0	16	20 4/19	3	10 1/4 +	3 10
	Others	9	0	12 3/6 2	0	9	22 3/2 5 7	4	0 1/4 +	4 0
Guelders and Utrecht,	Some	9	0	15	0	16	0	3	2 3/4 +	3 3
	Others	10	10	13	9	18	11 1/13	4	4 1/2 +	4 4
	Others	10	12	13	0	11	11 1/13	4	4 3/4 +	4 4
See Zutphen.										
Gulielmus of Sweden,		10	10	12 3/4	0	18	19 1/17 3	4	5 1/4 +	4 5
Gustavus of Liege 38th.		10	4	12 3/4	0	18	19 1/17 3	4	3 3/4 +	4 4
Holland,		9	0	13 1/3	0	18	0	3	7 3/4	3 8
Holland with the Crown,		8	0	13 1/3	0	18	0	3	2 3/4	3 3
Ismensen, as Basil.										
Luneburgh,		10	16 1/5	15	0	16	0	3	10 3/4	3 10
Philip,		10	0	10 5/7	1	2	9 3/5	5	0 1/2 +	5 0
Half of the Philip's Dollar,		10	0	21 3/7	0	11	4 4/5	2	6 1/4 +	2 6
Fourth Part,		10	0	42 6/7	0	5	14 2/5	1	3 +	1 3
Fifth Part,		10	0	53 4/7	0	4	11 1/2 3/5	1	0 +	1 0
Tenth Part,		10	0	107 1/7	0	2	5 1 9/5	0	6 +	0 6
Twentieth Part,		5	0	107 1/4	0	2	5 1 0 1/4 5	0	3 +	0 3
Fortieth Part,		5	0	214 1/2	0	1	2 1 2 2/4 3	0	1 1/2 +	0 1 1/2
Two third Parts of the same Dollar,		10	0	16 1/4	0	14	22 3/5	3	4 +	3 4
Poland,	Some as Batenburgh,									
	Others of 60 Creutzers,	11	3 1/2	15	0	16	0	4	0 1/4 +	4 0
Prince of Orange, or Lyon Dollar,		9	0	13	0	18	11 1/13	3	8 3/4 +	4 0
Keynsburgh, as Basil.										
Riga,		10	2 1/2	13 1/2	0	17	18 2/3	4	0 1/8 +	4 0
Scotland with the Cross Daggers,		11	2	11 3/4	1	0	10 1 0/4 7	5	1 1/4 +	5 0
States-General of the United Provinces,		9	0	12 3/6 4	0	19	22 3/2 5 7	4	0 1/4 +	4 0
Suecia, or	Merchant's Dollar,									3 2
	Rixs, or Imperial Dollar,									5 2
Tremone, as Brisgau,										
Utrecht: See Guelders,										
Zealand with the Eagles,		9	0	13 1/7	0	17	18 2/3	3	7 1/4 —	3 7
Zutphen and Guelders of 1586.		10	4	13 2/3	0	17	10 1 9/4 1	4	0 1/4 +	4 0
Drier,										0 0 1/4
Duplus,		2	0	324	0	0	17 7/9	0	0 1/4 +	Not cur. in Engl.
Dupli Simple,		5	10	882	0	0	6 2 6/4 9	0	0 1/4 +	
Dupli Mais 1/9 of Guliel. of Turing,		2	15	440	0	6	13 1/1 1	0	0 1/4 +	Nor this,
Duyts: 9 Duyts Penny of Charles and Philip,		4	14	129	0	1	20 2 8/4 5	0	2 1/4 +	0 2 1/4
11 Duyts of	Charles Limburgh,	4	15	120	0	2	0	0	2 1/2 +	0 2 1/2
	Holland,	6	0	144	0	1	16	0	2 1/2 +	0 2 1/2
	Philip and Mary,	11	3 1/2	270	0	0	21 1/5	0	2 1/2 +	0 2 1/2
17 Duyts.		10	10	147	0	1	15 2/4 5	0	2 1/2 +	0 4 1/2
17 Duyts of	Charles, Guelders, Liege, Limburgh, Lodouick, Philip, Philip of Flanders, Two standing Lyons,	9	10	145	0	1	15 2 1/2 9	0	4 1/4 —	0 4 1/2
17 Duyts of Sluce,		9	5	48	0	1	14 3 4/4 7	0	4 +	0 4
Flabes in the Low-Countries,										1 4
Finferkin,										0 0 1/8
Fleece: See Stivers.										

Florins by *Heylin*,										3	0
Franks of *Turkey*,										2	0
Franks of *France*, 3 to a Crown,	10	0	26¼	0	9	3⅜	2	0⅓+		2	0
Gagatta of *Italy*,										0	1
Gnibii of *Rome*,										0	6
Grot, or *Groot*,										0	1¼
Groots: 3 *Grots* or *Deniers*,	5	10	117¾	0	2	0 1/2 4/5 4/7	0	3 +		0	3
Groots: 5 *Groots* of *Flanders*,	10	6½	146½	0	1	15 9/5 3/5	0	4½+		0	4½
Groots: 5 *Groots* of *Gaunt*,	5	13	145	0	1	15 2/5 1/5	0	2½+		0	2½
Groots: 5 *Groots* of *Philip* of *Flanders*,	11	3	135	0	1	18⅗	0	5 +		0	5¼
Groots: 5 *Groots* of Others,	10	14	135	0	1	18⅖	0	5 +		0	5
5 ½ *Groots* of 1520. *Mr. Flanders*,	9	14	120	0	2	0	0	5¼—		0	5¼
Gross or Gross of: *Ambass.*	4	12½	94½	0	2	2 20/21	0	3 +		0	3
Ausburgh, Some,	5	7	108	0	2	5⅓	0	3 —		0	3
Ausburgh, Others,	6	4½	155	0	1	13 5/31	0	2½+		0	2½
Ausburgh, Others of the Batz,										0	9
Basil,	9	0	118½	0	2	0 48/59	0	3¼+		0	3¼
Bassaw,	5	7	116½	0	2	6 6/71	0	3¼+		0	3¼
Bohemia, 1 ½ Silver Grosh,	3	7½	87	0	2	18 6/29	0	2½+		0	2½
Brislau, as *Bassaw*.											
Brisgrave, } *Campido*, } as *Basil*.											
Corinthia, }											
Coningstein,	5	7	108	0	2	5⅓	0	3 +		0	3
Curiensis, as *Bassaw*.											
Duodena, or the 12 part of the Sil. *Grosh*,	3	3⅔	974½	0	0	6 3/5 4/8 2/3	0	0¼—		Not cur. in *Eng*	
Ferdinando of *Dantzick*,	5	0	180	0	1	8	0	1¾+		0	2
George and *Wormeser*, as *Ambass.*											
Kempton, as *Bassaw*.											
Markgrave, as *Ambass.*											
Mary,										0	1¼
Melvin 3 *Grosh* of 1340,	10	4	138	0	1	17 1/2 7/3	0	4¾+		0	5
Melvin 3 *Grosh* Others,	10	10	138	0	1	17 1/2 7/3	0	4¾+		0	5
Meysen,										0	2⅜ or 3*d*
Noiling, as *Ambass.*											
Poland,										0	1½
Poland fix *Grosh*,	6	0	13⅞	0	17	7 5/37	2	4 +		2	4
Prague,	9	12½	180	0	1	8	0	3¼+		0	3¼
Prussia, 3 *Grosh alb.*	10	10½	138	0	1	17 1/2 7/3	0	4¾+		0	5
Reynsburgh,	6	4½	155	0	1	13 5/31	0	2½+		0	2½
Salisburgh, Some,	6	2⅖	118½	0	2	0 48/59	0	3¼+		0	3¼
Salisburgh, Others,	4	12½	39	0	6	3 9/13	0	7½+		0	7½
Saxony, as *Coningstein*.											
Scafbauysen, as *Basil*.											
Sigismund of 1532 and 1535,	10	4	69	0	3	11 1/23	0	9½+		0	3½
Sigismund of *Prussia* 1534,	10	11	69	0	3	11 1/23	0	9¾+		0	10
Others with the Arms of *Dantzick*,	10	0½	69	0	3	11 1/23	0	9¼+		0	9¼
Silver Grosh common,										0	2
Tavern, as *Basil*.											
Vienna,	6	4	132	0	1	19 7/11	0	3 +		0	3
½ Silver *Grosh*,	3	7⅓	87	0	2	18 6/29	0	2½+		0	2½
4 *Grosh* Penny,	8	0	81	0	2	23 1/29	0	6¼+		0	6
Guilders or Guildens: *Albertus* Double,	10	15	14⅗	0	16	10 10/73	4	0 —		4	0
Albertus Single,	10	15	29⅕	0	8	5 1/73	2	0 —		2	0
Albertus Half,	10	15	58⅖	0	4	2 46/73	1	0 —		1	0
Albertus Quarter,	10	15	116⅘	0	2	1 23/73	0	6 —		0	0
Carolus, as ⅔ of the *Philip's Dollar*.											
Flanders Silver *Guilder*,										2	0
Gulielmus of *Turin*,	6	15	129	0	1	20 38/42	0	3¼+		0	3¼
Harp of *Ireland*, or *Silver Harp*,	11	0	82	0	2	22 10/41	0	8½+		0	9
Half *Harp*,	11	0	164	0	1	11 5/41	0	4¼+		0	4½
Base *Irish Harp*,	3	0	82	0	2	22 10/41	0	2¼+		0	2¼
Old *Harp*,	9	6	102	0	2	8 8/17	0	5¼+		0	6
Junctine or *Justino* of *Italy*,										1	6
Lion of *Gulielmi*, Some,	2	5	150	0	1	14⅖	0	0¾+		0	1
Lion of *Gulielmi*, Others,	2	5	179	0	1	8 2/17 2/3	0	0¼+		0	1
Livre of *France*: See *Quar. Cro.* by *Heylin*										2	0
Louis of *France*,	11	2								4	6
Half, Quart. and 8th part accordingly.	3	0									
Lyarts of *France*, H.										Not cur. in *Eng*	
Lyre of *Geneva*,										1	4
Lyre of *Venice*,										0	9

											Not cur. in *E*	
Maille, old *Petit Maille*,	1	0	450	0	0	12 4/5	0	0 7/8 +				
Magenburg, 3 Arms,	5	8 1/3	27	0	8	21 1/3	1	1 +	1	1		
Other Piece,	11	2 1/2	51	0	4	16 6/17	1	2 +	1	2		
Mark of *Denmark*,									2	2		
Mark of *Scotland*,	11	2	54	0	4	10 2/3	1	1 1/4 +	1	1 2/4		
Half and Quarter accordingly.												
Markestick { of *Lady Mary*. / *Lubeck*, }	10	16 1/2	27	0	8	21 1/3	2	2 +	2	2		
Medine of *Cairo*,									0	2 2/4		
Murfengio,									0	11		
Nummi Dragme, { Some,	6	0	140	0	1	17 1/7	0	2 3/4 +	0	3		
Others,	6	2	118 1/2	0	2	0 4 9/78	0	3 1/4 +	0	3		
Penny of { *Bohemia*, { White,	5	7	924	0	0	6 1 8/77	0	0 1/4 +				
Black,	2	13 1/2	990	0	0	5 9/11	0	0 2/5			Not cur. in *Eng.*	
Holland Black,	0	19	518	0	0	11 3/25 9	0	0 1/9 —				
Penny called *Brass Penny*,	4	10	120	0	2	0	0	2 1/4 +	0	2		
Half thereof,	4	10	240	0	1	0	0	1 +	0	1		
Half *Ruyters* Black *Penny*,	4	14	256	0	0	22 1/2	0	1 +	0	1		
Pfound, or *Pfound*,									0	4 3/4 or 2 3/4		
Plappot,									0	2 1/2		
Poali of *Italy*,									0	6		
Pound, 3 Pound of *Scotland*,	11	2							0	5 0		
Polpate, as *Baldpate* of *Scotland*;	11	2							0	10 1/2		
Half thereof,	11	2							0	5 1/4		
Quartid'esse, or { *France*,	10	6 2/3	39 0	0	6	3 9/13	1	5 +	1	6		
Quart-Crow of { *Lorrain*,	9	8 1/2	39 0	0	6	3 9/13	1	3 1/2 +	1	4		
Philip, / *Savoy*, }	10	16 1/2	39 0	0	6	3 9/13	0	6 +	1	6		
Rappen Muntz,									0	2 1/2		
Roustick,									0	1 1/2		
Ryals of: *Abertus* of *Austria*,	10	15	120	0	2	0	0	5 3/4 +	0	6		
Half and Quarter accordingly,												
Pieces of his of 3 Ryals,	10	15	40	0	6	0	0	5 1/4 +	1	6		
Italy, { Some,	9	17	108	0	2	5 1/3	0	5 2/4 +	1	0 6		
Others,	9	14	108	0	2	5 1/3	0	5 3/4 +	0	0 6		
Others,	9	11	108	0	2	5 1/3	0	5 3/4 +	0	0 6		
Mexico 8 *Ryals*,	11	0	13 2/3	0	17	13 9/41	4	4 +	4	0 4		
Rome, Course *Ryals*,	7	0	108	0	2	5 1/3	0	4 +	0	0 4		
Spain,	11	3 1/2	108	0	2	5 1/3	0	6 1/2 +	0	0 6		
Spanish 8 *Ryals*, called *Pieces of Eight*	11	4	13 1/3	0	17	18 2/3	5	5 3/4 +	4	4 0		
States General of the United Provinces,	10	0	10 5/7	0	2	9 3/5	5	0 1/2 +	5	0		
The twentieth part of the same, with the Arrows accordingly.												
Venice,	11	10	96	0	2	12	0	7 3/4 +	0	8		
Ryder of *Guelders* and *Friesland*,	9	0	12 1/2+1	0	19	22 34/57	4	0 1/4 +	4	0		
Salvator of *Venice*,	11	10	96	0	2	12	0	7 3/4 +	0	0 8		
Sassenars double,	10	6 1/2	146 1/2	0	1	15 23/29	0	4 1/2 +	0	0 4 1/2		
Scaby of *Turky*,									0	0 6		
Schaneberger,									0	0 1 3/4		
Scya of *Turky*,									0	0 6 1/4		
Senube, or *Snube* of *Bohemia*,	5	7	129	0	1	20 28/43	0	2 1/2 +	0	0 2 1/4		
Half thereof,	5	7	258	0	0	22 13/14	0	1 1/4 +	0	0 1 1/4		
Sestling,									0	0 0 3/4		
Shillings of: *Bridges* of 1582,	5	0	57	0	4	5 1/19	0	5 1/2 +	0	0 5		
Dantzick,									0	0 0 1/4		
8 Shillings of *Dantzick* of 1541,	10	12	156	0	1	12 12/13	0	4 1/4 +	0	0 4		
Flanders,									0	0 7 1/2		
Friesland of 1586,	6	0	57	0	4	5 1/19	0	6 3/4 +	0	0 6		
Gaunt of 1583,	7	7	54	0	4	10 2/3	0	8 3/4 +	0	0 9		
Germany,									0	0 5 1/4		
Guelders, as *Friesland*,									0	0 9 3/4		
Hamborough,									0	0 1 3/4		
Lubeck,									0	0 5		
M. E. and *Philip* of *Flanders*,	11	3	135	0	1	18 2/3	0	5 1/4 +	0	0 1		
Scotland,									0	0 1 1/4		
Switz. of *Helvetia*,												
Utrecht, / *Zeland* } as *Friesland*.												
Sicherling,									0	0 1 1/4		
Snaphanen, coined for 3 *Batz*,	7	7 1/2	39 3/4	0	6	0 48/53	1	0 +	1	0		
Snaphanen of { *Cleve*, / *Deventer*, / *Nimmeghen*, }	7	11	48	0	5	0	0	10 +	0	10		

Sloda

Teſtons, or Teaſtons

4
12
20

Soldi of *Genoa*,									o	o¾
Soli of *Wersburgh*, *Dantzick*, and *Prussia*,	5	6¼	157½	o	1	12⅘	o	2 +	o	2
Souls or *Sols* of *France*,									o	1
Souls ſtamped, called *Soulx Marque*,									o	1¼
The old *Soulx* with +,	4	5	175	o	1	8⅗	o	1½ +	o	2¼
Ordinary *French Soulx*,	3	10	147	o	1	15⅘	o	1½ +	o	1¼
Late *French Soulx*,	3	6½	147	o	1	15⅘	o	1¼ +	o	1
Double Hand of one *Soulx*,	3	15	132	o	1	19⅐	o	1¾ +	o	1¼
Two *Soulx* Pieces, or *Boubles*,	6	6⅔	117	o	2	1⅓	o	3½ —	o	3
Four *Soulx* Pieces accordingly.										
Cambray,	3	5	135	o	1	18⅔	o	1½ +	o	1¼
Embden,									o	1¼
Gaunti of 1583,	3	o	175½	o	1	8⅓	o	1 +	o	1
Groenghen, } as *Cambray*.										
Liege,										
States General of the United Provinces,	4	o	168	o	1	10⅖	o	1½ +	o	1¼
Utretcht,	3	o	167	o	1	10⅛⅐	o	1 +	o	1
Old *Styver*,	3	14⅛	120	o	2	o	o	2 +	o	2
New *Styver*,	3	13⅓	120	o	2	o	o	2 —	o	2
Half *Styver*,	3	10	201	o	1	4⅘⅐	o	1 +	o	1
Quarter *Styver Oort*,	1	17½	158	o	1	12⅗⅑	o	o¾ +	} Not cur.	
Eighth part *Styver Duyt*,	1	14	474	o	o	12⅓⅑	o	o¼ +	} in *Eng.*	
Old double *Styver*,	7	7½	120	o	2	o	o	4 —	o	4
Old 3 *Styvers*,	11	3¾	120	o	2	o	o	6 +	o	6
Old four *Styvers* with the *Eagle*, *Charles*, and *Philip*,	7	7½	60	o	4	o	o	8 —	o	8
Three *Styvers* or *Fleece*,	10	10	108	o	2	5⅓	o	6¾ +	o	6
Flemiſh ſix *Styvers*,	10	o	54	o	4	10½	1	o +	1	o
The *Bre*, 1492, } 3 *Styvers*,										
The *Key* and *Joan*, }	10	4	156	o	1	12⅓⅓	o	4 —	o	4
Cambray, Some,	6	6½	48	o	5	o	o	8½ +	o	8
Cambray, Others,	6	6½	51	o	4	16⅙⅐	o	8	o	8
Five *Styvers* of *Guelders*,	8	1½	48	o	5	o	o	10¾ +	o	10
Five *Styvers* of *Horne*, as *Cambray*.										
Liege, Some,	7	11	48	o	5	o	o	10 +	o	10
Liege, Others,	6	6½	48	o	5	o	o	8½ +	o	8
Liege, Others,	6	6½	51	o	4	16⅙⅐	o	8 +	o	8
Baden, *Chryſoſtome*,	10	10½	39	o	6	3⅑⅓	1	5½ +	1	5
Berne, Ottaman, Vincent,	11	5⅛	45	o	5	8	1	4 +	1	4
Caſtile, as *Berne*.										
Ferrare, *Hercules*, and *Alphonſus*,	11	5⅛	45	o	5	8	1	4 +	1	4
France Franciſcus,	10	7	42	o	5	17⅐	1	4 —	1	4
Friburg Nicholas, as *Berne*.										
Geneva,	10	4½	42	o	5	17⅐	1	3¾ +	1	4
Lorrain of 1524 and 1529,	10	7	42	o	5	17⅐	1	4 —	1	4
Lucerno, *Epiſcopus*, } as *Bern.*										
Mantua, *Francis*, }										
Milan Galleacius and Ludovicus,	11	5⅛	45	o	5	8	1	4 +	1	4
Montſerat, *George*, and *Guil.*	10	4½	42	o	5	17⅐	1	3¾ +	1	4
Navarre Hericus, Anna, as *Baden*.										
Portugal, Jo. V. L.	10	7	42	o	5	17⅐	1	4 —	1	4
Savoy, *Carolus*, Some,	11	5⅛	45	o	5	8	1	4 +	1	4
Savoy, *Carolus*, Others,	10	10½	39	o	6	3⅑⅓	1	5½ +	1	5
Sedun Nicol, *Dan. Adrian*,	11	5⅛	45	o	5	8	1	4 +	1	4
Solod, *Urſus*, as *Berne*.										
Turones of *France*,	10	18	26¼	o	9	3⅐	2	2¾ +	2	2
Vieryſers, Double,	4	10	138	o	1	17⅖⅐	o	2 +	o	2
Single accordingly.										

Styvers, or Teſtons, or Teaſtons

Engliſh Coins.

4 Farthings, 12 Pence, 20 Shillings } make 1 { Penny. Shilling. Pound.

	s.	*d.*
A Noble is	6	8
A Mark is	13	4

Spaniſh Coins.

6 Carnadoes, 54 Marveids, 11 Ryals, 8 Ryals, 4 Quartiles } make 1 { Marveid. Ryal, 6 *d. Engliſh.* Ducat. Piece of 8 = 4 *s. Eng.* Royal.

Portugal

Portugal Coins.

40 Res, 2½ Ryals, 4 Teſtoons or 10 Ryals, 2½ Ducats } make 1 { Ryal = 6 *d. Engl.* / Teſtoon / Ducat. / Milt of Gold.

French Coins.

12 Deniers, 20 Souls, 16 Souls, 4 Cardecues } make 1 { Souls. / Frank or Liver. / Cardecu. / Crown.

Engliſh Coins.

8 Pence, 2 Groots, 2 Single Stivers, 20 Single Stivers or 10 double Stivers, 6 Guilders } is 1 { Groot. / Single Stiver. / Doub. Stiv. = 3½ *d. E.* / Gilder. / Pound.

Scotch Coins.

1 Small Piece, 3 Small Pieces, 2 Nobles, 3 Nobles } is 1 { 2¼ *d. Engliſh.* / Noble = 6¼ *d. Engliſh.* / Mark = 13⅓ *d. Engliſh.* / 1 *l. Scotch* = 20 *d. Engliſh.*

Iriſh Coin.

1 Harper is two 4½ *d.* = 9 *d. Engliſh.*
20 Harpers is 1 *l. Iriſh*, or 15 *s. Engliſh.*

A TABLE *of* Engliſh Gold Coins, *ſhewing their Weight, Fineneſs, Value, &c.*

Names of the Pieces.	*Pieces to the lb. Tr.*	*Weight by* Malines, *&c.* pwts. gr. m. dr.	*Common Weight.* pwts. gr. m. dr.	*Pieces to the lb. Tr.*	*Fine* Car. gr.	*Value* 1640. *l. s. d.*	*Value* 1660. *l. s. d.*	*All.* gr.
Old double Roſe Noble,	23⅜	10 6 8 8 40/147	10 0 0	24	23 3¾	1 16 4	1 18 8	5
Double Roſe Noble of *Henry* 8. *Edward* 6. *Philip* and *Ma.* *Elizabeth,*	24	10 0 0 0	9 22 0 0	24⅓—	23 3¾	1 16 0	1 18 4	5
Great Sovereign of K. *James,*	24	10 0 0 0	9 16 5 3 2/3	24⅘	22 0	1 13 0	1 15 3	4½
Double Roſe Noble of K. *James,*	26⅔	9 0 0 0	8 21 6 16	27	23 3¾	1 13 0	1 25 3	4½
Double Royal or Real,			8 2 3 3	29⅔—	23 3½	1 10 0	1 12 0	4½
Double old Sovereign,	27⅜	8 18 8 5 19/73	8 0 0 0	30	22 0	1 6 8	1 8 5	4
Beſt double Sovereign of *Hen.*								
Double Sovereign of *Edward.* 6. *Elizabeth,*	30	8 0 0 0	7 4 0 0	33½—	22 0	1 3 10	1 5 5	4
Double Sovereign of K. *Ja.* called *Unite* or *Jacobus,*	36	6 16 0 0	6 10 16 18 8/31	37⅕	22 0	1 2 0	1 3 10	3
Laureat, or 20 *s.* Piece of *James,*	39⅗	6 1 9 2 2/11	5 20 9 18 6/11	41	22 0	1 0 0	1 1 4	3
Twenty Shil. piece of *Charles* 1.	40	6 0 0 0	5 20 9 18 6/11	41	22 0	1 0 0	1 1 4	3
Old Roſe Noble,	46⅔	5 3 4 4 20/187	5 0 0 0	48	23 3¾	0 18 2	0 19 4	2½
Spurre Royal of *Henry* 8. *Edward* 6. *Phil.* and *Mary,* *Elizabeth,*	48	5 0 0 0	4 23 0 0	48⅔—	23 3¾	0 18 0	0 19 2	2½
Spurre Royal of *James,*	53⅓	4 12 0 0	4 10 13 8	54	23 ¾	0 16 6	0 17 7	2½
Double Noble of *Elizabeth,*			4 10 6 16	54⅕—	23 3½	0 16 0	0 17 1	2½
Old Noble, or Noble of *Hen.*	53¾	4 11 3 6 6/45	4 10 0 0	54⅕ 3/5	23 3½	0 16 0	0 17 1	2½
Roſe Royal,			4 1 1 13 1/2	59⅕+	23 3½	0 15 0	0 16 0	2½
Old Sovereign,	54¾	4 9 4 2 46/73	4 0 0 0	60	22 0	0 13 4	0 14 2	2
Beſt Sovereign of *Henry,*								
Sovereign of *Edward* 6. *Elizabeth,*	60	4 0 0 0	3 14 0 0	66 42/43	22 0	0 11 11	0 12 8	2
Old Ang. Noble, or Ang. of *Hen.*	69	3 11 9 13 13/23	3 8 0 0	72	23 3½	0 12 1	0 12 10	2
Laſt Angel Noble of *Henry,*								
Edward 6. *Phil.* and *Mary,* *Elizabeth,*	72	3 8 0 0	3 7 5 0	72½—	23 3½	0 11 11	0 12 8	2
Firſt Angel of *James,*								
Sovereign of K. *James,* called *Double-Britain Crown,*	72	3 0 0 0	3 5 8 9 9/31	74⅖	22 0	0 11 0	0 11 9	2
George Noble,			3 0 0 0	80	23 3½	0 10 10	0 11 6	2
Laſt Angel of *James,*	80	3 0 0 0	2 23 2 5 1/3	81	23 3½	0 11 11	0 11 9	2
Half Laureat of *James,*	79⅕	3 0 14 13 1/11	2 22 4 21 3/4	82	22 0	0 10 0	0 10 8	2
Ten Shill. Piece of *Charles* 1.	80	3 0 0 0	2 22 4 21 3/4	82	22 0	0 10 0	0 10 8	2
Angel of *Charles,*			2 16 14 9	89 +	23 3½	0 10 0	0 10 8	2
Half Spurre Royal,	97	2 12 0 0	2 11 10 0	96⅘+	23 3¼	0 9 0	0 9 7	2
Firſt Crown of King *Henry,*	100½	2 9 6 6 30/97	2 9 0 0	101 3/5 7	22+	0 8 0	0 8 5	2
Single Noble of *Elizabeth,*			2 5 3 8	108⅗	23 2½	0 8 0	0 8 6	2
Half old Noble,	107½	2 5 11 15 3/48	2 5 0 0	108 3/5 6/7	23 3½	0 8 0	0 8 6	2
Salute,	108	2 5 6 16	2 5 0 0	108 3/5 6/7	23 3	0 7 10	0 5 8	2

Names

Names of the Pieces.	Pieces to the lb. Tr.	Weight by Malines. &c. pwts. gr. m. dr.	Common Weight pwts. gr. m. gr.	Pieces to the lb. Tr.	Fine Car. gr.	Value. 1640. l. s. d.	Value. 1660 l. s. d.	Al. gr.
Base Crown of K. *Henry*, called *Rose Crown*,	120	2 0 0 0	1 23 0 0	122 6/7	20 0	0 5 11	0 6 4	1
Crown of *Edward* 6. *Elizabeth*	120	2 0 0 0	1 19 0 0	133 4/23	22 0	0 5 11	0 6 4	1
Half Angle Noble of *Henry*,	138	1 17 14 18 8/15	1 16 0 0	144	23 3 1/2	0 6 0	0 6 5	1
Half last Angel of *Henry*, Half Angel of *Edward* 6. *Phil.* and *Mary*, *Elizabeth*.	144	1 16 0 0	1 15 12 12	145 1/5	23 3 1/2	0 5 11	0 6 4	1
Half first Angel of *James*,								
Britain Crown of *James*,	144	1 16 0 0	1 14 14 4 20/21	148 4/5	22 0	0 5 6	0 5 10	1
Half George Noble,			1 12 0 0	160	23 3 1/2	0 5 5	0 5 9	1
Half last Angel of *James*,	160	1 12 0 0	1 11 11 2 1/3	192	23 3 1/2	0 5 6	0 5 10	1
New Crown of *James*,	158 2/5	1 12 7 6 6/11	1 11 2 10 22/41	164	22 0	0 5 0	0 5 4	1
Crown of *Charles* I.	160	1 12 0 0	1 11 2 10 21/41	164	22 0	0 5 0	0 5 4	1
Two Parts of Salute,	162	1 11 11 2 2/3	1 11 0 0	194 4/7	23 3	0 5 0	0 5 7	1
Half *Henry* first Crown,	201	1 4 13 3 15/47	1 4 10 0	202 6/7	22 †	0 4 0	0 4 2	1
Half Salute,	216	1 2 13 8	1 2 10 0	217 10/13	23 3	0 3 11	0 4 2	1
Half Rose Crown,	240	1 0 0 0	0 23 10 0	245 5/47	20 0	0 2 11	0 3 2	1/2
Half Crown of *Edward* 6. *Elizabeth*,	240	1 0 0 0	0 21 10 0	267 39/47	22 0	0 2 11	0 3 2	1/2
Quarter old Angel Noble,	276	0 20 17 9 9/23	0 20 0 0	288	23 3 1/2	0 3 0	0 3 2	1/2
Quarter last Angel of *Henry*, Quarter Angel of *Edward* 6, *Phil.* & *Mary*, *Elizabeth*,	288	0 20 0 0	0 19 16 6	290 1/31	23 3 1/2	0 2 11	0 3 2	1/2
Quarter first Angel of *James*,								
Half Britain Crown of *James*,	288	0 20 0 0	0 12 7 2 15/31	297 3/5	22 0	0 2 9	0 2 11	
Quarter last Angel of *James*,			0 17 15 13 3/5	324	23 3 1/2	0 2 9	0 2 11	

COITION, is a Word ſometimes uſed for that mutual Attraction or Tendency towards each other, which is found between Iron and the Magnet.

COLATURE, is that, which after boiling or infuſion of any Ingredients, is *percolated* or ſtrained through a Sieve or Cloth; or through *Hippocrates*'s *Sleeve*, as the Chymiſts ſpeak.

COLCOTHAR, is the dry Subſtance red as Blood which remains after Diſtillation of Vitriol, commonly called *Caput Mortuum*; though when Vitriol is calcined a good while in a ſtrong Fire, it will turn red, and is alſo called *Colcothar*.

COLD, is one of thoſe Qualities of Bodies which they call *Primary*, and is nothing but the arriving of the minute and inſenſible Parts of any Body at ſuch a State, as that they are more ſlowly or faintly agitated than thoſe of our Fingers or other Organs of Feeling; for from this Effect we pronounce any Body to be cold.

Mr. *Hobbs* thought the Cauſe of Cold to be only a *Wind* taking the condenſed or frozen Body.

Whether *Cold* be barely a Privation of Heat, or rather a ſtop put to that violent tumultary Motion of the inſenſible Particles of Bodies, as the *Carteſians* aſſert; or whether *Cold* be introduced by the Entrance of adventitious Particles actually cold themſelves, and therefore called *Frigoriſick Particles*, according to the Opinion of the Learned and Ingenious *Gaſſendus*, is a Controverſy not ſo eaſy to be determined as at firſt Sight it may appear. For though the *conſiderable Encreaſe of the Dimenſions* of the ſame Quantity of Water when turned into Ice, and the *prodigious Force of Freezing*, by which Water may be made to lift up vaſt Weights, and to break to Pieces ſome of the ſtrongeſt Bodies that are; and alſo ſince it is true, that a briſk, nay a furious Agitation of the ſmall Parts of a Mixture may be produced, and yet on the Conflict the Mixture ſhall become not only *not Hot*, but ſenſibly and conſiderably *Cold*; though, I ſay, theſe ſeem to bid very fair for a Proof of *Gaſſendus*'s Opinion; yet, on the other Hand, 'tis certain, that a *bare Privation of Motion* will produce, or rather occaſion, Effects as conſiderable as any of thoſe of Cold, as the Excellent Mr. *Boyle* largely ſhews in his Dialogue about the *Poſitive* or *Privative* Nature of Cold: And alſo, if it ſhould be ask'd how the Frigorifick Particles themſelves become cold? What degree of Gravity or Levity they have? What kind of Structure in them is proper to produce ſuch an Effect? Whether ſuch a Structure be deſtructible or mutable, or not? Whether theſe Frigorifick Particles be primitive Bodies or not? And whether there was not Cold in the World till they were produced; If theſe or ſuch like Queries were made about the Nature and Circumſtances of the Frigorifick Particles, it would, I believe, puzzle the Maintainers of the Opinion of *Gaſſendus* to give ſatisfactory Anſwers to them and therefore the Deciſion of this Point muſt be ſuſpended further.

Mr. *Boyle* found, that though Water uſually *expands* it ſelf in Freezing, yet 'tis alway firſt *contracted* or *condenſed*; and that Spirit of Wine, common expreſt Oils, and Chymical Oil of Anniſeeds it ſelf, will be notably condenſed when expoſed to an intenſe Degree of Cold. And he found that no other Liquor but Water, or one in which there are ſtore of Watry Particles, will ever be expanded by Cold. The Reaſon of which perhaps may be, that Water contains more Air in its Pores than other Fluids; and 'tis not improbable, that from the Co-aleſcence of many of the Aereal Particles into one during the Action of

Freezing

Freezing, their Spring may by that Means be encreaſed, and ſo they may from thoſe numerous and large Bubbles we obſerve in Ice, which occaſions it to be ſpecifically lighter than Water.

The Expanſion of Water in Freezing is about $\frac{1}{10}$ Part of the Space more than it before took up.

The *Expanſive Force* of *Cold* is ſo great, that if the Barrel of a Gun be filled with Water, and then have its Muzzle and Touch-hole well ſtop'd, the Water within the Barrel, when either by Natural Cold or a Freezing Mixture it is turned into Ice, will break the Barrel in ſeveral Places, as Mr. *Boyle* and many others have tried.

That noble Philoſopher contrived ſeveral Experiments to eſtimate or meaſure the Quantity of this *Expanſive Force*, which were made with a Braſs Cylinder of two or three Inches in Diameter, into whoſe Cavity was put a Bladder filled with Water, and ſtrongly tyed about the Neck, and over it was put a Wooden Plug, to ſtop up the upper Orifice of the Cylinder; and on the Plug was put a broad flat Board, on which was laid as much Weight as one time amounted to above an Hundred Pound, another time an Hundred and Twenty Pounds, and another time to two Hundred fifty four Pounds; and yet in all the Experiments, when the Water in the Bladder was turned into Ice, it expanded ſo as to raiſe up all this Weight very conſpicuouſly, as appeared by a Circle deſignedly made on the Wooden Plug.

He tells us alſo, That by mingling together three Saline Bodies, each of them purified by the Fire, tho' there did ariſe a very great Commotion, Hiſſing and Exploſion, yet a very conſiderable Degree of Cold was thereby produced: And tho' he was under an Obligation of not diſcovering what theſe Ingredients were, yet he gives a *Succedaneum* to that Experiment, by telling us, that by putting good Salt of Tarter into Spirit of Vinegar, there was a Struggle, Commotion and Hiſſing produced, and yet inſtead of Heat, as is uſual in ſuch Caſes, a very ſenſible Degree of Cold was produced.

Sylvious alſo acquaints us with a Method of producing Cold, by mingling *Spirit of Vitriol* with another *Saline Spirit*.

If in 3 or 4 times its weight of Water, you put about half a pound of *Sal Almoniack* powdered, and ſtir it about to haſten the Diſſolution, ſo great a Degree of Cold will, even in the Heat of Summer be produced, as is very ſurpriſing; for if you nimbly ſhake it, or ſtir it about, it will produce actual Ice on the outſide of the Glaſs, if you purpoſely wet it with Water. This Noble Experiment Mr. *Boyle* firſt made, and thereby plainly proved the Mechanical Producibleneſs of the Quality of Cold; and the Experiment may be of great Uſe to cool Wine, *&c.* in the hot Months, or in ſuch Places where no good Cellerage is to be had. The *Sal Armoniack*, by evaporating the Water from it, may be recovered again, and will ſerve many times for the ſame Experiment.

That Honourable Virtuoſo found alſo, that by ſhaking Gunpowder in 4 or 5 times its Weight of common Water, a conſiderable ſenſible Coldneſs would be produced.

The Learned Dr. *Slare* produces a conſiderable Experiment *(in Philoſ. Tranſ. N.* 150.) whereby a conſiderable Degree of Cold is made with a very great Ebullition, as in the former Experiment it is produced without any. The Experiment is only to pour into any ſtrong Acid (he uſed moſtly Spirit of Verdigreaſe) a Quantity of the Volatile Spirit of Human Blood; by which Means he tells us, that he produced ſo much Cold, as that the Spirit of Wine in an immerſed Thermoſcope, deſcended within half an Inch of the Freezing Point even in Summer. And this he thinks, very ingeniouſly, may ſerve to Explain the Phænomenon of the Cold fits in Agues.

And ſince, if into this Mixture he poured a ſmall Quantity of Oil of Sulphur, the Matter would immediately grow ſenſibly Warm, he not improbably ſuggeſts, that ſomething like this may occaſion the coming of the Hot-fit afterwards, when the Animal Spirits come to be mixed with the Blood more copiouſly, than at firſt in an Ague Fit they can be.

Neither *our Senſes* nor common *Weather-Glaſſes*, can enable us to make an accurate Judgment of the Degree of *Cold*.

For as to *our Senſes*, the Organs of Feeling are in a continual State of Mutability, and that (in general) appears Cold to us, which hath its Parts leſs moved than thoſe of our Hands or Bodies; and therefore if one Hand be very Cold, and the other moderately Warm, the ſame Water, for inſtance, will appear *Warm* to the *Cold*, and *Cold* to the *Warm* Hand.

As to *Common Weather-Glaſſes*, ſome Part of the Liquor being contiguous to the open Air, the Weight and Preſſure of the Atmoſphere hath ſo great an Effect on them, that their riſing and falling depends more on that than on *Heat* and *Cold*, and therefore they will often miſ-inform us,

The *Coldneſs* of Places doth not ſolely nor principally depend on their nearneſs to the Poles.

For *Martinius*, in his *Atlas Chinenſis*, ſaith, that in *China*, whoſe Latitude is no where above 42 Degrees, the Rivers for four Months together (*viz.* from the Middle of *November* till the Beginning of *March*) are ſo Frozen up, that loaden Waggons do ſafely paſs on the Ice; and that the Ships and Veſſels are all Frozen up; and what is moſt remarkable, is, the Froſt is uſually the Reſult but of *one Day's time*, though it require many to thaw it again.

A *Dutch* Maſter of a Ship, that went within a Degree of the Pole, found the Sea open, and the Weather tolerable enough.

COLDNESS *Potential*: See *Potential Coldneſs*.

COLICK, is a Vehement Pain in the Abdomen or lower Belly, and takes its Name from the Part chiefly affected, *viz.* the Gut *Colon*, which is ſtretch'd, prick'd and corroded by Winds or Excrementious Humours, either remaining within its Cavity, or fix'd to its very Coat.

COLLAR *of a Ship*, is a Rope faſtned about her Beak-head, unto which the Dead-man's Eye is ſeized that holds her Main Stay. There is alſo a *Collar* or *Garland* about the Main-Maſt Head, which is a Rope wound about there to ſave the *Shrouds* from galling.

COLLATERAL *Aſſurance*, is a Bond that is made over and beſide the Deed it ſelf, for the performance of Covenants between Man and Man.

COLLATION, in a Logical Senſe, is the ſame as a comparing of one thing well with another; but now-a-days 'tis uſed for an *Handſome Treat* or *Entertainment*.

COL-

COLLATIONE *facta ani post mortem alterius*, is a Writ directed to the Juſtices of the *Common-Pleas*, commanding them to direct their Writ to a Biſhop, for the admitting a Clerk in the Place of another preſented by the King, who during the Suit between the King and the Biſhop's Clerk, is departed this Life. For Judgment once paſs'd for the King's Clerk, and he dying before admittance, the King may beſtow his Preſentation to another.

COLLATIONE *Heremitagii*, is a Writ whereby the King conferreth the keeping of an *Hermitage* upon a Clerk.

COLLICIÆ, are the joining of the *Puncta Lachrymalia* into one Paſſage on both Sides, which derive the Humour of the Eye-lids into the Cavity of the Noſtrils; the Holes that are made in the very Tops of the Eye-brows deſcend in little Channels, they ſpread themſelves into a larger Channel, and are continued to the Tunick of the Noſtrils. The ſame Holes or Openings in Hares, Calves, Rabbits, are not found in the very Eye-brows, but a little more Inward; and moſt of all in Birds, where they are larger than in any other Creatures; the *Membrane* which ſeparates the Holes here is very ſhort. *Blanchard.*

COLLIQUANS *Febris*, is one of the Nature of ordinary burning *Fevers*, but by its exceſſive Heat they ſay it ſuddenly melts the Fat, Fleſh and Subſtance of the ſolid Parts of the Patient's Body; nay ſometimes diſſolves the very Blood in the *Veins*, as ſome tell you, and diſchargeth the ſame by inſenſible Tranſpiration, as Sweat, Urine, or Stool, *&c.*

COLLIQUATION, or *melting of Metals*: Thus we ſay, Silver and Lead being melted or *Colliquated* together over a ſtrong Fire, will mingle *per minima*, that is, unite throughly together.

COLLISION, is the ſtriking of one hard Body againſt another.

COLLUSION, in Common-Law, is a deceitful Argument or Compact between two or more, for the one Party to bring an Action againſt another for ſome evil Purpoſe, as to defraud a Third Perſon of his Right, *&c.*

COLLUTIO, is a waſhing of the Mouth; as when 'tis done to clean or faſten bad or looſe Teeth, or free the Gums from Ulcers, *&c.*

COLLYRIUM, is an oblong or round *Tablet* or *Trochisk*, uſed formerly in Diſtempers of the Eyes, and was then called by the *Arabian* Name of *Seif* or *Sief*. It was diſſolved in a convenient *Vehicle*, that it might conveniently be applied; and from hence any Medicines, in a Liquid Form, deſigned to cure Diſeaſes in the Eyes, are called *Collyrium.*

COLOBOMA, is the growing together of either Lips or Eye-lids, or the adhering of the Ears to the Head preternaturally, *&c.*

COLON, is the ſecond of the great Guts, ariſing from the *Cæcum Intestinum* in the Right Flank, and adheres to the Right Kidney; thence it tends up unto the Liver, and ſometimes is annexed to the Gall-Bladder, which dies it of a Yellowiſh Clay-colour; thence it goes on tranſverſly under the Bottom of the Stomach, and on the Left Hand is faſtned to the Spleen; after which it is faſtned to the Left Kidney, winding and turning very obliquely there, but afterwards it deſcends almoſt in a Right Line. It is the wideſt and largeſt of all the Guts, and is uſually about 8 or 9 Hands Breadths long; it abounds with ſmall Cells, or little Cavities every where: It hath a Valve to hinder any thing from returning from the great Guts into the ſmall.

COLON, is a Point in Grammar mark'd thus, (:) and ſhews a Sentence to be perfect or entire, but yet the Senſe depending or continuing on; as in this of *Seneca*, *Ante omnia neceſſe eſt, ſeipſum eſtimare: Quia fere plus nobis videmur poſſe, quam poſſimus.*

COLOUR, may be conſidered two ways. 1. As it is a Quality reſiding in the Body that is ſaid to be ſo and ſo coloured, or which doth modify the Light after ſuch and ſuch a manner: Or, 2. As more properly the Light it ſelf, which ſo modified ſtrikes upon the Organ of Sight, and produces that Senſation which we call *Colour*.

The Peripateticks aſſert *Colours* to be real Qualities, and inherent in the coloured Bodies, and ſuppoſe that Light doth only diſcover them, but not any way Effect their Production.

Plato thought *Colour* to be a kind of Flame conſiſting of moſt minute Particles, very congruous to the Pores of the Eye, and darted againſt it from the Object. And ſome Moderns will have *Colour* to be a kind of internal Light of the more lucid Parts of the Object darkened, and conſequently altered by the various Mixtures of the leſs Luminous Parts.

Others, as did ſome of the ancient Atomiſts, maintain *Colour* not to be a lucid Stream, but a Corporeal Effluvium iſſuing out of the coloured Body.

Others account for all *Colours* out of the various Mixture of Light and Darkneſs: and the Chymiſts ſometimes will have it ariſe from the Sulphur, and ſometimes from the Salt that is in Bodies; and ſome alſo from the third Hypoſtatick Principle, *Mercury*.

The *Carteſians*, who make the Senſation of Light to be the Impulſe made on the Eye by certain ſolid, but very minute Globules, eaſily permeating the Pores of the Air and Diaphanous Bodies: Theſe, I ſay, derive *Colour* from the various Proportion of the direct Progreſs or Motion of theſe Globules, to their Circumrotation or Motion round their own Centres; by which Means they are qualified to ſtrike the Optick Nerve after diſtinct and divers Manners, and ſo do produce the Perception of various *Colours*.

Dr. *Hook*, in his *Micrographia* ſays, The Phantaſm of *Colour* is cauſed by the Senſation of the oblique or uneven *Pulſe* of Light; and that this is capable of no more Varieties than two, which ariſe from the two Sides of the oblique Pulſe; ſo that there is in reality but two ſimple *Colours*, Yellow and Blue; from the Mixture of which, and a due Proportion of Black and White (that is, Darkneſs and Light) all *Colours* may be produced.

The incomparable Sir *Iſ. Newton* found by two Experiments on Priſms, that there is a great Difformity in the Rays of Light, and that hereby the *Origin of Colours* may be unfolded. The Doctrine therefore of *Colours*, according to his Notion and Experiments, are contained in the follow-Propoſitions.

1. As the Rays of Light differ in degrees of Refrangibility, ſo they alſo differ in their Diſpoſition to exhibit this or that particular *Colour*.

Colours are not *Qualifications of Light*, derived from Refractions or Reflections of Natural Bodies (as 'tis generally believed) but *Original* and *Connate Properties*, which in divers Rays are divers. Some Rays are diſpoſed to exhibit a red *Colour*, and no other; ſome a Yellow, and no other; ſome a Green, and no other; and ſo of the reſt. Nor are there only Rays proper and particular to the more eminent *Colours*, but even to all their intermediate Gradations.

2. To the ſame Degree of Refrangibility, ever belongs the ſame *Colour*, and to the ſame *Colour* ever belongs the ſame Degree of Refrangibility. The *leaſt Refrangible Rays* are all diſpoſed to exhibit a *Red Colour*, and contrarily thoſe Rays which are diſpoſed to exhibit a *Red Colour*, are all the *leaſt Refrangible*; ſo the *moſt Refrangible Rays* are all diſpoſed to exhibit a deep *Violet Colour*; and contrarily, thoſe that are apt to exhibit ſuch a *Violet Colour*, are all the *moſt Refrangible*: And ſo all the intermediate *Colours* in a continued Series belong to intermediate Degrees of Refrangibility. And this Analogy 'twixt *Colours* and Refrangibility, is very preciſe and ſtrict; the Rays always either exactly agreeing in both, or proportionably diſagreeing in both.

3. The Species of *Colour*, and Degree of Refrangibility proper to any particular ſort of Rays is not mutable by Refraction, nor by Reflection from Natural Bodies, nor any other Cauſe that could be yet obſerved when any one ſort of Rays hath been well parted from thoſe of other kinds, it afterwards obſtinately retained its *Colour*, notwithſtanding all Endeavours to change it. Though refracted with Priſms, and reflected with Bodies, which in Day-light were of other *Colours*; having alſo intercepted it with the coloured Film of Air interceding two compreſſed Plates of Glaſs; tranſmitting it thro' other coloured *Mediums*, and thro' *Mediums* irradiated with other ſorts of Rays, and diverſly terminated it, and yet could never produce any new *Colour* out of it. It would by contracting or dilating become more brisk or faint, and by the loſs of many Rays, in ſome Caſes, very obſcure and dark; but could never be ſeen to change *in ſpecie*.

4. Yet ſeeming Tranſmutation of *Colours* may be made where there is any Mixture of divers ſorts of Rays; for in ſuch Mixtures the *Component Colours* appear not, but by their mutual allaying each other, conſtitute a middling *Colour*; and therefore, if by Refraction, or any other of the aforeſaid Cauſes, the difform Rays, latent in ſuch a Mixture, be ſeparated, there ſhall emerge *Colours* different from the *Colour* of the Compoſition: Which *Colours* are not new generated, but only made apparant by being parted; for if they be again entirely mix'd and blended together, they will again compoſe that *Colour* which they did before ſeparation. And for the ſame Reaſon Tranſmutation made by the conveneing of divers *Colours* are not real; for when the difform Rays are again ſevered, they will exhibit the very ſame *Colours* which they did before they entred the Compoſition; as you ſee *Blue* and *Yellow* Powders, when finely mix'd, appear to be naked Eye *Green*; and yet the *Colours* of the component Corpuſcles are not thereby really tranſmuted, but only blended, for when view'd with a good Microſcope, they ſtill appear *Blue* and *Yellow* interſperſedly.

5. There are therefore two ſorts of *Colours*, the one Original and Simple, the other compounded of theſe. The Original and Primary Colours are *Red*, *Yellow*, *Green*, *Blue*, and a *Violet Purple*, together with *Orange*, *Indico*, and an indefinite variety of intermediate Gradations.

6. The ſame Colours in *Specie* with theſe Primary ones may be alſo produced by Compoſition; for a mixture of *Yellow* and *Blue* makes *Green*; of *Red* and *Yellow* makes *Orange*; of *Orange* and *Yellowiſh Green* makes *Yellow*: And in general, if any two *Colours* be mixed, which in the Series of thoſe generated by the Priſm, are not too far diſtant one from another, they, by their mutual alloy, compound that Colour which in the ſaid Series appeareth in the Mid-way between them; but thoſe which are ſituated at too great a diſtance, do not ſo, *Orange* and *Indico* produce not the intermediate *Green*, nor *Scarlet* and *Green* the intermediate *Yellow*.

7. But the moſt ſurprizing and wonderful Compoſition was that of *Whiteneſs*. There is no one ſort of Rays alone which can exhibit this: 'Tis ever compounded, and to its Compoſition are requiſite all the aforeſaid Primary Colours mixed in a due Proportion; for all the Colours of the Priſm being made to converge, and thereby to be again mixed as they were in the Light before it was incident upon the Priſm, will produce Light intirely and perfectly White, and not at all ſenſibly differing from a *direct* Light of the *Sun*, unleſs when the Glaſſes are not ſufficiently clear.

8. Hence therefore it comes to paſs, that *Whiteneſs* is the uſual Colour of *Light*; for *Light is a confuſed aggregate of Rays indued with all ſorts of Colours, as they are promiſcuouſly darted from the various Parts of Luminous Bodies*. And of ſuch a confuſed Aggregate is generated *Whiteneſs*, if there be a due Proportion of the Ingredients; but if any one predominate, the Light muſt encline to that Colour, as it happens in the Blue Flame of Brimſtone; the *Yellow* Flame of a Candle; and the various Colours of the fixed Stars.

9. Theſe things conſidered, the *Manner* how *Colours* are produced by the Priſm is evident: For the Rays conſtituting the incident Light, ſince thoſe that differ in Colour proportionably differ in Refrangibility, *they*, by their unequal Refractions, muſt be ſevered and diſperſed into an oblong Form, in an orderly Succeſſion from the leaſt refracted Scarlet to the moſt refracted Violet. And for the ſame Reaſon it is, that Objects, when look'd upon through a Priſm, appear coloured: For the difform Rays, by their unequal Refractions, are made to diverge towards ſeveral Parts of the *Retina*, and there expreſs the Images of things coloured, as they do the Sun's Image upon a Wall. And by this Inequality of Refractions they become not only coloured, but alſo very confuſed and indiſtinct.

10. Why the Colours of the *Rainbow* appear in falling drops of Rain, is alſo from hence evident; for thoſe drops which refract the Rays diſpoſed to appear Purple in greateſt quantity to the Spectator's Eye, refract the Rays of other ſorts ſo much leſs, as to make them paſs beſide it; and ſuch are the Drops on the Inſide of the *Primary* Bow, and on the Outſide of the *Secondary* or exterior one: So theſe Drops which refract in greateſt Plenty the Rays, apt to appear Red towards the Spectator's Eye, refract thoſe of other ſorts ſo much more as to make them paſs beſide it; and ſuch are the Drops on the Exterior Part of the Primary, and Interior Part of the *Secondary* Bow. 11.

11. The odd Phænomenon of an Infuſion of *Lignum Nephriticum*, *Leaf-Gold*, *Fragments of Coloured Glaſs*, and ſome other tranſparently Coloured Bodies appearing in one Poſition of one Colour, and of another in another, are on theſe Grounds no longer Riddles; for thoſe are Subſtances apt to reflect one ſort of Light, and tranſmit another, as may be ſeen in a dark Room, by illuminating them with ſimilar or uncompounded Light: For then they appear of that Colour only with which they are illuminated, but yet in one Poſition more vivid and luminous than in another, accordingly as they are diſpoſed more or leſs to reflect to trnſmit the incident Colour.

12. From whence alſo is manifeſt the Reaſon of an unexpected Experiment, which Dr. *Hook* in his *Micrography* relates to have made with two Wedge-like tranſparent Veſſels, filled the one with a Red the other with a Blew Liquor; namely, that tho' they were ſeverally tranſparent enough, yet both together became opake; for if one tranſmitted only Red, and the other only Blue, no Rays could paſs through both.

13. That the *Colours* of all natural Bodies have no other Origin than this, that they are variouſly qualified to reflect one ſort of Light in greater plenty than another. And this was experimented in a dark Room, by illuminating thoſe Bodies with uncompounded Light of divers Colours; for by that means any Body may be made to appear of any Colour: They have there no appropriate Colour, but ever appear of the Colour of the Light caſt upon them, but yet with this Difference, that they are more briſk and vivid in the Light of their own Day-light Colour. *Minium* appeareth there of any Colour indifferently with which 'tis illuſtrated, but yet moſt luminous in *Red*; and ſo *Biſe* appeareth indifferently of any Colour with which 'tis illuſtrated, but yet moſt luminous in *Blue*; and therefore *Minium* reflecteth Rays of any Colour, but moſt copiouſly thoſe indeed with Red; and conſequently, when illuſtrated with Day-light, that is, with all ſorts of Rays promiſcuouſly blended, thoſe qualified with Red ſhall abound moſt in the reflected Light, and by their Prevalence cauſe it to appear of that Colour: And for the ſame Reaſon *Biſe* reflecting *Blue* moſt copiouſly, ſhall appear *Blue* by the exceſs of thoſe Rays in its reflected Light; and the like of other Bodies. And that this is the entire and adequate Cauſe of their Colours is manifeſt, becauſe they have no Power to change or alter in the Colours of any ſort of Rays incident apart, but put on all Colours indifferently with which they are enlightned.

Theſe things being ſo, it can be no longer diſputed, whether there be Colours in the Dark? Nor whether they be the Qualities of the Objects we ſee? no *nor*, perhaps, whether *Light* be a *Body*? For ſince Colours are the *Qualities of Light*, having its Rays for their entire and immediate Subject, how can we think thoſe Rays Qualities alſo, unleſs one Quality may be the Subject of and ſuſtain another, which in effect is to call it *Subſtance*? We ſhould not know Bodies from Subſtances, were it not for their ſenſible *Qualities*; and the Principal of thoſe being now found due to ſomething elſe, we have as good Reaſon to believe that to be a Subſtance alſo.

Thus far went this wonderful Man, as long ſince as the Year 1675, as you may ſee more at large in the *Philoſoph. Tranſact. N.* And as himſelf acquaints us (with his uſual Modeſty) in his excellent Treatiſe of *Opticks* juſt now publiſhed, and come to my Hands while this Part is compoſing at the Preſs, where the Reader will meet with ample Satisfaction as to all Parts of the admirable Doctrine of *Light and Colours*. And that the World may ſee that the Account he ſo long ago Publiſhed of this Theory was both intelligible and certainly true, I have ſubjoined the ſubſequent *Experiments* which came to my Hands a Year ago, and are inſerted here alſo at the deſire of their Author, the ingenious Mr. *John Perks* of *Old Swinford* in *Worceſterſhire*.

An Abſtract *of Sir* Iſ. Newton's *Doctrine concerning* Light *and* Colours.

1. Light conſiſts of an infinite number of Rays Right-lined and Parallel, but of different Degrees of Refrangibility when meeting with a different *Medium*.

2. Eeach Ray according to its degree of Refrangibility, when ſo refracted, appears to the Eye of a different Colour.

3. The leaſt Refrangible Rays appear of a deep Scarlet, the moſt Refrangible appear of a Violent Blue, the intermediate proceeding from Scarlet to Yellowiſh, than to light Green, and ſo to Blue.

4. The Colours ariſing from the different Refrangibility of Light, are not only the more noted Colours of Red, Yellow, Green, Blue, but alſo all the intermediate Degrees of Red to Yellow, of Yellow to Green, *&c.* differing as the Degrees of ſound from Graye to Acute, in which there are not only the Notes of common Denomination, but alſo indefinite intermediate Degrees of Sounds, which are diſtinct different Sounds as the other.

5. Whiteneſs (ſuch as the Sun's Light appears) containing all theſe Degrees of Refrangibility, is conſequently made up of all the above-mentioned Colours.

6. Simple or Homogeneal Colours are ſuch as are produced by Homogeneal Lights or Rays, that have the ſame Degree of Refrangibility, and mix'd Colours are ſuch as are produced by Rays of different Refrangibility.

7. Rays of the ſame Refrangibility produce the ſame Colour, which Colour is not alterable by repeated Refractions, only made more ſtrong or faint as the Rays are united or ſcattered.

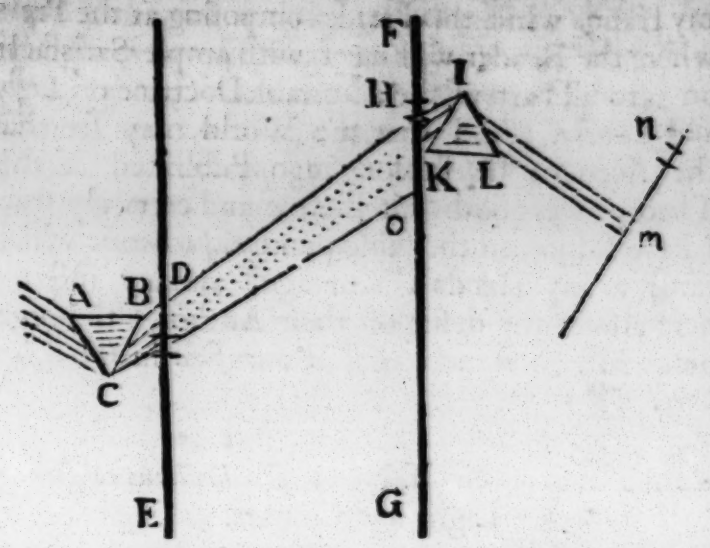
8. All Bodies appear of this or that Colour according as the Surfaces are adapted to reflect only the Rays of ſuch a Colour, or (at leaſt) in more plenty than the reſt.

Experiments for Confirmation of the foregoing Doctrine.

Experiment I.

The great Experiment on which Sir *Iſ. Newton* grounds his Doctrine (and which he calls *Experimentum Crucis*) is after this manner; *B E* and *F G* are two Boards about 4 or 5 Yards diſtance, having in each of them a little round Hole at *D* and *H*, about $\frac{1}{4}$ of an Inch Diameter; *A B C* is a Priſm expoſed to the Sun, *I K L* is another Priſm, whoſe Side *I K* is near parallel to the Side *B C* of the other, and receiving the Rays *D H*, refracts them to fall on a Paper *n m*.

The Colours will fall from *H* to *O* on the Board *FG*: Let one only Colour (ſuppoſe Blue) fall on the Hole *H*, and it will be refracted by the Priſm



I K L to fall (ſuppoſe) at *M*; then move the Glaſs *A B C* about its Ax, ſo as to bring another Colour (ſuppoſe the Red at *O*) to the Hole *H*, and it will by the Glaſs *I K L* be refracted not to *M*, but another Place (ſuppoſe *N*) ſome diſtance from the other, and in like manner will each Colour be refracted to fall on a different Place, tho' the Glaſs *I K L* be held unmoved. This Experiment proves the different Refrangibility of the Rays of Light, and that different Colours do thene ariſe.

For the Holes *D* and *H* being fix'd, and alſo the Glaſs *I K L*, 'tis plain, that the Rays have *a like Incidence* on the Glaſs *I K L*, but the different Places where they fall on the Paper, as *M*, *N*, &c. ſhew a different Refraction in the Glaſs *I K L*; and the Eye diſcovers a different Colour, according to the different Places on which the Rays fall, which demonſtrates the fundamental Doctrine of the Theory.

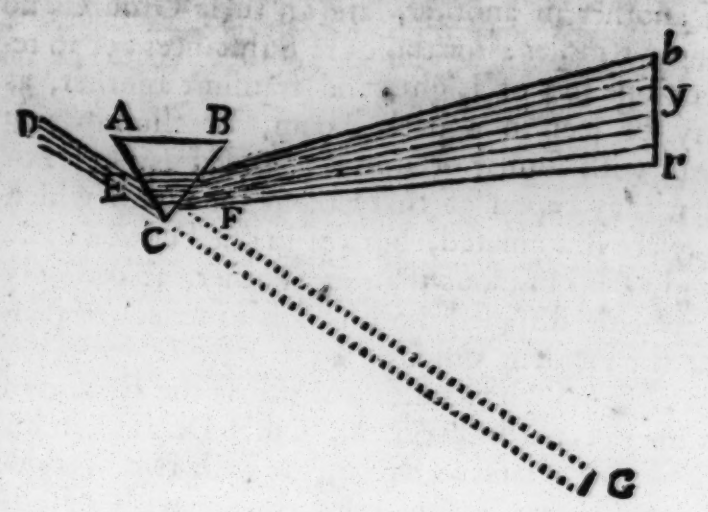
Sir *Iſ. Newton* directs this to be done in a dark Room, where (no doubt) all will appear more exact and lively. My Trial (for want of Conveniencies) was in an open Room, but it ſucceeded well enough to ſatisfy me of the Truth.

He obſerves, that the Oblong Image of Colours *H O* will be about 5 times its Breadth, which alſo ſhews the different Refrangibility of the Rays, which otherwiſe would be near round as the Hole *D* is.

Experiment II.

Being in a convenient Room, where the Sun ſhines thro' a Hole or open Caſement, turn your Back towards the Sun, and hold the one End of the Priſm ſo to your Eye, that the Sun may ſhine on the other End; then move it ſo about its Ax, that the Colours may appear ſomewhere on the Wall; find the Colours with your Eye looking thro' the other End of the Glaſs, and there will appear a Spot of perfect Light.

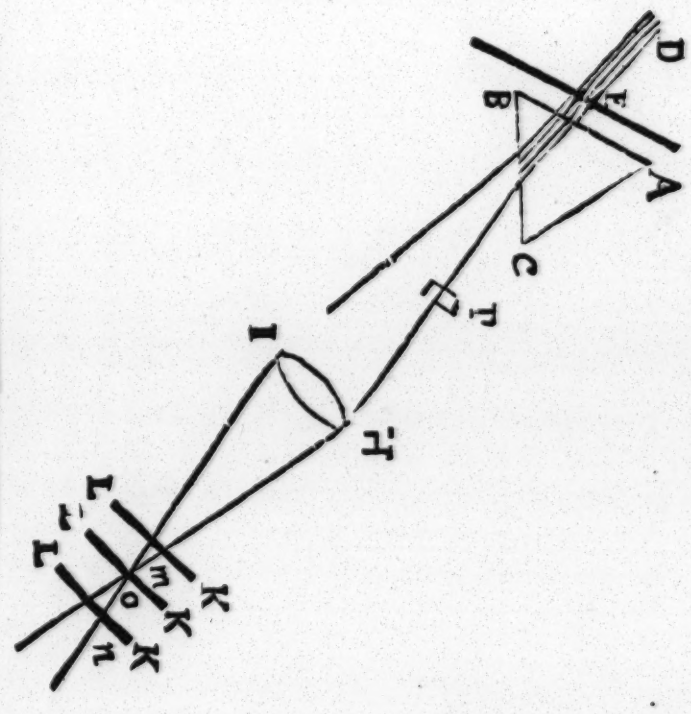
The Reaſon of this Appearance is this; The parallel Rays *D E* meeting with the Glaſs at *E*, and again with the Air at *F*, are ſeperated by theſe two Refractions, the leaſt Refrangible appear Red at *r*, and the moſt Refrangible appear Blue at *b*, with the intermediate Colours between. Theſe Colours being view'd by the Eye at *E*, the Rays come back (near) the ſame way they went, and are therefore in like manner *united* at the Eye, as they were in their Incidence from the Sun, and conſequently have the ſame Appearance (White) as the Light it ſelf. The Place where the Spot of Light appears to the Eye is at *G*, where the Rays would have



fallen had they not been intercepted, and of a Bigneſs according to what Light falls on the Glaſs, whereas the Coloured Image *b y r* will appear four or five times longer, by reaſon of the ſcattering of the differently refracted Ray.

Experiment III.

A B C is the Priſm, upon one of whoſe Sides is put a Paſt-board or thick Paper *A B*, or the like, with a little round Hole at *E*, which being expoſed to the Sun's Rays *D E*, they are refracted and carried (in Colours) towards *H I*.



H I is a Lens (or a common Magnifying Glaſs) broad enough to receive all the coloured Rays; where they being made to converge by the Glaſs, they will be united in *O*, the Focus of the Glaſs.

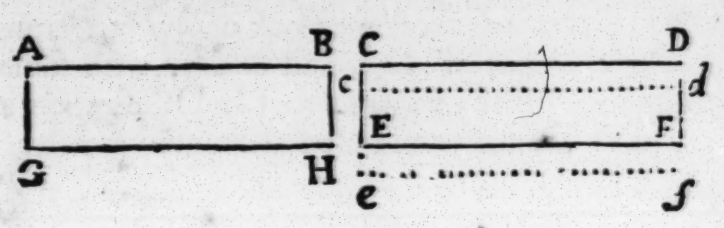
Hold a Piece of Paper *K L* in the Focus, where all the Colours are united, and the little Spot at *O* will be perfect Light or Whiteneſs: But if the Paper *K L* be held farther or nearer off (as at *M* or *N*) the Colours will appear. If any Colours be intercepted, as at *P*, the Light near *O* will not be clear White, but inclining to the remaining Colours. If the Blue be wanting, the White will be ſomewhat Reddiſh or Fleſh-colour, and if the Red be wanting, the White will encline to be ſomething Bluiſh: And if only one Colour be let come to the Lens, that Colour, without Alteration, will be transferr'd to the Paper *K L*.

This

This Experiment ſhews, (1.) That all the Colours being united make Light or Whiteneſs. (2.) That if any Original Colour be wanting, the White will not be pure. (3.) That a Simple Colour is not alterable by farther Refractions, which alſo will appear if another Priſm be put at *O*.

Experiment IV.

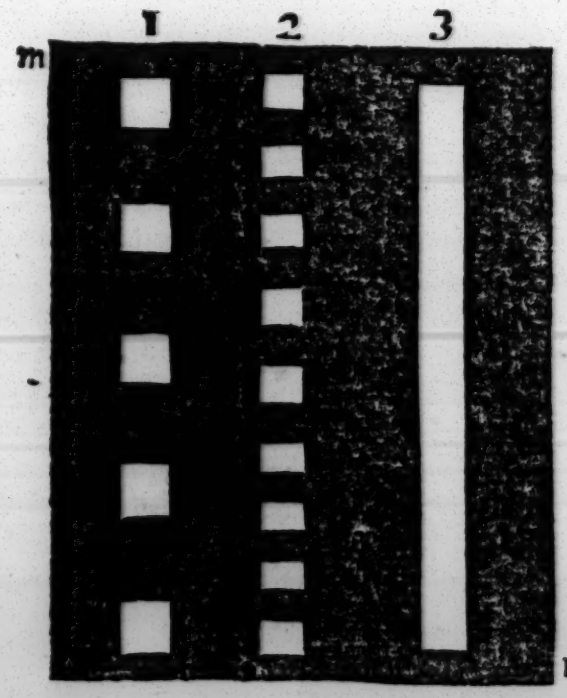
Let *ABGH* be a Piece of fine Silk of a lively Scarlet Colour, whoſe Edges *AB* and *GH* are ſtreight, parallel and ſmooth; let *CDEF* be a



nother Piece of Violet Blue Silk, like and equal to the other. Let them be placed, as in the Figure, on ſome black Cloath or Door, with their Edges in a ſtraight Line: View them through a Priſm at about two or three Yards diſtance: The Ax of the Priſm being Parallel to the Poſition of the Silks: So will the blue Piece *CF* appear lower than the other (*viz.*) as in *c d e f*. The Reaſon of which appearance is, that Blue is more Refrangible than Red.

This will more fully appear, if inſtead of the Blue Silk *CF*, there be let fall in the Place of *CF*, the Blue Rays from another Priſm (the other Colours being intercepted by a Paper with a Square Hole for the Blue to paſs through.) If the Silk *AH* and the blue Square *CF* be view'd thro' a Priſm (as before) the Blue will appear far below, as at *KL*, this being a more perfect Blue than any Silk can be of.

Experiment V.

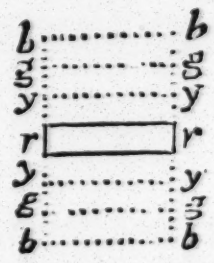


Let *MN* be the black Cover of a Book, Paper coloured Black, or the like; upon which lay in a ſtreight Line five or ſix little Squares of White Paper, about the Bigneſs and at the Diſtance as in the Figure, firſt Column: View theſe through a Priſm, ſo as that the Row of little Squares have its one End towards you, or be in a Plain perpendicular to the Ax of the Priſm, and about two Foot diſtance from the Glaſs; ſo will you ſee a Stream of Colours proceeding from every Square towards the next nearer you, the Colours ariſing out of each white Square. Move theſe Squares near to one another, or put others between them, as in the ſecond Column (ſtill keeping them in a ſtraight Line) and you will ſee as they come near, that the Colours mixing one with another will alter, approaching nearer to White till the Squares touch, and then all the Colours being perfectly mix'd they produce *Whiteneſs*, and appear as in the third Column, a white Line, only tagg'd with Red at the Top and Blue at the Bottom, there being no other Colours coming from above to mix with the uppermoſt Red, nor any Colours below the Blue at Bottom for it to mix with. If you turn the Paper *MN* aſide a little from its Perpendicularity to the Glaſs, the third Column, which before appeared White, will all appear in Colours ariſing out of the White, and Streaming towards you, being always in a Plain Perpendicular to the Axis of the Priſm.

From this Experiment and the foregoing Doctrine we have the Reaſon why a Sheet of white Paper, or the like, appears coloured only at the *Edges*, for *there* only the Colours want others to mix with them: In the Middle, taking any Point the ſeveral Colours from ſo many other Points meet there as make White. For Inſtance,

Let *r r* be any little Particle in the Middle of the white Surface, whoſe other Colours ſtreaming towards *B*, leave the Particle *r r* it ſelf Red, as the Squares will do in the laſt Experiment. The Yellow of the Particle *y y*, the Green of the Particle *g g*, the Blue of the Particle *b b* do all meet on the Particle *r r*, which is Red.

B

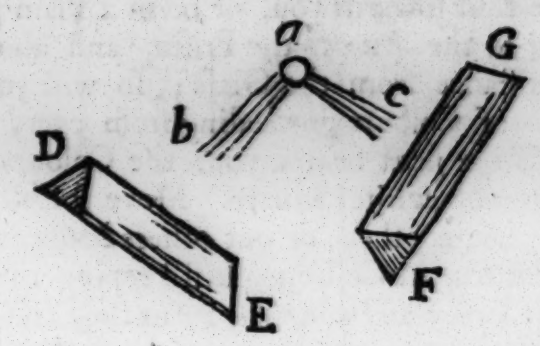


(For if *b b* were a white Particle, and all black about it, its blue Colour would be ſeen upon *r r*; and if *g g* were another, its Blue would be below *r r*, and its Green upon it, &c.) and ſo there being a Concurrence of all the Colours that make up White, it conſequently appears White. The ſame is to be ſaid of any other Particle lying ſo far from the Edges as to have other Particles between to tranſmit their Colours.

If a Square Paper be held ſo ſtraight before you that the two Side Edges be in a plain Perpendicular to the Axis of the Glaſs, they will be White, and no Colours appear but at the Top and Bottom, the Streaming of the Colours being in ſuch a perpendicular Plain, as may be obſerved by looking at any white Spot through the Glaſs, and then turning it a little obliquely to the Horizon, or one End higher than the other.

So in the Poſition of the Glaſs *DE* (*ſee the following Fig.*) the white ſpot aſcends its Colours towards *b*, and in the Poſition *FG* the Colours ſtream from *a* to *c*. If a black Spot, as *A*, upon a Paper be view'd through the Priſm, the Top will have Green and Blue upon it, and under the lower Part will appear Red and Yellow; the

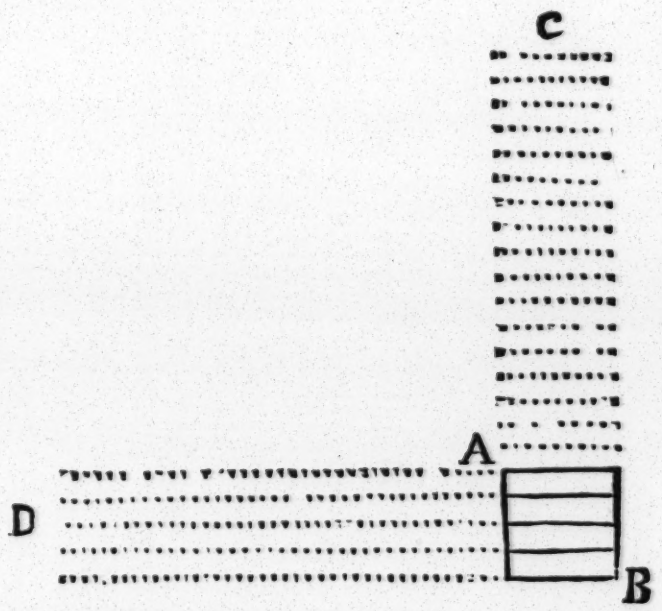
the Reaſom of which is, that the Blue comes from the White above it, and appears on the



Black, there being no other Colours to mix with it: The Red appears under the Spot, becauſe the black Spot tranſmits no other Colours to mix with the Red.

Experiment IV.

Hold the Priſm ſo to the Sum, as that thee Colours may appear upon a large plain Wall, as at *A B*; turn the Priſm ſwiftly about it Axis, ſo as that the Colours may move ſwiftly up and down, as from *B* to *C*.



So will there appear no Colour diſtinct, but a faint white Streak between *B* and *C*, which ſo appears, becauſe by the ſwiftneſs of the Motion the ſeveral Colours are confounded and mixed, and therefore appear White. Then move the Glaſs in ſuch manner, that the Colours may move ſideways and ſwiftly from *B* to *D*, in which Caſe the Colours will not diſappear, but make a ſort of Liſt of ſeveral Colours, becauſe they are not mix'd to make Whiteneſs, but each Colour keep in its own Line.

Experiment VII.

In a dark Room, having a little Hole for the Sun's Rays to come in, apply the Priſm to the Hole, ſo as that the Colours may appear on a Wall. Hold a Quantity of Smalt, or Powder-Blue, or blue Silk in the Colour ſeverally, and it will appear clear of the Colour of the Rays that fall on it, (*viz.*) Red while the Red Light falls upon it, and Yellow when the Yellow Light falls on it: but of all the Colours 'twill moſt ſtrongly reflect the Blue, the Surface being moſt diſpoſed to reflect thoſe Rays, *&c.*

Then view a Quantity of Vermilion, or a little Piece of Scarlet Silk in the Blue Light, and 'twill appear Blue, and Green in the Green Light; but of all the Colours, 'twill moſt ſtrongly reflect the Scarlet Rays, and appear deepeſt of that Colour. This Experiment confirms the 8th Propoſition, That Bodies appear of the Colour of thoſe Rays that are moſt plentifully reflected from the Body to the Eye. Thus far Mr. *Perks*.

I can now only give you ſome of the *Propoſitions* of Sir *Iſ. Newton*'s excellent Book of *Opticks*, relating to the Doctrine of *Light* and *Colours*, with ſomething from him by way of Proof and Illuſtration in the moſt Eminent and Material Points.

Prop. I.

Lights which differ in Colour, differ alſo in Degrees of Refrangibility.

Prop. II.

The Light of the *Sun* conſiſts of Rays differently Refrangible.

Prop. III.

The Sun's Light conſiſts of Rays differing in Reflexibility; and thoſe Rays are more *Reflexible* which are more *Refrangible* than others.

This, which ſeems to be a ſurpriſing Property of Light not before Diſcovered, he proves in his 9th and 10th *Experiments* of the First Book; where 'tis evident, that the Rays within a Priſm, and refracted by its Baſe at their going out into Air, being by the Revolution of the Priſm round its Axis made ſo oblique to the Baſe, as thereby to begin to be totally reflected by it: Then he ſhews that theſe Rays became firſt of all totally reflected, which before at equal Incidences with the reſt had ſuffered the greateſt Refraction; and the ſame thing he found to happen alſo when the Reflection was made by the common Baſe of two Priſms placed ſo together as to make a Parallelopiped, as in the 10th *Experiment*.

Prop. IV. *Probl.* I.

To ſeperate from one another the Homogeneal Rays of compound Light.

Prop. V.

Homogeneal Light is refracted regularly, without any Dilation, Splitting or Shattering of the Rays; and the confuſed Viſion of Objects ſeen through refracted Bodies by Herogeneal Light, ariſes from the different Refrangibility of ſeveral ſorts of Rays.

This he proves in his 5th, 12th, 13th and 14th *Experiments*; from whence it appears, that the croſs Poſition of a ſecond Priſm to refract the Light of the Sun which came to it from a former Priſm, placed at the ſmall Hole of a darkened Room, did not at all dilate the *Image* or *Coloured Spectrum* as to Breadth, nor increaſe it Dimenſions that way: As alſo, that Homogeneal Light, refracted by a Priſm, did not exhibit an oblong coloured Image, as Heterogeneal Light doth, but that a round

round Spot of it was by the Priſm refracted exactly in the ſame Figure, and of the ſame Colour it was before the new Refraction; and moreover, that Flies and ſuch like ſmall Objects placed in Homogeneal Light, and viewed through a Priſm, were not thereby at all rendred confuſed and indiſtinct as to appearance, whereas if placed in Heterogeneal Light, and viewed after the ſame manner, they ſeemed egregiouſly confuſed.

BOOK II. *Prop.* I.

The *Phænomena* of *Colours* in reflected or refracted Light are not cauſed by new Modifications of the Light variouſly impreſt, according to the various Terminations of the Light and Shadow.

For by this 10th *Experiment*, *Book* I. 'tis evident that the Sun's Light being tranſmitted into a dark Room through the parallel Surface of two Priſms faſtned together in the Form of a Parallelopiped, became totally of one Colour (either uniformly *Yellow* or *Red*) at its emerging out of the Priſm: In the Production of which Colour the Confine of Shadows (he ſhews) can have nothing to do, becauſe the Light changes from White to Yellow, Orange and Red ſucceſſively, without any alteration of the Confine of Shadow: At both Edges of the emerging Light where the contrary Confines of Shadow ought to produce different Effects, the Colour is one and the ſame, whether it be White, Yellow, Orange or Red; and in the *Middle* of the emerging Light where there is no Confine of Shadow at all, the Colour is the very ſame as at the Edges, the whole Light at its Entrance being of one uniform Colour, whether White, Yellow, Orange or Red, and going on thence perpetually without any change of Colour, ſuch as the Confine of Shadow is vulgarly ſuppoſed to work in its refracted Light at its Emergence.

Neither can theſe Colours ariſe from any new Modifications of the Light by Refractions, becauſe they change ſucceſſively from White to Yellow, Orange or Red, while the Refractions remain the ſame; and alſo becauſe the Refractions are made contrary ways by parallel Superficies, which deſtroy one another's Effects.

He ſhews alſo in *Experiment* the Firſt of this 2d Book, That by applying an Iron Wire, or ſuch like Body, to a proper Part of a very large Priſm, poſited about 20 Feet from the Hole of a darkned Room, you may ſo intercept the Rays at their Entrance, as to take away any one Colour (which you pleaſe) either wholly or in Part, out of the *Spectrum* or coloured Image, and leave the reſt remaining; which ſhews that all Colours have an Indifference to any Confines of Shadow, and therefore the Differences of theſe one from another don't ariſe from the different Confines of Shadow, whereby the Light is variouſly modell'd, as hath hitherto been the Opinion of Philoſophers. Again, a Lens being placed about 8 Feet from the Priſm at the Hole, had a Paper placed in its Focus, which, when it was ſituate perpendicular to the Light, appeared of its own colour White, but when very much oblique appear'd Yellow and Red when inclined one way, and Blue, when turned another, and yet here the Confines of Light and Shadow, and the Refractions of the Priſm remained in all Caſes the ſame. And the reaſon of the Phænomenon (he ſhews) is this, That the Paper in one Poſture being more oblique to the more refrangible Rays than to the leſs, is more ſtrongly illuminated by the latter than by the former; and therefore the leſs refrangible Rays are predominant in the reflected Light, and wherever they are ſo, they tinge the Light with Yellow or Red; as when the Paper being placed in the contrary way, and in an oblique Poſture, the more refrangible Rays become Predominant; and they always tinge the Light with Blues and Violet Colours.

Prop. II.

All Homogeneal Light hath its proper Colour anſwering to its degree of Refrangibility; and that Colour cannot be changed by Reflections and Refractions.

This is plain by Experiment, for after he had ſeparated the ſeveral ſorts of Rays one from another (as he ſhews how to do in the *Experiments* belonging to the 4th *Propoſ.* of his Firſt *Book*) and by that means got a quantity of Homogeneal Light; this Spot of Homogeneal Light was afterwards uncapable of being changed by either Refraction or Reflection, and all Bodies placed in that Homogeneal Light ſtill appear'd of its Colour, however different their own proper Colours were from that. From whence he concludes, That if the Sun's Light conſiſted but of one ſort of Rays, there would be but one Colour in the whole World; nor would it be poſſible to produce any new Colour by Reflections and Refractions; and conſequently all the variety of Colours depend upon the Compoſition of Light.

Prop. III. *Problem*

To define the Refrangibility of the ſeveral ſorts of Homogeneal Light anſwering to the ſeveral Colours.

In this the Author is very curious and Exact, ſhewing the Laws of the Refractions out of Glaſs into Air, whence by the 3 Axioms of his firſt Book, the Laws of Refractions out of Air into Glaſs are eaſily derived. And finding by Experiment, that when Light goes out of Air thro' ſeveral contiguous refracting *Mediums* (as thro' Water and Glaſs) and thence goes out again into Air, whether the refracting Surfaces be parallel or inclined to one another; that Light, as often as by contrary Refractions 'tis ſo corrected, as that it emergeth in Lines parallel to thoſe in which it was incident, continues ever after to be White: But if the emergent Rays be inclined to the Incident, the whiteneſs of the emerging Light, will by degrees, in paſſing on from the Place of Emergence, become tinged in its Edges with Colours. He thinks he can gather two Theorems (which he there gives) and by which the Refractions of the Rays of every ſort, made out of any *Medium* into Air, are known by having the Refraction of the Rays of one ſort; and alſo the Refraction out of one *Medium* into another, may be had as often as you have the Refractions out of them both into any third *Medium*. And theſe Theorems, if admitted into Opticks, would give a ſcope to treat that Subject voluminouſly after a new manner, not only by teaching thoſe things which tend to the Perfection of Viſion, but alſo by determining, Mathematically, all kinds of *Phænomena* of Colours which could be produced by Refraction.

Prop.

Prop. IV.

Colours may be produced by Compoſition, which ſhall be like the Colours of Homogeneal Light, as to the *Appearance* of Colour, but not as to the *Immutability* of it; and the Conſtitution of Light, and thoſe Colours, by how much more they are compounded, by ſo much are they leſs full and intenſe; and by too much Compoſition they may be diluted and weakened, till they ceaſe. There may alſo Colours be produced by Compoſition, which are not fully like any of the Colours of Homogeneal Light.

Prop. V.

Whiteneſs, and all Grey Colours between White and Black, may be compounded of other Colours; and the Whiteneſs of the Sun's Light is compounded of all the primary Colours, mixed in a due Proportion.

This he proves by many Experiments, and in particular by this: That a Lens being placed to receive the colour'd *Spectrum* caſt from a Priſm at the Hole of a darkened Room, the Light in the Focus of the Lens converged, and there made a bright Spot, which received on a white Paper there, and in a right or normal Poſition to the Rays, appeared White on the Paper; but if either the Paper be moved towards the Hole, or behind the *Focus* of the Lens, it will preſently begin to appear coloured with the uſual Colours of the Priſm. Now the Reaſon of its appearing White at the *Focus*, was, becauſe there all the Rays were exactly mingled; for if any Colour, ſuppoſe the *Red* or *Blue*, were by the Interpoſition of ſome Body intercepted at the Lens; the Image in the *Focus* would never appear White, but ſome how coloured; ſo that to make Whiteneſs the Blending or Mixture of the Rays is neceſſary. And then in

Prop. VI. he propoſes this *Problem.*

In a Mixture of Primary Colours, the Quantity and Quality of each being given, To know the Colour of the Compound.

Prop. VII.

All the Colours in the Univerſe which are made by Light, and depend not on the Power of Imagination, are either the Colours of Homogeneal Lights, or compounded of ſuch; and that either accurately or very nearly, according to the Rule of the preceding *Problem.*

For *Book* II. *Prop.* I. he ſhews, That the changes of Colours made by Refractions, do not ariſe from any new Modifications of the Rays impreſt by thoſe Refractions, and by the various Terminations of Light and Shadow, as has been the conſtant and general Opinion of Philoſophers. He has likewiſe proved, that the ſeveral Colours of the Homogeneal Rays do conſtantly anſwer to their degrees of Refrangibility (*Prop.* I. *Lib* I. and *Prop.* II. *Lib.* II.) and that their degrees of Refrangibility cannot be changed by Refractions and Reflections (*Prop.* II. *Lib.* I.) and by conſequence, that thoſe Colours are likewiſe immutable: He has alſo proved directly by refracting and reflecting Homogeneal Lights apart, that their Colours cannot be changed (*Pr.* II. *L.* II.) He has proved alſo, That when the ſeveral ſorts of Rays are mix'd, and in croſſing paſs through the ſame Space, they do not act ſo upon one another, ſo as to change each others colorifick Qualities (*Exp.* X. *L.* II.) but by mixing their Actions in the *Senſorium* beget a Senſation differing from what either would do apart; that is, a Senſation of a mean Colour between their proper Colours; and particularly, when by the Concourſe and Mixtures of all ſorts of Rays a white Colour is produced, the White is a Mixture of all the Colours which the Rays would have apart (*Prop.* V. *Lib.* II.) The Rays in that Mixture do not loſe or alter their ſeveral Colorifick Qualities, but by all their various kinds of Actions mix'd in the *Senſorium*, beget a Senſation of a middling Colour between all the Colours, which is Whiteneſs; for Whiteneſs is a Mean between all the Colours, having it ſelf indifferently to all, ſo as with equal Felicity to be tinged with any of them: A Red Powder mixed with a little Blue, or Blue with a little Red, doth not preſently loſe its Colour; but a White Powder mixed with any Colour, is preſently tinged with that Colour, and is equally capable of being tinged with any other Colour whatever: He has likewiſe ſhown, that as the Sun's Light is mixed of all ſorts of Rays, ſo its Whiteneſs is a Mixture of the Colours of all ſorts of Rays; thoſe Rays having from the beginning their ſeveral colorifick Qualities, as well as their ſeveral Refrangibilities, and retaining them perpetually unchanged, notwithſtanding any Refractions or Reflections they may at any time ſuffer, and that whenever any ſort of the Sun's Rays is by any Means (as by Reflection in *Exper* 9 and 10. *Lib.* I.) or by Refraction, as happens in all Refractions, ſeparated from the reſt, then they manifeſt their proper Colours.

Theſe things having been proved, ſays he, the Sum of all this amounts to the *Propoſition* here to to be proved; for if the Sun's Light is mixed of ſeveral ſorts of Rays, each of which have originally their ſeveral Refrangibilities and colorifick Qualities, and notwithſtanding their Refractions and Reflections, and their various Separations and Mixtures, keep thoſe their original Properties perpetually the ſame without alteration; then all the Colours in the World muſt be ſuch as conſtantly ought to ariſe from the original colorifick Qualities of the Rays, whereof the Lights conſiſt by which thoſe Colours are ſeen: And therefore, if the Reaſon of any Colour whatever be required, we have nothing elſe to do but to conſider how the Rays in the Sun's Light have by Reflections or Refractions, or other Cauſes been parted from one another, or mixed together; or otherwiſe, to find out what ſorts of Rays are in the Light by which that Colour is made, and in what Proportion; and then, by the laſt *Problem*, to learn the Colour which ought to ariſe by mixing thoſe Rays (or their Colours) in that Proportion. After this in

Prop. VIII. *and* IX.

He ſhews, how by theſe diſcovered Properties of Light, to explain the Colours made by Priſms, and alſo thoſe of the Rain-bow. And then in

Prop. X.

By the ſame diſcovered Properties of Light, he explains the Permanent Colours of Natural Bodies.

Shewing that their Colours ariſe from hence, that ſome Natural Bodies reflect ſome ſort of Rays, and others other ſorts, more copiouſly and ſtrongly than the reſt: As for Inſtance, *Minium*, or Red-lead, reflects the leaſt Refrangible, or Red making Rays, moſt copiouſly, and thence appears Red.

But

But *Violets* reflect the moſt Refrangible moſt copiouſly, and thence have their proper Colour; and ſo of other Bodies. Every Body reflects the Rays of its own Colour more copiouſly than the reſt, and from their Exceſs and Predominance in the reflected Light, hath its Colour.

Then in his Second *Book*, *Part* I. and II. he takes into Conſideration the *Phænomena* of thoſe Colours which are obſerved in thin tranſparent Bodies, making many excellent Obſervations about their Reflections and Refractions, and diſcovering many things as wonderful as they are certain. And here he finds new reaſon to conclude, that the colorifick Diſpoſitions of Rays are alſo connate with them and immutable; and conſequently, that all the Productions and Appearances of Colours in the World are derived not from any Phyſical Change cauſed in Light by Refraction or Reflection, but only from the various Mixtures or Separations of Rays, by vertue of their different Refrangibility or Reflexibility; and in this reſpect the Science of Colours becomes a Specolation as truely Mathematical as any other part of *Opticks*; that is, as far as they depend on the Nature of Light, and are not Creatures of the Imagination only. And in *Part* the Third, he diſcourſes again of the permanent Colours of Natural Bodies, and ſhews the Analogy between them and the Colours of thin tranſparent Plates; as alſo ſhewing their Conſtitutions, whereby they reflect ſome Rays more copiouſly than others: As alſo about the Colours which ariſe from the Inflection of the Rays of Light: In all which there is intermixed many excellent Obſervations and curious Experiments relating to this moſt copious Subject. See more under Light and Colour, in *Vol.* II.

Promiſcuous Obſervations and Experiments about Colours.

It's obſervable, that moſt tranſparent Bodies when they are either ſplit, divided, or extended ſo that they have no ſenſible thickneſs upon their Surfaces, exhibit various Colours like thoſe of the Rainbow. Thus is it with *Muſcovy* Glaſs when ſplit into exceeding thin Pieces, and fine Glaſs when blown at the Flame of a Lamp into Bubbles as thin or thinner than the fineſt Paper; and ſo we ſee it is in thoſe Bubbles which Children make out of a mixture of Soap and Water, and thoſe which ariſe from the ſhaking of almoſt any Chymical Oyle, or Spirit of Wine into very fine Froth.

Mr. *Boyle* found that one Grain of Cochineal diſſolved firſt into a pretty quantity of Spirit of Urine, and then that Diſſolution diluted with Water, would impair a ſenſible, though but a faint Colour, to fix Glaſſes of Water, each of which contained 43 Ounces and $\frac{1}{2}$, which amounts to above 125000 times its own Weight: And this ſhews the very great Diviſibility of the Parts of Matter, as well as the Inteſtine Motion of the Parts of Fluid Bodies.

Dr. *Hook* in his *Microgr.* ſeems to think there are but two Original Colours, *viz.* *Red* and *Blue*, which, *Page.* 64. he defines thus:

Red is an Impreſſion on the Retina, made by an Oblique and confuſed Pulſe of Light, whoſe ſtrongeſt Part preceeds, and its weakeſt follows. Blue, an Impreſſion made by an Oblique and confuſed Pulſe of Light, whoſe weakeſt part precedes, and its ſtrongeſt follows. Out of theſe two he ſuppoſes all other Colours may by mixture, *&c.* ariſe.

The Ways by which a Liquor may ſuddenly change the Colour of another Liquor, or of another Body, Mr. *Boyle* thinks reducible to ſuch as theſe.

1. By the Minute Particles of the Adventitious Liquors inſinuating themſelves into the Pores of the other, and filling them up either perfectly or in part; by which means the Light paſſing thro', the Liquor will be differently refracted from what it was before, when the Pores of it were only filled with Air, or perhaps ſome more ſubtle Fluid.

2. A Liquor may alter the Colour of a Body, by freeing it from thoſe things which hindred it before from appearing in its genuine and proper Colour; as when Water waſhes off the Filth of ordinary Bodies, and other Lixiviums or Menſtruums clear away, or four of the diſcoloured Ruſt of Metals, *&c.*

3. By making a Comminution of the Parts of any Body, and that either by really ſubdividing them and making them leſs, or elſe by disjoining and ſeparating ſuch Aggregates or Cluſters of Particles which clung together before.

4. Contrary to the laſt Way, the Colour of a Body may be changed by means of a Liquor's making Coalitions or Aggregates of ſeveral Particles, which before lay too ſcattered and diſperſed to exhibit any Colour; and this way the new Colours of Precipitates may be ſuppoſed in part to ariſe.

5. A Liquor may alſo change the Colour of a Body, by diſlocating and changing the Site and Poſition of the Parts of it: Thus bruiſed Fruits appear of a different Colour from their Ripe and Natural ones; and ſeveral Bodies are of a different Colour when diſſolved in a *Menſtruum* from what they had before.

6. The chiefeſt and moſt important way of all, as being that which doth contain many others within it, is by aſſociating the Saline Corpuſcles or any other ſort of the more rigid ones of the Liquor with the Particles of the Body that it is employed to work upon, and by that means muſt needs alter the Figure, Poſition, Bigneſs and Degree of Motion of the Component Particles of that Body.

The Learned Dr. *Grew* thus ſums up the Reſult of aboundance of curious Experiments about the Cauſes of *Vegetable Colours.*

1. While the Sulpher and Saline Principles of Plants do only ſwim together, and are not yet united into one Precipitate, no Colour reſults from them, but the Contents are rather Limpid; as uſually in the *Roots* and many other *Parenchymous Parts.*

2. But when they are united, and the Alkalines are predominent, they produce a *Green* Colour.

3. When the Sulphur and Alkaline are more equal, they make a *Tawny.*

4. When the Sulphur, Acid and Alkaline are nearly equal, they produce a *Yellow.*

5. When the Sulphur is predominent, and the Acid and Alkaline equal, it makes a Blue: But;

6. When the Sulpher and Acid are predominant to the Alkaline, it produces a *Purple*.

7. When the Sulpher is predominant to the Alkaline Principle, and the Acid to them both, it produces a *Scarlet*: But,

8. When the Acid is predominant to the Alkaline, and the Sulphur to them both, a *Blood-Red*; which is the higheſt and moſt Sulphurous Colour in Nature, *Anatom. of Plants*, P. 276, 277.

Experiments of the ſudden Change of Colours.

1. Into a ſtrong Solution of Sublimate in common Water (the Quantity a Spoonful or two) drop 5 or 6 Drops of good Spirit of Urine (or almoſt any Volatile Spirit) and the Mixture will preſently appear White; which Whiteneſs may immediately be deſtroyed by pouring in a little good *Aqua Fortis*. The Tribe of *Urinous Salts* are diſtinguiſhed by producing this white Colour.

2. Drop a large Drop of Syrup of Violets on White Paper, it will ſpread and exhibit a tolerable blue Colour; then if you drop upon it any Acid Spirit or Stygian Liquor, as ſuppoſe a Drop of Spirit of Vitriol, 'twill immediately turn into a fine Red; whereas a Drop of Spirit of Urine or any Volatile Spirit would have turned into a lovely Green; as alſo will a Drop of the Solution of Copper in Spirit of Urine, though it be of a deep Blue it ſelf. *Note*, To make the Experiment appear the better, 'tis beſt to ſtir about or mingle the Liquors with the Tip of your Finger.

3. The Eſſential Oil of Anniſeeds in cold Weather coagulates and turns Whitiſh; yet if on this Whitiſh Ointment, ſpread on White Paper, you let fall but a Drop or two of good Oil of Vitriol, a Heat and Smoak will ariſe, and a Blood-red Colour will be produced.

4. The *Adiaphorous* Spirit of Box mingled with a Solution of Mercury in *Aqua Fortis*, made firſt a deep Yellow, and then in a Minute or two turned a deeply *Red*; and being digeſted a Day or two, let fall a white *Precipitate*. Mr. *Boyle*.

5. An Infuſion of an Handful of ſliced *Lignum Nephriticum* in 4 Pound of Spring Water all Night, will give the Liquor that is poured off into a clear Glaſs Vial a Colour almoſt like that of Gold, provided you hold up the Vial between your Eye and the Light; but when you hold it from the Light, ſo that your Eye be between the Light and it, it will appear of a deep and lovely Blue Colour; which fine Blue Colour a few Drops of any Acid Liquor will immediately make diſappear, and about as many of Oil of *Tartar per Deliquium* or any ſuch fix'd Alkalizate Liquor will again reſtore.

6. Every one knows, that red Roſe Leaves held a while in the Smoak of Sulphur will turn pale; and yet if you infuſe old diſcoloured Roſe-Leaves that have been long dried in a Glaſs of Water, it will ſcarce impart any Colour to the Liquor; but on the dropping a due Quantity of the Spirit of Sulphur, the Liquor will turn into a lovely Red.

7. Tincture of Red Roſe-Leaves drawn with Water and a little Oil of Vitriol was put into a clear Vial about half full of fair Water, in ſuch a Proportion as that the Mixture was very red, but yet tranſparent; then into it was dropt leiſurely a little Spirit of Urine, and the Mixture being ſhaked, exhibited a fine Greeniſh Blue.

8. If into a Spoonful of the Infuſion of Powder of Logwood in Water, which will be Red, you drop two or three Drops of Spirit of Urine, it will produce a lovely Purple; but if the Water which drew the Tincture from the Logwood, had been impregnated with Spirit of Salt, the Drops of Spirit of Urine, inſtead of Purple, would have produced a Yellow Colour.

9. Three or four Drops of Oil of *Tartar per Deliquium* drop'd into a Spoonful or two of clear Solution of Sublimate in common Water, though the Liquors are both Colourleſs, will in a trice produce a deep Yellow Colour; which, by dropping in four or five Drops of Oil or ſtrong Spirit of Vitriol, may be as ſoon deſtroyed and made to vaniſh; and by putting in more of the Oil of Tartar, recovered again, *&c.* The Tribe of Lixiviate Salts are known and diſtinguiſhed by this Teſt, that they will all produce this Yellow Colour, when mix'd duly with a Solution of Sublimate.

10. Diſſolve Filings of Copper in good Spirit of Fermented Urine, the Solution will be deeply Blue; but if into a Spoonful of this you drop 2 or 3 Drops of Oil of Vitriol, the Ceruleous Colour will immediately vaniſh, and the Liquor become clear as Rock-Water.

11. If three times its Weight of Oil of Vitriol be in a Glaſs Retort placed in Sand, drawn off from a Quantity of good Quick-ſilver, it will leave a Calx as *white as Snow*; which yet as ſoon as ever common Water is poured on it, turns into one of the brighteſt and lovelieſt *Yellow Colours* in the World.

12. Diſſolve Camphire in Oil of Vitriol, and it will impart a deep and almoſt opake Red on the *Menſtruum*, though it ſelf be White, and the *Menſtruum*, if good, clear and tranſparent. And if into the Solution you pour a little Water, the Red Colour will vaniſh in a trice, the *Menſtruum* grow pale, and the Camphire be recovered again in its priſtine Form.

A CATALOGUE of the Simple Colours.

1. *Spaniſh White*, made of *Chalk* and *Alumn*, burnt together.
2. *Lapis Armenius*, ſuppoſed to be the ſame with the common *Blue Bice*.
3. *Ultramarina*, made of the blueſt *Lapis Lazuli*, which is freeſt from Gold Veins by Calcination.
4. *Smalt*, made of *Zaffer* and *Pot aſhes* calcin'd together in a Glaſs Furnace.
5. *Litmoſe*, ſuppoſed to be the Juice of a Plant.
6. *Indico*, by ſome ſaid to be a kind of Mud adhering to the Froth about Reeds in *India*. Others ſay it is a Plant like *Roſemary*, called *Intil*, growing in *Cambia*, which is gathered and dryed, then wetted with fair Water, and beaten to a Mud; this Operation being repeated, it is dryed and fitted for uſe.
7. *Indian Ink*, whoſe Compariſon is ſuppoſed to be burnt *Rice*.
8. *Cerus* or *Pſymithium*, is the Ruſt of Lead made by a Vaporous Calcination.
9. *Maſticot*, is a kind of improper *Calx* of *Tin*.
10. *Gambodia*, or *Gutta Gambæ*, is ſuppoſed to be the inſpiſſated Juice of a *Plant* that comes from the *Indies*.
11. *Oker*, a ſort of Natural Earth.
12. *Orpiment*, a fat inflammable Mineral, juſtly ranked

ranked amongſt *Poyſons* for its extream Corroſive Quality.

13. *Umber*, a native Earth.

14. *Red-Lead*, made of Litharge or burnt Lead, by a Reverberatory Calcination, or of *Ceruſs* put on a Platter over the Fire, which muſt be continually ſtirred till it has acquired a *Red-Lead* Colour.

15. *Burnt Oker*, is the common Yellow *Oker* burnt in open Fire.

16. *Cinnabar* or *Vermillion*, there are two ſorts, Native, or the *Minium* of the Ancients, which is a Mineral that yields *Quick-ſilver*, whereof, and of *Sulphur*, it chiefly conſiſts. It is found in the Mines of *Iſtria*.

The *Factitious Cinnabar* is that which we now uſe; and is made by a Sublimation of *Mercury* and *Sulphur*.

17 *Carmin*, made of *Cochineal*.

18. *Lake*, is made of *Flocks* dyed, or Shavings of *Scarlet-Cloth*, or of the *Cochineal Inſect*, or elſe of *Kermes-Berries*, their Tincture being extracted with a Lee of *Pot-aſhes*, and then precipitated with a Solution of *Roch-Allum*. After the ſame manner a *Lake* may be made of a Plant or Flower. There is alſo another ſort of *Lake* made of *Gum-Lac*, by extracting its Tincture with *Urine*.

19. *Sanguis Draconis*, is the Gum of a Tree which looks like dried Blood; 'tis brought out of ſeveral Places in the *Eaſt-Indies*.

20. *Earth Reddle*, or *Ruddle*, found in many Places of *England*.

21. *Lamb-black*, made of *Soot* of *Roſin* or *Pitch*, burnt in Places built on purpoſe for it, that keep in the Smoak.

COLUMN, in the Art Military, is the long File or Row of Troops, or of Baggage of an Army in its Match. To march in a *Column*, is to march a great Depth, or in a long File, inſtead of making a large Front. An Army marches in one two, three, or more *Columns*, according as the Ground will allow, and the General ſees expedient.

COLUMN, in Architecture, is properly that round long Cylinder or Part of a Pillar which is called the *Shaft*, *Trunk*, *Fuſt*, the *Scapus*, *Vivo*, *Tige*, *&c.* containing the Body of it from Spire to the Baſe, or from the Aſtragal of the Baſe to the Capital.

COLUMNÆ *Cordis*, are the Muſcles and Tendons by which the Heart is contracted and dilated.

COLURES, are two great Cirles imagined to paſs through the Poles of the World, one of them through the Equinoctial Points *Aries* and *Libra*, and the other through the Solſtitial Points *Cancer* and *Capricorn*, theſe are called the *Equinoctial* and *Solſtitial Colures*. And theſe divide the *Ecliptick* into four equal Parts or Quarters, which are denominated accordingly: And the Points where theſe paſs through are called the *four Cardinal Points*.

COLPUS, the ſame with *Sinus*.

COLUMELIA, the ſame with *Cion*.

COLUMMA *Naſi*, is the Fleſhy Part of the Noſe, prominent in the Middle near the upper Lip.

COLUMMA *Oris*, the ſame with *Coin*.

COLUMN, in Architecture, taken in the largeſt Senſe, is a ſort of Pillar of a round Form, which ſerves to ſupport or adorn a Building conſiſting of a Baſe, a Shaft or Shank (which is properly the *Column*) and a *Capital*. *Columns* are different according to the ſeveral Orders of Architecture.

The *Tuſcan* being the ſhorteſt and moſt ſimple, is ſeven Models long, comprehending its Baſe and Capital, and diminiſhed a fourth Part of its Diameter.

The *Dorick* ought to be Seven and a Half, or Eight Diameters long; and its Baſe and Capital are ſomewhat more beautify'd with Mouldings.

The *Ionick Column* is nine Diameters long, and hath its Capital ſet off with *Voluta*'s or curl'd Scrolls, differing in that reſpect from others as well as in its Baſe, which is peculiar thereto.

The *Corinthian* is the Richeſt of all, having two Rows of Leaves for the Ornament of its Capitals with Stalks or Stems, from whence ſhoot forth ſmall Voluta's. Its Length is Ten Diameters.

The *Compoſit Column* is likewiſe Ten Diameters long, and its Capital is made like that of the *Corinthian*, with the Angular *Voluta*'s or the *Ionick*.

COMA *Somnolentum*, is a deep Sleep, leſs than a Lethargy, without a Fever, wherein the Patient being awakened, anſwers to any Queſtion propounded to him, but falls into a profound Sleep again, with his Mouth open and his under Jaw fallen, more like to one dead than alive. *Blanchard*.

COMA *Vigil*, waking Drowſineſs, is a Diſeaſe wherein the Patients are continually inclined to Sleep but ſcarce can Sleep, being affected with a great Drowſineſs in the Head, a Stupidity in all the Senſes and Faculties, and many times with a *Delirium* too.

COMB, in a Ship, is a ſmall Piece of Timber ſet under the lower Part of the *Beak-head* near the Middle; it hath two Holes in it, and ſupplies to the *Fore-Tacks* what the Chiefs-Trees do to the Main ones, that is, to bring the Tacks aboard.

COMBATANT, the Herald's Word for two Lions born in a Coat of Arms in a Fighting Poſture, Rampant, and their Faces towards each other.

COMBINATION, is the Art of finding how many different Ways a certain given Number of things may be varied, or taken one and one, two and two, three and three, *&c.* *See* Vol. II.

COMBUST, a Term in Aſtronomy, when a Planet is not above 8 *Degrees* and 30 *Minutes* diſtant from the *Sun*, either before or after him; he is ſaid then to be *Combuſt*, or in *Combuſtion*.

COMETS, are what are commonly called *Blazing-Stars*. The Ancients, eſpecially *Ariſtotle* and his Followers, ſuppoſed them to be Meteors or Exhalations ſet on Fire in the higheſt Region of the Air: The Modern *Aſtronomers* have found them to be above the Orbit of the *Moon*, but yet to deſcend ſo low as to move in the Regions of the *Planets*: It is not improbable but that they may be a ſort of very *Eccentrical Planets*, and move Periodically about the *Sun*.

Mr. *Azout*, a *French* Gentleman, was the firſt as I can find, who pretended to perdict what would be the future Motion of a *Comet*; which he did for one that appeared *Jan.* 166$\frac{4}{5}$, and ſent Copies of them to the Secretary of the Royal Society, *Jan.* 2. 1664, *New Stile*. He alſo did the ſame for a ſecond Comet, which appeared the Year following.

Hevilius, in his *Prodromus Cometicus*, ſaith, he is almoſt poſitive no Account can be given of the *Phænomena* of *Comets*, without ſuppoſing the Annual Motion of the Earth.

Meaſuring the *Comet* in the Year 166$\frac{4}{5}$, he found it to be diſtant from the Earth above 5000 Semi-Diameters of the ſame; and that its true Diameter was then 25600 *German* Miles, which is 3 times as long as the Diameter of the Earth.

He ſuppoſes all of them to move round the *Sun* as their Center, and to be a kind of Spurious Planets.

Their Train or *Coma* he takes to be occaſioned by the Beams of the *Sun* falling on the Head of the *Comet*, and paſſing through the ſame Reflected and Refracted.

Afterwards, in 1668, he publiſhed his *Cometographia*, wherein he ſuppoſes, that the Trajectory of a *Comet* is nearly Rectilinear, or that they always move in a ſtraight Line.

Yet he ſuppoſes alſo a *Motion impreſſed*, and an Inclination of the *Comet*'s Disk to the Sun, as two Cauſes why *Comets* may ſometimes deviate from a ſtraight Courſe, eſpecially about the Beginning and End of their Appearance.

He obſerves, That this Line is ſomething near that of a *Parabola* ſometimes, but never is the Ark of any Circle: Alſo that there is in *Comets* a *Libratory* Motion, like that in the *Moon*.

The famous Sr. *Iſaac Newton*, in his excellent *Principia Philoſ. Mathem.* hath a large Diſcourſe of *Comets*, p. 473, *&c.* where he proves.

1. That they are above the Moon, and in the Region of the Planets, becauſe they have no Diurnal Parallax, but an Annual one: For thoſe *Comets* which move forward according to the Order of the Signs, are all at their Exit or Diſappearance, ſlower in their Motion than they were before, or (Retrograde) if the Earth be between them and the Sun; but they move ſwifter than ordinary when they begin to diſappear, if the Earth be in oppoſition to the Sun: And on the contrary, if they move contrary to the Succeſſion of the Signs, and have the Earth between them and the Sun, then they move more ſwifter than ordinarily at their Exit; but if the Earth be in oppoſition, they move ſlower, and retrograde towards their going off. This chiefly depends on the Motion of the Earth, as it is in the Planets, who, according as the Earth's Motion agrees with, or is contrary to theirs, appears ſometimes retrograde, ſometimes to move ſlower, and other times more ſwiftly.

If the Earth move the ſame way with the *Comet*, and ſwifter by its angular Motion round the *Sun* than the *Comet*, the *Comet*, when beheld from the Earth, will appear to be Retrograde.

And if the Earth move ſlower than it, the Motion of the *Comet* (ſubducting the Motion of the Earth) will be, to appearance, ſlower,

But if the Earth move a contrary way to the *Comet*, it will then appear to move ſwifter than the Earth: All which he illuſtrates and proves, and ſhews alſo a Way from the *Comet*'s Parallax to find its diſtance.

From the Conſideration alſo of the Curvity of the Way of a *Comet*, he concludes, That when they diſappear, they are much below the Orb of *Jupiter*; And that in their *Perigeums* and *Peribeliums*, they often deſcend below the Orbits of *Mars* and the inferior Planets.

From the Light alſo of the apparent Star that is in the Head of the *Comet*, he concludes their Vicinity to the Sun and Earth; and that they can by no Means be in the Region of the fixed Stars, as ſome have imagined, for then their Heads could no more be enlightned by the Sun, than the Planets are by the fixed Stars.

Conſidering alſo the Obſcuration of the *Comet* by that thick Fume or Vapour with which its Head is always encompaſſed, he concludes, That they muſt often deſcend down below the Sphere of *Saturn*, as he had before found by their Parallax. The ſame thing he concludes alſo by examining into the Cauſe of the *Coma* or Tail, and then draws theſe *Corollaries*.

1. That *Comets* ſhine by the Light of the Sun's Beams reflected from them.

2. That the Heavens are devoid of all Reſiſtance, ſuch as our Air and other *Mediums* have: For theſe *Comets* move every way with all the freedom that can be, obliquely, directly, and often againſt the Courſe of the Planets, and yet can continue their Motion for a very long while, even ſo. And therefore the Celeſtial Regions cannot be filled with Matter like the *Carteſian* Vortices, but muſt be almoſt void Spaces.

Next, in *Propoſ.* 40. *Book* 3. he proves, That *Comets* move round the *Sun* in Conick Sections, having their *Umbelici* in the Center of the *Sun*; and that by Lines drawn from themſelves to the *Sun*, they deſcribe *Area*'s proportional to their Times of Revolution, as the other Planets do: And he ſeems to think them a kind of Planets, and that they revolve in real Elliptical Orbits, though they nearly approach to *Parabola*'s. From which Propoſition he concludes,

1. That if *Comets* do ever come about again, their Orbits are very Eccentrical Ellipſes; and that their Periodical Times are to thoſe of the Planets in a Seſquialteral Ratio of the Tranverſe Axes; and therefore *Comets* being uſually above the Planets, and deſcribing Orbits of longer Axes than they, do really move ſlower than they; and particularly, that if the Ax of the Orb of a *Comet* were 4 times as long as the Ax of *Saturn*'s Orbit, the Time of the Revolution of the *Comet* to that of *Saturn*, would be $4 \times \sqrt{4}$, or 8 to 1; that is, 240 Years.

After this, in ſeveral *Lemma*'s, he prepares the Way to determine the Species of the Conick Section a *Comet* deſcribes; to find its Place at any intermediate given Time; and to determine the Trajectory from three Obſervations, which he illuſtrates by Examples.

Then he proceeds to conſider more particularly what the Bodies of *Comets* are, and concludes that they are ſolid, compact, fix'd and durable, like thoſe of the other Planets. Refuting the old Opinion of their being Meteors or Exhalations from this, That in their Tranſits, ſo near the *Sun* as we find they do go, they would be perfectly diſſipated, diſperſed and deſtroyed.

The Heat of the *Sun* he had before ſhewn to be as the Denſity of the Rays, or reciprocally as the Squares of the Diſtances of Places from the *Sun*: Wherefore ſince the Diſtance of the *Comet* which appeared in the Year 1680, being in its Periheli-on *December* the 8th, was then to the Diſtance of the Earth from the *Sun* as 6 to 1000 nearly. The *Sun*'s Heat in the *Comet* at that time was to his Heat with us at *Midſummer* as 1000000 to 36, or 28000

28000 to 1; whereas the Heat of boiling Water, as he tried, was but very little more than triple the Heat of our dry Earth exposed to the *Midsummer Sun*; and the Heat of red hot Iron he Conjectures to be about 3 or 4 times as great as that of boiling Water: Wherefore the Heat of the dried Earth or Body of the *Comet* in its *Peribelion*, was near 2000 times as great as that of red hot Iron; and consequently, if the *Comet* had been a Meteor, or an Aggregate of Vapours and Exhalations, the Sun would have rendred it invisible.

The *Comet* therefore acquired so great, so immense a degree of Heat in its *Peribelion*, that it must needs be a long time before it will be cold again; for he computes that a Globe of red hot Iron of the Dimensions of our Earth, would scarce be cool in 50000 Years. If therefore we suppose the *Comet* to cool 100 times as fast as red hot Iron, yet since his Heat was 2000 times greater than that of red hot Iron, if you suppose his Body to be of the same Bigness of our Earth, he will not be cool in a Million of Years.

He observes also, that the Tails of all *Comets* are longest and largest after their passing from the Sun, or just after their *Peribelions*; which shews that the Sun's Heat contributes to the encrease of the Tail: Whence 'tis more than probable, that the Tail of a *Comet* is only a long and very thin Smoak or train of Vapours which the ignited *Nucleus*, or the Head of the *Comet* emits from it. And this Notion he confirms after this, by refuting the two other Opinions about the Origin of the Tail of a *Comet*.

For some will have it to be only the Sun-Beams shining thro' the Head of the *Comet*, as they do, thro' a Crevise into a dark Place, and by that Means come to appear in that Form.

But this Notion he shews will not hold, because the Reason that the Sun-Beams appear thus lucid when his Rays shine thro' an Hole or Chink into a dark Place, is because the Light is reflected from the Particles of Smoak, small Dust, *&c.* which continually fly to and fro in the Air, and therefore is always more splendid where the Air abounds with the most gross and greatest number of Particles of this Nature. But in a thin and clearer Air, no such Appearance can well be seen; and consequently in the Celestial Regions, where probably there is little or no Matter to reflect, cannot be visible: For Light, as in the Sun-Beams only, is not discernable, but only so far as it is from thence reflected to our Eyes.

Others will have the Tails of *Comets* to be formed by the Refraction of Light as it passes thro' the Head of the *Comet* to the Earth: But this Opinion he thinks prest with many scarce answerable Difficulties; for first, the Tails of *Comets* never appear adorned with various Colours, which yet are usually the inseparable Concomitants of Refraction. Again, the Light of the fix'd Stars and Planets coming to us directly, and transmitted distinctly, plainly shews that the Celestial *Mediums* it passeth thro' have no refracting Power. And as to the Radiation and Twinkling of the fixed Stars, that ought to be attributed rather to a Refraction in our Eyes, or to be occasioned by the tremulous Motion of the Air, because when we look on them thro' a Telescope, there is no such thing. The Tremor of the Air, and of the ascending or descending Vapours, may easily occasion a little quick successive Distortion of the Rays from so small a Point as the Pupil of one's Eye; but they cannot do so from the much larger Aperture of a Telescope's Object Glass, which is the Reason why there is an apparent twinkling in the former, but not in the latter Case; and the Cessation of the Scintillation in the Latter, is a Demonstration that there is a regular Transmission of the Rays of Light without any sensible Refraction.

Lastly, If the Tails of *Comets* were produced by the Refraction of the Sun's Light shining thro' them towards us, and according to the Figure of the Heavens, were reflected to Parts opposite to the Sun, that Defluction in the same Regions of the Heavens must always be made towards the same Parts: But this, by plain and undoubted Observation, hath been found to be false in Fact, and therefore this account cannot be the true one.

That the Tails or Beards of *Comets* do arise from the *Nucleus* or Head, and ascend towards the Regions opposite to the Sun, is confirmed by the Laws which they observe; as, that lying in the Planes of the Orbits of *Comets* which pass thro' the Sun, they deviate from the Opposition of the Sun always towards those Parts, which their Heads, as they move forward, leave in those Orbits: That to a Spectator placed in these Planes, they appear in Parts directly opposite to the Sun; but that if the Spectator deviate a little from these Planes, their Deviation will become sensible, and every Day appear greater and greater: That, the Deviation, all things consider'd, is less where the Tail is oblique to the Orbit of the *Comet*; as also when the Head of the *Comet* approaches nearer to the Sun, especially if the Angle of the Deviation be observed near the Head of the *Comet*; besides that those Tails which do not deviate appear straight, but those that do, appear Curved: That the Curvature is greater where the Deviation is greater, and more sensible where the Tail is of the greater length; for in short ones it is hardly observable: That the Angle of Deviation is less near the Head of the *Comet*, and greater near the opposite Extreme, and therefore that the Tail turns its Convex Parts towards the Place from which the Deviation is made, and which are in a Right Line drawn from the Sun thro' the Head of the *Comet*, and produced infinitely: And that those Tails which are larger and longer, and which shine brightest, are more splendid towards their Convex Sides, and are better defined, or more distinctly terminated there, than on their Concave Sides.

Wherefore the *Phænomena* of the Tails of *Comets* depend upon the *Motion of their Heads*, and not upon *that Region of the Heavens* in which the Head is seen, and therefore do by no means arise from Refraction in the Heavens, but have their Matter supplied from the Head.

For, as in our Air, the Smoak of any kindled Body ascends upright if the Body be at rest, but obliquely if it have a Lateral Motion any way: So in the Heavens, where Bodies gravitate towards the Sun, Smoak and Vapours ought to ascend up from the Sun, and that in a Right Line, if the Smoaking Body be at rest, or obliquely, if it move any way laterally, and by its progressive Motion doth always desert those Spaces from whence the Superior Parts of the Vapours had ascended: And this Obliquity will be less where the Ascent of the Vapours is more swift, *viz.* near the Sun, and near the

the ſmoaking Body. From the Diverſity of this Obliquity the Column of the aſcending Vapour will be incurvated; and becauſe the Vapour in the Precedent Side of the Column, is ſomething newer or more recent than the other, it will therefore be a little more denſe, and conſequently more copiouſly reflect the Light, and be defined or terminated more diſtinctly than the other Side.

That there may ariſe from the Atmoſphere of *Comets*, Vapours enough to take up ſuch immenſe Spaces, may be underſtood from the Rarity of our Air: For Air, near the Surface of our Earth, takes up a Space 850 times as large as Water of the ſame weight with it; and therefore a Column of Air of 850 Foot high, weighs no more than one of Water of but one Foot high, if they have both the ſame Baſe. But a Column of Air of the height of the whole Atmoſphere, weighs no more than a Column of Water of about 33 Feet high, and of the ſame Baſe; and therefore if from this whole Column of Air you ſubtract the lower Part as far as the Height of 850 Foot, the remaining Column will weigh equal to a Column of Water of 32 Foot; from whence (by that Hypotheſis which is now confirm'd by many Experiments, it may be fairly concluded, that *the Compreſſion of the Air is as the Weight of the incumbent Atmoſphere; and that Gravity is reciprocally as the Square of the Diſtance of Places from the Center of the Earth.* I found by Circulation, ſaith he, (the Ground of which he gives in *Prop.* 22. *Lib.* 2.) that Air, at the Diſtance of our Earth's Surface, of only one Semi-diameter of the Earth, is more *rare* than it is with us in a Ratio much exceeding that which all the Space below the Orb of *Saturn* bears to the Diameter of a Globe of only one Inch in length. And therefore a Globe of our Air of only one Inch in Diameter, if it had but the ſame degree of Rarity which our Air hath at the Diſtance of 4000 Miles, or of the Earth's Semi-diameter from us, would more than fill all the Regions of the Planets, as far as the Sphere of *Saturn*, and much farther. Wherefore ſince Air, as you go higher, will ſtill grow immenſely *rare*, and that the *Coma* or *Atmoſphere* of a *Comet*, counted from its Center is about 10 times higher than the Superficies of the *Nucleus*, the Tail of it aſcending much higher, muſt needs be exceedingly rare.

And tho', becauſe of the great Craſſitude of the Atmoſphere of *Comets*, and the great Gravitation of Bodies towards the Sun, and the Gravitation of the Particles of Air and Vapour towards one another, it may be that the Air in theſe Celeſtial Spaces, and in the Tails of *Comets* may not be rarified quite ſo much, yet 'tis plain by this Computation, that a very little Quantity of Air and Vapours will ſuffice to ſolve all the *Phænomena* of the Tails of *Comets*.

For the very great Rarity of the Tails of *Comets* may be concluded by the fix'd Stars ſo plainly appearing thro' them, as we find they do. The Atmoſphere of our Earth ſhining with the Sun's Light, tho' perhaps its Thickneſs be but a few Miles, yet quite extinguiſhes all the Light of the fixed Stars, and obſcures the Moon it ſelf; whereas the immenſe Thickneſs of the Tail of a *Comet*, illuſtrated as our Atmoſphere is by the Rays of the Sun, will permit the ſmalleſt fix'd Stars to be ſeen thro' it without any Diminution of their Brightneſs.

And the Tails of moſt *Comets* have no greater Splendor than the Sun-beams exhibit when reflected from a Stream of Motes, Duſt, *&c.* in a darken'd Room, of but one or two Inches in Thickneſs.

At what time the Vapour aſcends from the Head to the Extremity of the Tail, may be almoſt diſcovered by drawing only a Right Line from the End of the Tail to the Sun, and then noting the Place where that Right Line cuts the Trajectory: For the Vapour in the Extremity of the Tail, if it aſcend in a Right Line from the Sun, will begin its aſcent at the time when the Head of the *Comet* is in the Place of Interſection.

But indeed the Vapour doth not aſcend in a Right Line from the Sun, but by retaining the Motion of the *Comet* which it had before its Aſcent, and compounding it with the Motion of its Aſcent, it aſcends obliquely; wherefore it will be a truer Solution of the *Problem*, to ſuppoſe the Right Line which interſects the Orbit to be parallel to the Length of the Tail, or rather (becauſe of the Curvilinear Motion of the *Comets*) that it diverge from the Line of the Tail. By this means I found that the Vapour which was in the Extremity of the Tail, *Jan.* 25. began to aſcend from the Head before *December* 11. and therefore had taken up more than 45 Days in its Aſcent: But all that long Tail which appeared *December* 10. aſcended in the ſpace of thoſe two Days, which were then juſt paſt ſince its *Perihelion*; wherefore the Vapour at the Beginning, when the *Comet* was near the Sun, aſcended prodigiouſly ſwift, and afterwards continued to aſcend with a Motion retarded by the Gravity of the Particles, and by that Aſcent encreaſeth the Length of the Tail: But the Tail, as long as it appeared, conſiſted almoſt all of that Vapour which aſcended from the Time of the *Perihelion*; and the Vapour which firſt aſcended and compoſed the Bounds of the Tail, did not vaniſh till it was both too far off the Sun to be illuminated by him, and off us to be viſible. Hence alſo the Tails of *Comets* which are ſhorter, do not aſcend with a quick and continual Motion from the Head, and then preſently vaniſh and diſappear; but are permanent Columns of Vapours and Exhalations, gathered from the Head by a very gentle Motion, and in a great ſpace of Time; which yet by participating of that Motion of their Heads which they had at the Beginning, they continue eaſily to move along with their Heads thro' the Celeſtial Regions. And from hence it may again be concluded, That the Heavens are filled with no Matter that hath any Power of Remittance or Reſiſtance in it; ſince only the Planets and Comets themſelves, but even ſuch very rare Bodies as the Tails of *Comets*, can both move there very freely and ſwiftly, and alſo continue that Motion for a vaſt while together.

This excellent Author ſuppoſes the Aſcent of Vapours into the Tails of *Comets*, to be cauſed by the Rarefaction of the Matter in the Atmoſphere at the Time of the *Perihelion*. Smoak, ſaith he, in a Chimney aſcends up by the Impulſe of the Air in which it ſwims or floats: And Air, rarify'd by Heat, aſcends by the Dimunition of its Specifick Gravity, taking the Smoak, and carrying it up along with it. Why ſhould not the Tail of a *Comet* be, after the ſame manner, ſuppoſed to be raiſed by the Sun? for the Sun-Beams do not agitate any *Mediums* which they paſs through, but only by Reflection

and

and Refraction. The reflecting Particles being made warm by this Action, do warm the Æther, with which they are compounded. This Æther (or whatever you will call it) being rarified by the Heat communicated to it, and having its Specifick Gravity by which it deſcendeth toward the Sun before, now diminiſhed by this Rarefaction, aſcends and carries along with it thoſe reflecting Particles of which the Tail of a *Comet* is compoſed.

To the Aſcent of theſe Vapours, it conduces that they are carried by a circular Motion round the Sun, and conſequently endeavonr to recede from the Sun, while the Atmoſphere of the Sun, and the Matters of the Heavens, doth either really reſt, or elſe being moved with no other Motion than what they have from the Sun's Circumrotation, are moved very ſlowly. Theſe are the Cauſes of the Aſcent of Vapours into the Tails of *Comets*, when they are within the Confines of the Sun, where their Oebits are more curved, and where *Comets* being within the *denſer*, and therefore *heavier* Atmoſphere of the Sun, have their Tails of the greateſt Length. For the Tails which are now produced by preſerving their own Motion, and at the ſame time gravitating towards the Sun, will move about him in Ellipſes like their Heads, and by that Motion will always accompany and freely adhere to their Head: For the Gravity of the Vapours towards the Sun, will no more cauſe the Tails of the *Comets* to forſake their Heads, and to fall down towards the Sun, than the Gravity of the Heads can make them fall off from their Tails. But their common Gravity they would either fall down to the Sun together, or be together retarded in their Aſcent: and therefore this Gravity doth by no means hinder, but that the *Heads* and *Tails* of *Comets* may receive and retain any Poſition to one another, which either the above-mentioned Cauſes, or any other may produce.

Theſe *Tails* therefore which are thus produced in the *Peribelions* of *Comets*, will go off along with their Heads into remotely diſtant Regions, and from thence, either with the *Comets* themſelves, return again to us after a long ſeries of Years; or rather being there rarified vaniſh quite away by little and little: For afterwards in the deſcent of their Heads towards the Sun, ſome little ſhort Tails ought gradually and ſlowly to be produced from the Heads, which afterwards in the *Peribelions* of ſuch *Comets* deſcend down into the Sun's Atmoſphere, muſt needs be immenſely encreaſed; for the Vapours in thoſe free Spaces will continually be rarified and dilated, whence it comes to paſs, that the Extremity of the Tail is always much broader than the End next to the Head of the *Comet*.

And it appears agreeable enough to reaſon, to ſuppoſe, that thoſe Vapours which are thus dilated, rarified and diffuſed throughout all the Celeſtial Regions, may by little and little by their own proper Gravity, be attracted down to the Planets, and become intermingled with their Atmoſpheres. For as to the Conſtitution of this Earth of ours, it is neceſſarily required that there ſhould be *Seas*, that from them vaſt quantities of Vapours being raiſed, by the Heat of the Sun, they may either gather into Clouds, and then fall down in Rain to moiſten and nouriſh the whole Earth, and to render it Fertile; or elſe (as ſome Philoſophers think with good Reaſon) being condenſed by the cold Tops of Mountains and Hills, run down from thence, and form Springs, Fountains and Riverrs; ſo for the Conſervation of the *Seas* and Moiſture of the *Planets*, *Comets* ſeem neceſſarily requiſite: from whoſe condenſed Exhalations and Vapours all that Moiſture which is conſumed in Vegetations and Putrefactions, and turned into dry Earth, may by degrees, be continually re-ſupplied and recruited: For all Vegetables do entirely grow and encreaſe from Liquors, and then, as to their greateſt Part, do turn by Putrefaction into dry Earth, and a Slime perpetually is precipitated to the Bottom of putrifying Liquors. From hence the Quantity or Bulk of dry Earth muſt continually increaſe, and the Liquors or Moiſture of our Globe continually decreaſe, and at laſt be quite evaporated and loſt, if they had not as continual a Supply from ſome Part or other of the Univerſe. And I do alſo ſuſpect (ſaith our Author) that that *Spirit* which is the fineſt, ſubtileſt, and beſt Part of our Air, and which is neceſſarily requiſite to the Life and Being of all things, comes chiefly from *Comets*.

The Atmoſphere of *Comets*, as they deſcend towards the Sun, are ſenſibly diminiſhed by their running out to afford Matter to produce the Tail, and (certainly in that Part which looks towards the Sun) do grow more narrow and contracted; but after this, as the *Comets* recede from the Sun, when they do not ſo much run out into the Tail, they are inlarged, if *Hevelius* hath rightly obſerved the *Phænomena*. But they appear leaſt of all when the Heads of the *Comets*, having been ſo exceedingly heated by the Sun (in the *Comet*'s *Peribelia*) blaze out into thoſe vaſtly great and bright ſhining Tails, and when the *Nuclei* being perhaps covered with a black thick Smoak, are covered by the lower Parts of the Atmoſphere: for all Smoak is greater and more black and thick when the Heat is very great.

Thus the Head of that *Comet* of which we have been ſpeaking, as equal Diſtances from the Sun and the Earth, appeared more obſcure after the *Peribelion* than before. For in *December* it appeared but like a Star of the 3d Magnitude, whereas in *November* it was like one of the Firſt or Second.

He concludes therefore, that *Comets* are a kind of *Planets* moving round the Sun in very excentrical Orbits; and as thoſe Planets which are neareſt the Sun, and revolve about him in leſſer Orbits, are leſſer than others, ſo he ſuppoſes thoſe *Comets*, which in their *Peribelion* come very near the Sun, are leſs than others, and revolve in leſſer Orbits.

If a *Comet* in its deſcent to, or aſcent from the *Sun*, approach near to a Planet as it paſſes by, and its Plain be different from that in which the Planets move: By its attractive Power it will, agreeably to the univerſal Law of Gravitation of Bodies, draw it from the Plain in which it before moved, and ſo cauſe it afterward to move to a new one, inclined to the former, but paſſing thro' the *Sun* as the former did.

Hence 'tis poſſible, That though the Planets originally revolved in the ſame common Plain, yet by the ſubſequent Attraction of *Comets*, their Plains may be inclined to one another and different, as 'tis certain, *de facto*, they now are.

Dr. *Gregory*, in his *Aſtronomical Phyſ. & Geometrica Lib.* 5. ſhews, That the ancient Aſtronomers and Philoſophers believed *Comets* to be very Eccencrical

centrical Planets revolving round the Sun; and that it was the Peripatetick School which brought up the Notion of their being nothing but Meteors and below the Moon.

Caſſini obſerved of the *Comet* which appeared in the Year 1680, that it was but 22 or 23 Degrees from the Sun, and yet to us appeared to have half its Globe illuminated, or not to be either *falcated* or *gibbous*; which alſo was obſerved of the *Comet* in the Month of *April*, 1665; and from thence he concludes juſtly, that thoſe *Comets* were at that time not only higher than the Moon, but alſo than the Sun himſelf; becauſe *Mercury* and *Venus* at that diſtance from the Sun do never appear full but when they are ſo.

The ſame Perſon thinks it is too raſh in the Modern Philoſophers to condemn as falſe and ridiculous, the Notion that hath been long received of the bad Preſages of *Comets*; for he ſaith, If the Tail of a *Comet* ſhould be intermingled with our Atmoſphere, or if the Matter of it ſhould, by its Gravity, fall down upon our Earth, it may induce changes in our Air, that may be very ſenſible among Animal and Vegitable Bodies. *Aſtron.* p. 408.

And p. 412. he ſhews the Way of determining the *Way* and apparent Place of a *Comet*. And p. 418. from four obſerved Places of a *Comet* to determine its Trajectory, if it were *Rectilineal*; and at p. 421. he gives the Method of determining the true Trajectory of a *Comet*. At p. 446. he ſhews how to find the Poſition of the Bodies of a *Comet*'s Orbit, and when the *Comet* will be in them; and p. 447. to find the Inclination of the Plane of ths *Comet*'s Orbit to that of the Ecliptick. And after this he ſhews how to correct the Trajectory, and to determine the Heliocentrick and Geocentrick Place of the *Comet* in the Trajectory, determined by the Method before given, for any given Time; as alſo to make neceſſary Tables for readily finding the Places of *Comets*. From p. 448. to 460.

The Famous *James Bernouli* in his *Syſtema Cometarum*, *An.* 1682, ſuppoſes, That there is ſome primary Planet revolving round the Sun in the Space of 4 Years and 157 Days, and at the Diſtance from him of 2583 Semi-diameters of the *Magnus Orbis*: The primary Planet he ſuppoſes either from his vaſt Diſtance or Smallneſs not to be viſible to us, but however, to have, at various diſtances from him, ſeveral Satellites moving round him (though none deſcending ſo low as the Orbit of *Saturn*;) and that theſe becoming viſible to us when they are in their *Perigæum*, are what we call *Comets*.

COMITATU *& Caſtro Commiſſo*, is a Writ whereby the Charge of a County, together with the keeping of a Caſtle, is committed to the Sheriff,

COMITATU *Commiſſo*, is a Writ or Commiſſion, whereby the Sheriff is authoris'd to take upon him the Command of the County.

COMITIALIS *Morbus*, the ſame with *Epilepſia*.

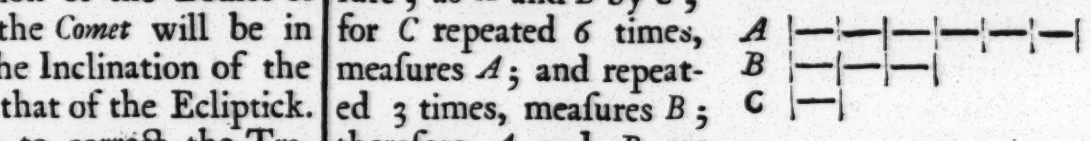
COMMA, is one of the Points or Stops uſed in Writing, and is thus mark'd (,) and is the leaſt in Power of them all, implying only a ſmall Reſt or little Pauſe, without breaking off the Sentence.

COMMA, in Muſick, is the Ninth Part of a Tone, or the Interval whereby a Semi-tone or a perfect Tone exceeds the Imperfect. This Term is uſed only in Theorical Muſick, to ſhew the exact Proportion between Concords.

COMMANDING *Ground*, in Fortification, is ſuch as overlooks any Poſt or ſtrong Place: Of this they reckon 3 ſorts; 1. *A Front Commanding Ground*, which is an Height oppoſit to the Face of the Poſt which plays upon its Front. 2. *A Reverſe Commanding Ground*, which is an Eminence that can play upon the Back of any Place or Poſt. 3. *An Enfilade Commanding Ground*, or *Curtin Commanding Ground*, which is an high Place that can with its Shot ſcour all the Length of a ſtrait Line.

COMMENDAM, is a Benefice that being void, is commended to the Care of ſome ſufficient Clerk, to be ſupplied till it may conveniently be provided of a Miniſter. He to whom the Church is commended hath the Fruits and Profits thereof only for a certain time, and the Nature of the Church is not changed thereby, but is as a thing depoſited in the Hands of him to whom it is commended who hath nothing but the Cuſtody thereof which may be revoked. When a Parſon is made a Biſhop, there is a *Ceſſion* of his Benefice by the Promotion; but the King may give him a Power to hold it in *Commendam*.

COMMENSURABLE *Magnitudes*, are ſuch as are meaſured by one and the ſame common Meaſure; as *A* and *B* by *C*; for *C* repeated 6 times, meaſures *A*; and repeated 3 times, meaſures *B*; therefore *A* and *B* are ſaid to be *Commenſurable*. *Def.* 1, 2, *&c.* 10. *c. e. Euclid.*



COMMENSURABLE *Numbers*, whether Integers or Fractions, are ſuch as have ſome other Number which will meaſure or divide them without any Remainder: Thus 6 and 8, $\frac{8}{12}$ and $\frac{3}{4}$ are reſpectively *Commenſurable Numbers*.

COMMENSURABLE *in Power*: Right Lines are ſaid to be *Commenſurable in Power*, when their Squares are meaſured by one and the ſame Space or Superficies. *Def.* 3. *e.* 10. *Eucl.*

COMMENSURABLE *Surds*, are ſuch *Surds* as being reduced to their leaſt Terms, become true Figurative Quantities of their kind; and are therefore as a Rational Quantity to a Rational.

COMMINUTION, is a dividing of a thing into very ſmall Parts or Particles.

COMMISSARY: In an Army there are two ſorts of Commiſſaries, 1. The *Commiſſary General of the Muſters*, or *Muſter-maſter General*, who takes an Account of the Strength of every Regiment, reviews them, ſees that the Horſe be well mounted, and all Men well armed and accoutred. 2. The *Commiſſary General of Proviſions*, who hath the Charge of furniſhing the Army with all things of that kind.

COMMISSURES, a Word uſed frequently by Mr. *Boyle* and others for the ſmall Pores of any Body, or the little Clefts, Cavities or Interſtices which are between the Particles of any Body; eſpecially when the Particles are broadiſh and flatiſh, and lie contiguous to one another, like very thin Plates.

COMMON *Axis*, in *Opticks*: See *Axis*.

COM-

COMMON *Diviſor*, is that Number which exactly divides any two other Numbers, without leaving any Remainder.

COMMON-PLEAS, is the King's Court now held in *Weſtminſter-Hall*: all Civil Cauſes, both Real and Perſonal are, or were, in former times, try'd in this Court according to the ſtrict Law of the Realm. The Chief Judge of that Court is called *The Lord Chief Juſtice of the Common-Pleas*, aſſiſted with three or four Aſſociates, which are created by Letters Patents from the King, and as it were inſtalled or placed upon the Bench by the *Lord Chancellor* and *Lord Chief Juſtice of the Court*. *Forteſcue*, cap. 51. The reſt of the Officers belonging to this Court are the *Cuſtos Brevium*, three Protonotaries, one Chirographer, fourteen Filacers, four Exigenters, Clerk of the Warrants, Clerk of the Juries, or *Jurata* Writs; Clerk of the King's Silver, Clerk of the Treaſury, Clerk of the Eſſoyns, Clerk of the Outlawries; whoſe diſtinct Functions ſee in their proper places.

COMMON *Ray*, in *Opticks*, is a Right Line drawn from the Point of Concourſe of the two *Optical Axes* through the Middle of the Right Line which paſſes by the Center of the Pupil of the Eye.

COMMON *Receptacle*, in Anatomy, is a certain Veſſel, ſo termed, becauſe it receives both the *Chyle* and *Lympha* promiſcuouſly, though ſome falſly call it the *Receptacle* of the *Chyle* in particular.

Common *Section* of two Planes: See *Section*.

COMMON *Senſory*, the *common* Perception of all Senſations, or that which receives the Images of ſenſible things, or the Impreſſion made by the Objects upon the Nerves, and according to theſe Impulſes determines the Appetite and exerts other Animal Actions.

COMMUNI *Cuſtodia*, was a Writ that lay for that Lord, whoſe Tenant, holding by Knight-ſervice, dies, and leaves his eldeſt Son under Age, againſt a Stranger that entreth the Land, and obtaineth the Ward of the Body: But now is become of no uſe.

COMMUNIA *Placita non tenenda in Scaccaria*, is a Writ directed to the *Treaſurer* and *Barons* of the *Exchequer*, forbidding them to hold Plea between two Common Perſons in that Court, where neither of them belong to it.

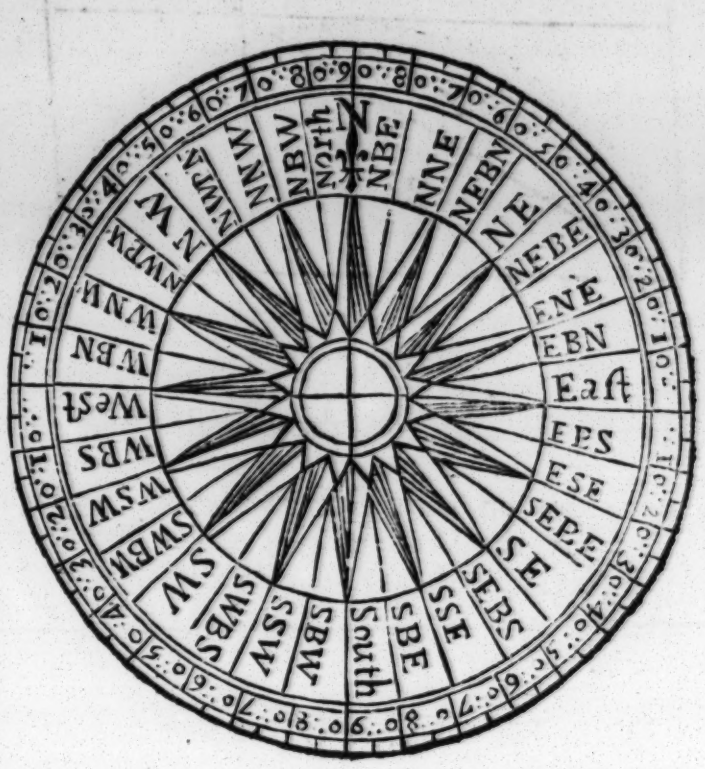
COMPARATIVE *Degree*, in Grammar, is when an Adjective hath joined to its natural and ordinary Signification the Word *more*, either actually or implied; as *more wiſe*, or *worſe*, that is, *more bad*.

COMPARISON, in Grammar, is the Variation of the Senſe of an Adjective, as to Degree; as *good*, *better*, *beſt*, are the three Degrees of Compariſon of that word.

COMPARTIMENT, is a regular orderly diſpoſition of agreeable Figures all round any Picture, Map, Draught, *&c.* for its better Ornament.

COMPASS, in Navigation, is a Circle divided into four Quadrants, repreſenting the four *Cardinal Winds*, or *Principal Points*, *Eaſt*, *Weſt*, *North*, and *South*; and each Quarter ſubdivided into eight other equal Parts, making in all 32 *Rhumbs* or *Points*.

This thus graduated Circle being drawn on a Chard, or Paſt-board, hath a toucht Needle or Wire placed under it, and in its Center a Braſs little Cell or a Conical Hollow, by which means it hangs horizontally on an erect Pin, and keeps its Lilly or North-Point always towards the *North*; by which means the Man at Helm, or Steerſman knows how to keep the Ship to her Courſe.



This Inſtrument, though it be ſubject to Accident, and always to Variation, is yet of vaſt uſe in *Navigation*; as alſo in *Surveying*, *Dialling*, and many other Parts of the *Mathematicks*.

The Learned Dr. *Wallis* conjectures, That the *Compaſs* was invented by an *Engliſhman*, becauſe the word *Compaſs* is uſed in many parts of *England* for a *Circle*.

COMPASS *Dials*, are ſmall ones fitted in Boxes for the Pocket, and ſhew the Hour of the Day by the Direction of the Needle; which ſhews how to place them right, by turning the Dial about till the Cock or Stile ſtand directly over the Needle, and point up to the Northward; but theſe can never be very exact, becauſe of the Variation of the Needle it ſelf.

COMPASS *of Proportion*, is an Inſtrument to divide Lines and Circles into proportional Parts at one opening of the Compaſſes, and is very much uſed in reducing or inlarging of Maps or Draughts. The *French* ſometimes call a *Sector* by this Name the *Compaſs of Proportion*.

COMPERTORIUM, a Judicial Inqueſt in the Civil-Law, made by Delegates or Commiſſioners to find out, or relate the Truth of a Cauſe.

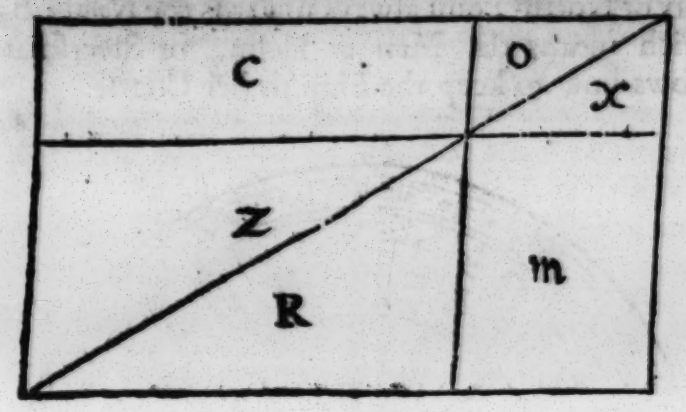
COMPLEMENT of any Ark of a Circle, or of any Angle, is what it wants of a Quadrant or 90 Degrees.

COMPLEMENT *of the Courſe*, in *Navigation*, is the Number of Points the *Courſe* wants of 90 *Degrees*, or eight *Points*, viz. of a *Quarter* of the *Compaſs*.

CONPLEMENT *of the Curtain*, in *Fortification*, is that part of the *Curtain* which (being wanting) is the *Demigorge*.

COMPLEMENT *of the Line of Defence*, is the Remainder of the *Line of Defence* after you have taken away the Angle of the Flank.

COMPLEMENTS *in a Parallelogram*, are the two leſſer Parallelograms *C* and *M*, which are made by drawing two Right Lines parallel to each ſide of the Figure, through a given Point in the Diagonal.



Propoſition.

In every Parallelogram the Complements *C* and *M* are equal: For $Z+C+O=R+M+X$, as making up on each ſide the great Triangle, made =by the Diagonal; of which $Z=R$ and $O=X$ (becauſe the Diagonal makes them ſo) wherefore the remaining Parallelogram $C=M$. *Q. E. D.*

COMPLEX *Terms*, in Logick, are ſuch as are compounded of ſimple or ſingle ones; which they call *Incomplex Terms*.

COMPLEX, or *Complicated Diſeaſes*: See *Complication*.

COMPLEXUS, a Muſcle of the Head, ſerving to move it backwards. It is alſo called *Trigeminum*, becauſe it hath plainly a three-fold Beginning, and ſeems to be compounded of 3 Muſcles; one Beginning is from the tranverſe Proceſſes of the fourth and fifth *Vertebræ* of the Thorax: The Second from the firſt and ſecond of thoſe *Vertebræ*; and the Third from the Spine of the 7th *Vertebra* of the Neck: After, in their Aſcent, they all unite together, and are inſerted into the *Occiput*, ſometimes by one, and ſometimes by a threefold Tendon.

COMPLICATION *of Diſeaſes*, is when divers Diſtempers ſeize on the Body at the ſame time, eſpecially if they depend one upon another.

COMPOSITA, or *Compouud Medicines*, are Medicines made up of any Simple Medicines; as certain Waters, Syrups, Electuaries, Opiates, Trochisks, Ointments, Plaſters, *&c.*

COMPOSITE *Order*, in Architecture, which is alſo called *Italick* and *Roman*, becauſe it was the Invention of the Ancient *Romans*, is ſo called, becauſe it is *compoſed* of the other four *Orders*, *viz. Tuſcan*, *Dorick*, *Ionick*, and *Corinthian*; the firſt is compoſed only of the *Ionick* and *Corinthian*.

COMPOSITON, in Painting, is uſed in the ſame Senſe with *Invention* or *Deſign*; See *Deſign*. There is alſo a certain Method of Demonſtration in Mathematicks call'd by this Name of,

COMPOSITION, which is the Reverſe of the Analytical Method, or of *Reſolution*: It proceeds upon Principles in themſelves ſelf-evident, on *Definitions*, *Poſtulates*, and *Axioms*, and a previouſly demonſtrated Series of Propoſitions, ſtep by ſtep, till it give you a clear knowledge of the thing to be demonſtrated. This is what they call the *Synthitical Method*, and is uſed by *Euclid* in his *Elements*.

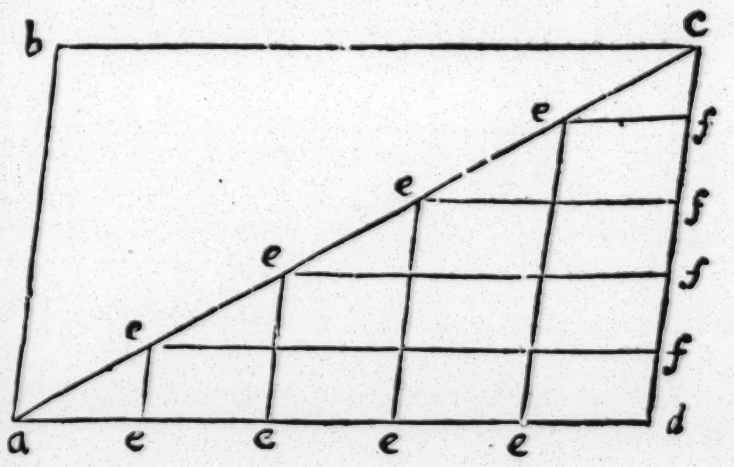
COMPOSITION *of Motion*, is the Compoſition of the ſeveral Directions or Declivities of Motion, whether equable or unequable.

If any Point be ſuppoſed to move or flow (for this Speculation gives an Illuſtration of the Doctrine of *Fluxions*) according to one and the ſame Direction; whether it move equably or not, whether it be *accelerated* or *retarded* in any Proportion whatſoever, it will ſtill keep the ſame Right Line, only the *Celerity will be changed*, and will be increaſed or diminiſh'd according to the Forces with which it is impelled.

Nay, if the Motion be ſo compounded as that the Directions be made one quite contrary to the other, as one ſuppoſe directly downward, the other upward, *&c.* yet ſtill the Line of Motion will be the ſame.

But if the Compounding Motions are not according to the ſame Line of Direction, but ſuch *as do interſect each other*, then the Compound Motion will not be according to the Line of Direction of either of the former, but in a different one from them both; and this either ſtraight or crooked, according as the Directions and Celerities ſhall require.

If two Compounding Motions be each of them *equable* (or every where equally ſwift) whether the Celerity of thoſe Compound Motions be each to other equal or unequal, yet the Line of the Compound Motion will ſtill be a ſtraight Line; and this, though the Motion be neither at Right Angles one to another, nor equally ſwift, nor (each to it ſelf) equable, if they be at leaſt but *Similar*, that is, if they be both accelerated and retarded alike.



Thus, for inſtance, if the Point *a* be impelled by a double impulſe of equal force, both upwards towards *b*, and alſo forwards towards *d*, 'tis plain, that when it is gone forwards as far as *e e*, it muſt of neceſſity be gone upwards as far *e f*; and if the Motions were both equable, it would always go on in the Diagonal *a c*.

Nay, if the Motions be unequal as to Celerity, ſo as, *v. gr.* it move twice as faſt upward as forward, *&c.* yet ſtill it muſt go on in the Diagonal *a c*, becauſe the Triangles *a e e*, *a e c*, *&c.* and *a c d* will ſtill be *Similar*, being as the Motions are: But if the Motions be *Diſſimilar*, then the Compound Motion muſt be a *Curve*.

And this Conſideration of the Compoſition of Motions is of great uſe in Mechanicks. See *Diton*'s Law of Motion.

COMPOSITION *of Proportion*, the comparing the Sum of the Antecedent and Conſequent with the Conſequent in two equal *Ratio*'s, as ſuppoſe 4. 8 :: 3. 6. they ſay by Compoſition of Proportion, 12. 8 : : as 9. to 6. But,

There is, as Dr. *Wallis* well diſtinguiſhes it in his *Algebra* (*Engl. Ed.* p. 85.) a great difference between Compoſition of Proportion by Addition, and by Multiplication; the Inſtance above is of Com-

Compoſition by addition; but if it had been 4 × 8 it would have been Compoſition by Multiplication. In one word, Compoſition of Proportion by Addition, is by Addition of the *Indices* of the *Ratio*'s, but by Multiplication, it is when the *Ratio*'s are multiplied into one another. See more of this Matter under the Word *Proportion*.

COMPOSSIBLE, is an old barbarous Word uſed to ſignify ſuch things as are capable of exiſting together, whereas ſuch as cannot exiſt together are called *impoſſible things*.

COMPOUND *Intereſt*, are thoſe which ſome Number may meaſure beſides Unity; as 15, which is meaſured by five and three.

COMPOUND *Quantities*, in *Algebra*, are ſuch as are connected together by the Signs + and —. and are expreſſed by the ſame Letters than one, or elſe by the ſame Letters unqually repeated; thus, $a + b - c$, and $bb - b$ are Compound Quantities.

CONPOUNDED, *Compoſite*, or *Aggregated Flower of a Plant*, is by the Botaniſts accounted ſuch an one as conſiſts of many little Flowers concurring together to make up one whole one, each of which hath its *Style* and *Stamina*, and adhering Seed, and are all contain'd within one and the ſame *Calyx* or *Perianthium*. This *Compoſite Flower* diſtinguiſhes a large *Genus* of Plants, which our Accurate Botaniſt, Mr. *Ray*, divides as follows:

Herbs of Compounded or Aggregated Flowers are,

1. Such as have a plain Leav'd Flower naturally, and for the moſt part full, and having their whole Body Milky (*i. e.* on cutting or cropping yielding a Milky Juice) and theſe have their Seeds.
   1. *Pappous* or *Winged*, *i. e.* having a little Lanugo adhering to each Seed, by which the Wind can carry it eaſily from place to place: Such as the *Lactuca*, *Tragopogon*, *Scorzonera*, *Dens Leonis*, *Hieracium*, and the *Piloſella*.
   2. Such as the ſolid Seed without any Pappus or Down upon them; as the *Eringium Luteum*, *Cichorium*, *Lampſana*.

2. Such as have a *Diſcous Flower*, that is, one compoſed of many ſhort, thick, compreſſed, ſmall *Floſculi* (which ſome by miſtake call *Stamina*) ſet together ſo as to make one flat or hollowiſh Superficies: And theſe alſo either are ſuch as have their Seeds,
   Pappous, as the *Tuſſilago*, *Petaſites*, *Carlina*, *Helenium*, *Doronicum*, *Conyza*, *Aſter*, *virga Aurea*, *Jacobœa*, *Stœchas Citrini*, *Jacea*, *Senecio*, *Euparorium Avicennæ*, *Cacalia Valgaris*, *Gnaphalium Maritimum*, and *Monſpelienſium*.
   Such whoſe Seeds are Solid and not Pappous, as the *Corymbiferous Herbs*; which ſee under that Word.

COMPULSION, is when in an Agent capable of Volition, the Beginning or Continuation of any Action is contrary to the Preference of his Mind.

COMPUTO, is a Writ ſo called of the Effect, becauſe it compelleth a Bailiff, Receiver, or Chamberlain to yield up his Accounts: It lieth alſo for Executors of Executors; and againſt tha Guardian in Soccage, for Waſte made in the Miniority of the Heir.

CONARIUM, or the *Glandula Pinealis*, is a part of the Brain hanging in a ſmall Cavity called the *Anus* in the hinder part of the third Ventricle of the Brain, and leading into the fourth; it is ſo called from being of the Shape of a Pine Cone. *Des Cartes* ſuppoſed this Glandule to be the Seat of the Rational Soul; but its Subſtance being the ſame with the reſt of the Brain, its probable it ſerves for the ſame Uſe.

CONATUS *Recedendi ab Axe motus*, is the Endeavour which any Body moved circularly hath to recede or fly off from the Center or Axis of its Motion.

CONCATENATION *of Cauſes*, is a Term ſometimes uſed to expreſs, that an Effect is the Reſult of a long Chain of Cauſes depending upon or linked one to another.

CONCAVE and *Concavity*, ſignifies the Hollowneſs of any thing: See *Convexity*.

CONCAVE *Glaſſes*, are ſuch as are ground hollow, and are uſually of a Spherical Figure, though they may be of any other; as *Parabolical*, &c.

All Objects ſeen through *Concave Glaſſes* appear erect and diminiſhed or leſſened.

What the *Virtual Focus* of a *Concave Glaſs* is, ſee under that Term.

The confuſed Appearance of a Point through any *Concave Glaſs* proceeds from the too great Divergence of thoſe Rays which fell on the Eye; wherefore, becauſe the more remote the Eye is from the Glaſs, the leſs will the Rays Diverge; therefore the farther the Eye is from a *Concave Glaſs*, the more *diſtinct* will be the Appearance of any Object thro' it, tho' the more *faint*.

The *Apparent Place* of Objects ſeen through Concaves, is always brought nearer to the Eye; which is the Reaſon why they help Short-ſighted Perſons, or ſuch as can ſee only nigh Objects Diſtinctly.

For a Rule to fit a *Concave Glaſs* to the Eye of ſuch a Perſon, let him obſerve nicely the Diſtance at which he can read Letters, or ſee Objects Diſtinctly; which ſuppoſe to be at 12 Foot, then will a *Concave Glaſs*, whoſe *Virtual Focus* is a Foot diſtant from it, make that Perſon ſee diſtant Objects diſtinctly.

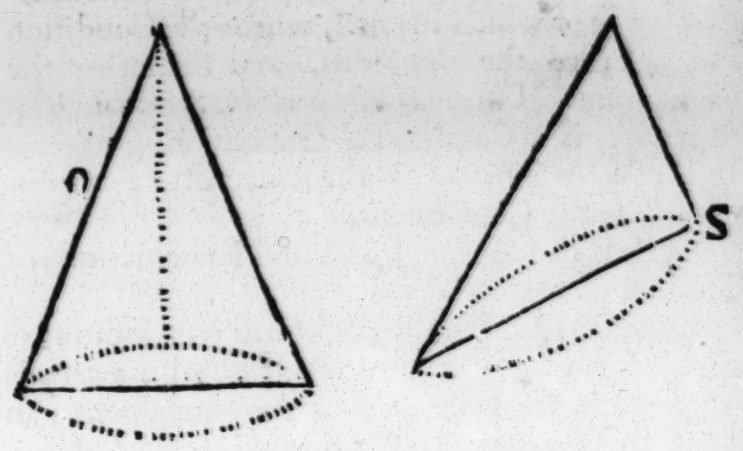
The farther the Eye is removed from any *Concave Glaſs* the leſs the Object appears, and a leſſer Area of it is ſeen; and when the Glaſs is exactly in the Middle between the Eye and the Object, the Object will appear the *moſt diminiſhed*, that that Diſtance between the Eye and Object will allow of.

CONCENTRATION, accoeding to Dr. *Grew*, is the higheſt Degree of Mixture, and is when two or more Atoms or Particles of the Mixture do touch by *Reception* and *Intruſion* of one into the other: And this he takes to be the Caſe of all fixed Bodies which are without Taſte or Smell, whoſe Conſtitution is ſo firm, that till the Particles are as it were *unprim'd* from each other, they cannot affect either of thoſe Senſes.

CONCENTRICK *Figures*, are ſuch as have the ſame common *Center*.

CONCEPTIO, a Grammatical Figure: See *Syllepſis*.

A *Cone* is ſaid alſo to be *Right* as to the Poſition of its Axis in reſpect to the Horizon; *i. e.* when its Axis be not ſo, 'tis called an *Oblique Cone*. A *Cone* is called *Scalenous*, when one Side of it is longer than the other, as *S*.



The ſolid Content of a *Cone* is found by multiplying the Area of its Baſe by $\frac{1}{3}$ of its perpendicular Height.

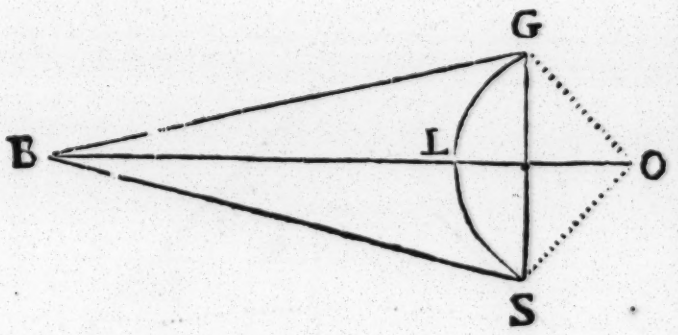
For a *Cone* is but a *Pyramid* of infinite Sides, and a *Pyramid* is equal to $\frac{1}{3}$ of its circumſcribing *Priſm*, and a *Priſm* is but a *Cylinder*, having an infinite Number of Sides; therefore a *Cone* is equal to $\frac{1}{3}$ of a Cylinder circumſcribing it. 7. *e.* 12. *Eucled.*

See alſo the Demonſtration under *Proportion of Solids.*

How to find the External Surface of a *Cone*, ſee under the Word *Pyramid.*

If a *Cylinder*, *Sphere* and *Cone* have the ſame Baſe and Altitude, the *Cone* is the Difference of the *Cylinder* above the *Sphere*; and *Cylinder*, *Sphere* and *Cone*, are as 3, 2 and 1. See *Cyliuder.*

CONE *of Rays*, in Opticks, are all thoſe Rays which fall from any Point, as ſuppoſe *B*, in any Ob-



ject, on whoſe Surface of any Glaſs, as *G L S*, having Vertex in *B*, and the Glaſs for its Baſe; ſuch is the *Cone G L S B.*

CONFECTIONS, a Compoſition of Powders, Gums, Sugar, Honey, Syrups, *&c.* made up into one Subſtance; and it is two-fold, either dry, as *Lozenges*, &c. or moiſt, as *Preſerves*, *Conſerves*, and all ſorts of *Antidotes. Blanchard.*

CONFISCATE, in Law, ſignifies to be forfeited to the Publick Fiſque or King's Treaſury: For among the *Romans* the Emperor's Treaſure was kept in Hampers or Baskets, which, in Latin, is *Fiſcus.* Now if a Man be Indicted for Felonioufly ſtealing the Goods of another, tho' in truth they are the proper Goods of the Perſon Indicted, yet if, when the Goods are brought in Court againſt him, as the Manner is, he ſhall then *Diſclaim* them, he doth by this *Diſclaimure* loſe the Goods, although he be afterwards acquitted of the Felony, and they ſhall be *Confiſcated* to the King; but it is otherwiſe if he does not Diſclaim them. The ſame Law is where Goods are found the in Felon's Poſſeſſion, which he diſavows, and afterwards is attainted of other Goods, and not of them, there the Goods which he diſavows are *Confiſcated* to the King; but had he been attainted of the ſame Goods, they ſhould have been ſaid to be *Forfeited*, and not *Confiſcated*, notwithſtanding the Diſavowment. So if an Appealof Robbery be brought, and the Plaintiff leaves out ſomeof his Goods, he ſhall not be received to enlarge his Appeal; and foraſmuch as there's none to have the Goods ſo left out; the King ſhall have then as *Confiſcate*, according to the old Rule, *Quod non capit Chriſtus, capit Fiſcus.*

CONFUSED *Viſion*: See *Viſion.*

CONGE, a Term in Architecture: See *Apophyge.*

CONGEALE, in Chymiſtry, is to let ſome Matter that is melted fix or grow into a Conſiſtency; as when a Metal is left to cool, which hath been melted in a Crucible; or when Wax, Fat, Butter, or the like, are taken from the Fire and ſet to cool, they ſay, 'tis let *Congeal.*

CONGLOBATE, a Word uſed for ſuch of the *Glands* in an Animal Body as are ſmooth in their Surface, and ſeem to be made up of one continued Subſtance: They ſerve to ſeparate the *Lympha* from the Arterious Blood, and to return it by the Lympheducts, either into the Chyliferous or Sanguiferous Veſſels, though ſome think the Glands of the Meſentary, and Breaſts of Lacteſcent Women ſerve to ſeparate true Chyle.

CONGLOMERATE *Glands*, are ſuch in an Animal Body as are uneven in the Surface, and are made up, as it were, of many leſſer Glands. Their Uſe in the Body is to ſeparate ſeveral ſorts of Juices from the Blood, and alſo to Elaborate and alter them, and by proper Ducts to convey them to their appropriate Receptacles and Cavities. Thus the *Parotides* and Maxillary Glands ſeparate and bring the *Saliva* into the Mouth by their proper *Ducts.*

CONGREGATION, according to Dr. *Grew*, is the leaſt Degree of Mixture; in which the Parts of the Mixt are *inconſiſtent*, and do touch each other but in a Point; and he ſaith, he hath many Arguments to induce him to believe, that the Atoms or Particles of all Fluids, as ſuch, do touch one another only after that Manner.

CONGRUITY, by the Naturaliſts is eſteemed a Relative Property to a Fluid Body, whereby any Part of it is readily united with any other Part, either of it ſelf, or of any other Similar Fluid or Solid Body. And *Incongruity* is a Property by which it is hindred from uniting with any Solid or Fluid Body diſſimilar to it.

CONGRUITY *of Geometrical Figures*: See *Concurring.*

CONICK *Sections*: See *Sections.*

CONJERIES, is the joining or collection together of many Bodies or Particles in Maſs or Lump.

CONIFEROUS *Plants*, whether Trees, Shrubs or Herbs, are ſuch as bear a Squammoſe Scaly Fruit, of a Woody Subſtance, and of a kind of Conical Figure, in which Cone are many Seeds, and when they are ripe, the ſeveral Cells or Partitions in the Cone gape or open, and the Seed drops out: Of this kind are the *Scorch* Firrs, Male and Female, and the Pine, which in our Gardens is called

called the *Scotch Firr*, the common Alder, and the Beech Tree.

CONJUNCTIVA *Tunica*, the ſame with *Adnata*.

CONJUGATE *Diameter*, is the ſhorteſt Axis or Diameter in an Ellipſis.

CONJUGATE *of the Hyperbola*, is a Line drawn parallel to the *Ordinates*, and thro' the Center or middle Point of the Tranſverſe Axis; and is always a middle Proportion between the *Parameter* (or *Latus Rectum*) and the *Latus Tranſverſum*. This Line alſo is ſometimes called the *Second Axis or Diameter*.

CONJUGATION of a Verb, in Grammar, is varying or forming it by Mood, Tenſe and Perſon.

CONJUNCTION, in Aſtronomy, is the meeting of the Stars or Planets in the ſame Degree of the Zodiack; and is either *Apparent* or *True*.

CONJUNCTION *Apparent*, is when the Right Line that is ſuppoſed to be drawn thro' the Centers of the two Planets, does not paſs thro' the Center of the Earth.

CONJUNCTION *True*, is when that Right Line being prolonged, paſſes alſo thro' the Center of the Earth.

CONJUNCTION, in Grammar, is an undeclinable Word, which is uſed to connect or join Words and Sentences together.

CONNIVENTES *Glandulæ*, are thoſe Wrinkles which are found in the Inſide of the *Inteſtinum Ileum* and *Jejunum*. For the inner Tunick of the Guts being longer than the Middle or the Outward, it doth frequently, and in many Places wrinkle or bag out, by which Means the Paſſages for the Contents become ſtrait'ned, and conſequently the Matter deſcends thro' the Guts more ſlowly, ſo that the Lacteals have the more time to imbibe Chyle.

CONOID, is a Solid produced by the Circumvolution of any Section of the *Cone* about its *Ax*, and may be either a

CONOID *Epileptical*, when made by an *Ellipſis*, and then is more commonly called a *Spheroid*; and if the Revolution be made round the *Latus Tranſverſum*, it forms an oblong *Spheroid*; but if round the Conjugate Axis, a *Prolate* or *Oblate one*: Such is the Figure of our Globe, and of the other Planets.

CONOID *Hyperbolical*, when made by an *Hyperbola*.

CONOID *Parabolical*, when it is produced by the Section called a *Parabola* turning about its *Ax*.

CONOIDES, the ſame *Conarium*.

CONSCRIBED, the ſame with *Circumſcribed*: Which ſee.

CONSECTARY, is a Deduction or a Conſequence drawn from a preceding Propoſition, and is the ſame with *Corollary*.

CONSENT (in Medicine) is the depending of one Diſtemper upon another: Thus a Difficulty of Breathing is ſaid to proceed by *Conſent* from a *Pleuriſy*, and in that Caſe does not require a particular Cure, becauſe it ceaſes as ſoon as the Diſeaſe on which it depends is removed; or the mutual Sympathy or Correſpondency betwixt the Parts of the Body, which is uſually ſaid to be occaſioned. 1. By the Likeneſs or Similitude of their Kind, as when one Nerve is affected with the Hurt of another. 2. By the Similitude of their Office or Function, as when the Intercoſtal Muſcles ſuffer by an Inflammation of the Diaphragm. 3. By a Communication of Veſſels, for which Reaſon a Fit of the Stone in the Kidneys is frequently attended with Vomiting. 4. By the Contiguity or Neighbourhood of the Parts, as when the Inflammation of the Pleura is communicated to the *Lungs*: But the two former may be reduced to the two latter, which are the only real Cauſes of a *Conſent* or Sympathy betwixt the Parts of the Body.

CONSEQUENCE or *Conſequentia*, a Term in Aſtronomy: See *Antecedence*.

CONSEQUENT, in Mathematicks, is the latter of two Terms of Proportion, as if the Proportion were of *A* to *B*, *B* is ſaid to be the *Conſequent*.

CONSERVA, a *Conſerve*, is a Compoſition of Flowers or Herbs beat together, to every Pound whereof, if they be dry, are added three Pounds of Sugar; if moiſter two Pounds, ſo that they may be kept ſeveral Years. *Blanchard*.

CONSISTENT *Bodies*, ſo Mr. *Boyle* calls ſuch as we uſually ſtile ſolid or firm ones, and he means ſuch whoſe Parts are firmly and conſiſtently united together, ſo that they do not ſlide over one another's Surfaces, as eaſily as the Parts of Fluid Bodies do.

CONSOLE, is a kind of Bracket or Shouldering-Piece in Building, which hath a Projecture, and ſerves to ſupport a Cornice, or to bear up Figures, Butts, Veſſels, and other Ornaments of the like Nature.

CONSOLIDATING *Remedies*, are thoſe things which cleanſing with a moderate Heat and Force, by taking Corruption out of Wounds, and preſerving the Temperature of the Parts, cauſe the Nouriſhment to be fitly apply'd to the Part afflicted. *Blanchard*.

CONSOLIDATION, is a Word uſed by Phyſicians and Surgeons for the uniting ſtrongly together the Fractures of broken Bones, or the Lips of a Wound; then they ſay the Parts begin to conſolidate or join together in one entire Piece, as they were before the *Fracture* or the *Solution of Continuity*.

CONSONANCE, in Muſick, is the Agreement of two Sounds, the one *Grave*, the other *Acute*, which are compounded together by ſuch a Proportion of each, as ſhall prove agreeable to the Ear. A *Uniſon* is the Firſt *Conſonance*, an *Eighth* is the Second, the *Fifth* is the Third, and then follows the *Fourth*, and the *Thirds* and *Sixths*, *major* and *minor*. There are other *Conſonances*, which are the Doubles or other Repetitions of the former. There can be but Seven or Eight *Simple Conſonances*; the *Perfect* ones are the *Uniſon*, the *Eighth* and the *Fifth*, with their Correſpondents.

CONSPIRATIONE, is a Writ that lies againſt Conſpirators.

CONSTABLE, is a Word variouſly uſed in our Common-Law: Firſt, for the *Conſtable of England*, who is alſo called *Marſhal*; his Office conſiſteth in the Care of the common Peace of the Land in Deeds of Arms and Matters of War. The Court of the *Conſtable* and *Marſhal* determineth Contracts touching Deeds of Arms out of the Realm, and handling things concerning War within the Realm, as Combats, Blazons of Armory, *&c.* But he may not deal with Battel in Appeals, nor, generally, with any other thing that may be tried by the Laws of the Land. Out of his Magiſtracy were drawn theſe lower *Conſtables* which

we

we call *Conſtables of Hundreds* and *Franchiſes*, and firſt ordained by the Statute of *Wincheſter*, which appointed for the Conſervation of Peace and View of Armour two *Conſtables* in every Hundred and Franchiſe: And theſe be now *High-Conſtables*, becauſe continuance of Time and increaſe of People and Offences, hath again, under theſe, made others in every Town called *Petit Conſtables*, which are in like Nature, but of inferior Authority to the other. Beſides theſe there be Officers of particular Places called by this Name, as *Conſtable of the* Tower, *Conſtable of the Exchequer*, *Conſtable of* Dover *Caſtle*, *&c.*

CONSTAT, is a ſort of Certificate made by the Clerk of the Pipe and Auditors of the *Exchequer*, at the Requeſt of any Perſon who intends to plead in that Court for the Diſcharge of any thing.

CONSTELLATION, or *Aſteriſm*, is a Company of fixed Stars, imagined to repreſent the Image of ſomething, and commonly called by the Name of that Thing: There are 21 *Northern* and 12 *Southern* ones.

CONSTIPATION, is when the Parts of any Body acquire a cloſer Texture than what they had before.

CONSTITUTIONIS *Baſilick*: See *Baſilick Conſtitutions*.

CONSTRICTION, is the crouding the Parts of any Body cloſe together in order to Condenſation.

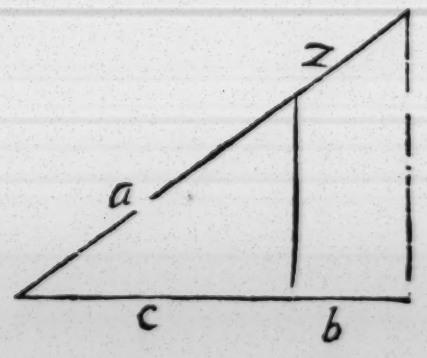
CONSTRICTOR *Labiorum*, *Sphincter & Orbicularis Labiorum*, a Muſcle which environs the Lips with Orbicular Fibres, and when it acts it purſes them up; wherefore ſome Name it *Oſculatorius*.

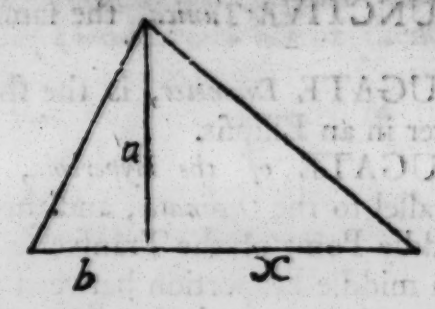
CONSTRICTORES *Alarum Naſi ac Depreſſores Labii Superioris*: Theſe Muſcles ariſe from the fourth Bone of the upper Jaw, immediately above the Gums of the *Dentes Inciſorii*, and aſcending, are ſoon inſerted to the Roots of the *Alæ Naſi* and ſuperior Parts of the upper Lip; they draw the upper Lip and *Alæ* downwards.

CONSTRUCTION *of Equations*, in Algebra, is the contriving ſuch Lines and Figures as ſhall demonſtrate the Equation, Canon or Theorem to be true Geometrically. And this is often of great Uſe to ſolve and illuſtrate Algebraical Equations: And the Manner of it you will ſee in the following Rules, which ſhew you how to reſolve Simple Equations into Proportionals, and to build a Geometrical Conſtruction thereupon.

1. Thus if $\frac{ab}{c} = z$, then $c : b :: a : z$; by 12. *e.* 6. *Euclid.*

Or if $\frac{aa}{b} = x$, then $b : a :: a : x$.





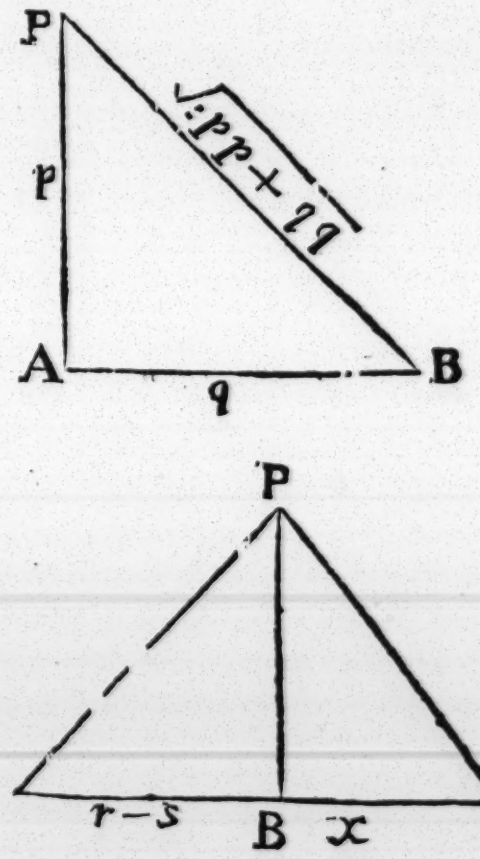
Or if $\frac{ab + ag}{b + i} = x$, then $b + i : b + g :: a : x$.

Or if $\frac{ab + ag}{b + i} = x$, then $b - i : b + g :: a : x$.

2. If $\frac{ab + mn}{r - s.} = x$, the Conſtruction and Solution will be more difficult, becauſe no Letter in the Numerator is taken twice; but that it may be ſo, and that *(a)* (for Inſtance) may be twice us'd, make, as $a : n :: m :$ to a Fourth Proportional, which call p; then $nm = ap$, and conſequently, $\frac{ab + ap}{r + s.} = x$; wherefore, by *Rule* 1, $r + s : b + p :: a : x$.

Or if this Equation were propoſed, $\frac{ab + m}{r - s} = x$, firſt find a mean Proportional between a and b, which ſuppoſe to be p; alſo another mean Proportional between m and n, which let be q; then the Equation will ſtand thus, $\frac{pp + qq}{r - s} = x$.

Let therefore a Right-angular Triangle be made, wherein the Perpendicular $AP = p$, and the Baſe $AB = q$; therefore ſhall $PBq = pp + qq$, which, ſince according to the Equation it is to be divided by $r - s$, make, as $r - s : PB (= \sqrt{pp + qq}) ::$

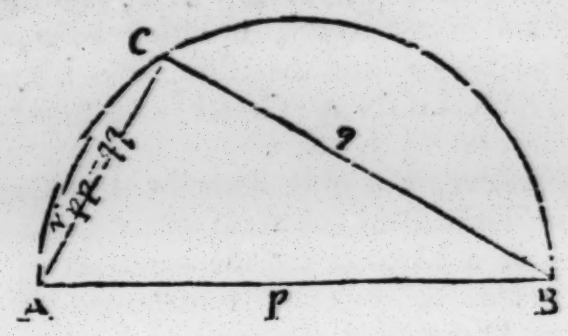


PB : to a Third Proportional, and that ſhall be x ſought.

3. In this Equation $\frac{ab - mn}{c + d} = y$.

Firſt, Make, as $a : m :: n : p$, a Fourth Proportional;

portional; then will $\frac{ab-ap}{c+d}=y$, and consequently (as in *Case* 3.) $c+d:b-p::a:y$.



Or you might (as in *Case* 2.) have found a mean Proportional between a and b, as alſo between m and n, which being called (as there) p and q, the Equation would have ſtood thus, $\frac{pp-qq}{c+d}=y$: Then having taken $AB=p$, and on it, as a Diameter, drawn a Semicircle, and applying in $BC=q$, the Square of AC will be $=pp-qq$; which, ſince it is to be divided by $c+d$, make, as $c+d:AC::AC:y$, the Quantity ſought.

4. Let this Equation $\frac{aabc}{ffg}=z$ be propoſed:

Firſt, Find out (p) a Third Proportional to f and a, then $fp=aa$; the Equation will ſtand thus, $\frac{fpbc}{ffg}=z$, that is, $\frac{pbc}{fg}=z$.

Secondly, Find a Fourth Proportional (q) to f, p and b, ſaying, as $f:p::b:q$; then will $fq=pb$, and conſequently the Equation will ſtand thus, $\frac{fqc}{fg}=z$, that is, $\frac{qc}{g}=z$; and therefore (as *Rule* 1.) $g:q::c:z$, ſought.

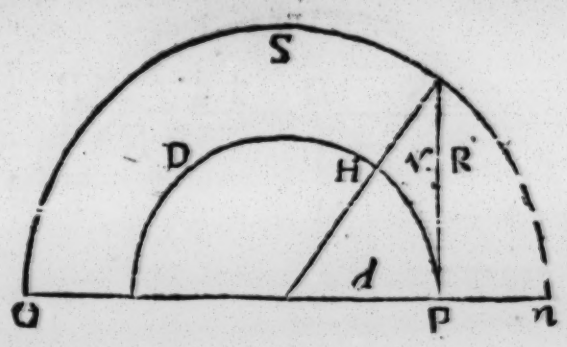
5. If this Equation $\frac{hkk}{mm}=z$ were propoſed,

Firſt, Find a Fourth Proportional to m, h and k, which let it be p; therefore $pm=hk$, and conſequently the Equation will ſtand thus, $\frac{pmk}{mm}=x=\frac{pk}{m}$; therefore $m:p::k:x$, ſought.

Conſtruction of all the Three Forms of *Quadratick Equations*, according to Mr. *Oughtred*'s Method of Solution.

Draw two Concentrick Circles, as in the Figure, and let the Diameter of the Greater be called S, and the Diameter of the Leſſer be D.

Which Letters S and D do repreſent the Sum and Difference of the Roots found, as H and d do the Half Sum and Half Difference.



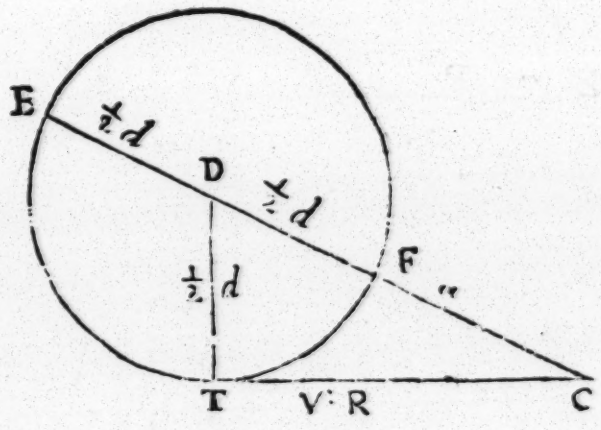
Since therefore his Theorem is, that $SS-DD=4R$, let $\sqrt{:R}$ be made a Tangent to the leſſer Circle, and a Right Sine in the Greater, and draw the Hypotenuſe H, and call the Baſe of the Triangle d.

Then will $HH-dd=R$, (*viz.* $\frac{1}{4}SS-\frac{1}{4}DD=R$;) wherefore $HH=R+dd$, and therefore $H=\sqrt{:R+dd}$: Thus H, if required, is found: Or if H had been given, and d required; now ſince $HH-R=dd$, therefore $\sqrt{:HH-R}=d$.

And having thus found H and D, then $H+d$ ($=Op$) = the greater Root a; and $H-D$ ($=pn$) = the leſſer Root e, which will be Affirmative or Negative according to the Form of the *Equation*.

CONSTRUCTION *of Quadraticks* after another Method, in Imitation of *Des Cartes*.

In the Firſt Form, which is $aa+da=R$, Let $FC=a$, the Leſſer of the Two Roots, and DF or $DT=\frac{1}{2}d$, *i. e.* Half the Co-efficient.

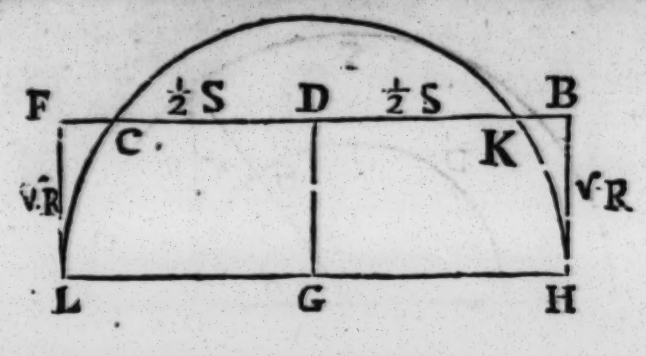


Then will $BC=d+a$, and conſequently $\square BCF=\square TC$, by 36 *e.* 3 *Euclid.* That is, $aa+da=R$.

In the Second Form, which is $aa-da=R$, Make $BC=a$, the Greater of the two Roots, and DF or $DT=\frac{1}{2}d$ (Half the Co-efficient;) Then will $\square BCF=\square TC$ (by 36 *e.* 3) or $aa-ad=R$.

In the Third Form, which is $Sa-aaR$, Let $FB=S$, and CB or $FK=a$ (the Greater Root;) Then will FC or $KB=S-a$.

But by 36. *e.* 3. *Eucl.*
$\square CBK$ or $KFC=\square BH$ or $\overline{FL}$;
That is, $Sa-aa=R$.



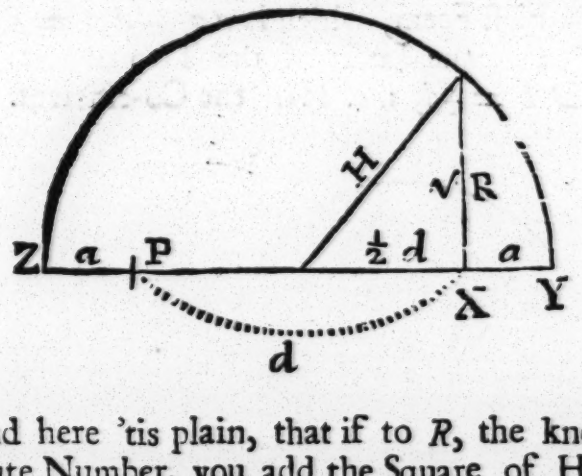
But if KB be ſuppoſed equal to a (the leſſer Root) Then will $KF = S - a$.

But $\square KFC = \square FL$, that is, $Sa - aa = R$, by 36. *e.* 3 *Eucl.*

The Three Forms of *Quadraticks* may alſo be conſtructed another Way after the following Manner, which agrees very well with *Harriot*'s Method of Solution by compleating the Square.

Thus; Suppoſe $aa + da = R$:

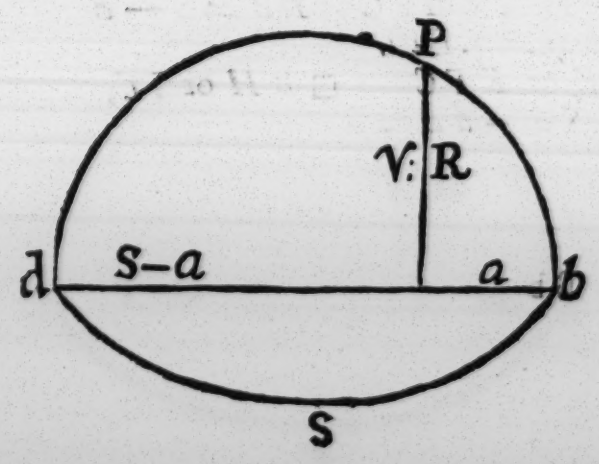
Draw a Line at pleaſure, and on it ſet the Co-efficient d, and biſect it: At any End of it erect perpendicularly a Right Line equal to the $\surd : R$. Then, with the Diſtance between the Top of the Line and the Middle of d, deſcribe a Circle, which will give you a, as you ſee; for then $\surd : R$ will be a mean Proportional, and $aa + ad = RR$, by 14 *e.* 6. *Euclid.*



And here 'tis plain, that if to R, the known or abſolute Number, you add the Square of Half the Co-efficient, or of $\frac{1}{2}d$, 'twill give you the Square of H, or of $\frac{1}{2}d + a$; from the Root of which, at laſt taking $\frac{1}{2}d$, there will remain a, the Leſſer of the two Roots ſought.

In the Second Form, where $aa - da = R$. Let zx be ſuppoſed $= a$; Then will $xy = a - d$; and conſequently (all things being conſtructed as before) $aa - ad = R$ (by 14. *e.* 6. *Eucl.*) And here, as before, $Q\frac{1}{2}d - R = HH$, which is equal to $Q\frac{1}{2}d + xr$; to the Square Root of which adding $\frac{1}{2}d$, you have zx or $py = a$.

As to the Third Form, *viz.* $Sa - aa = R$,



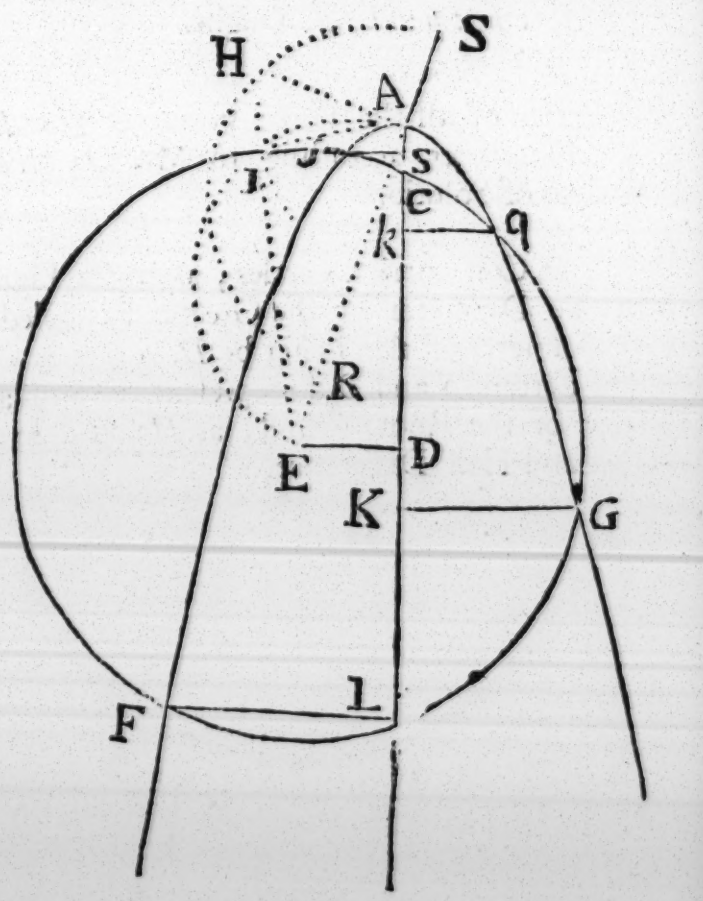
where the Co-efficient is the Sum of the Roots; on S, as a Diameter, draw the Circle dpb; then apply, in a Line equal to the Square Root of R, the abſolute Number perpendicularly as before; and then will $S - a. \surd : R :: \surd : R. a$; (for ſince S = to the Sum of the Roots, if either be a, the other muſt be $S - a$) and therefore $Sa - aa = R$.

CONSTRUCTION *of Cubick and Biquadratick Equations in Algebra.*

This, I believe, was firſt done by *Des Cartes*, who (in the Third Book of his excellent *Geometry*) hath given us a Method for the conſtructing and finding the true Roots of all Equations, not exceeding four Dimenſions, by means of a Parabola and a Circle; which Method was indeed not perfect, becauſe it would not conſtruct any Equations but ſuch as had their Second Term firſt taken away. However, becauſe it was that which gave the firſt Riſe to *Baker*'s excellent Rule, and to whatever Improvements have been ſince made in it, it's proper to give you an Account of it in the firſt Place.

When the Second Term is wanting, *Des Cartes* reduces all *Cubick Equations* to this Form, $Z^3.*.apz, aaq = o$; and *Biquadraticks* to this, $z^4.*.apzz, aaqz, aaar = o$; where a ſtands for the *Latus Rectum* or *Parameter* of any given *Parabola*, and is ſuppoſed equal to 1, that its Power may produce no Trouble in Operation: By which Means the former Equations will ſtand thus, $Z^3.*.pz, q = o$, and $Z^4.*.pzz, qz, r = o$.

Let then any *Parabola*, as FAG, be ſuppoſed to be deſcribed, whoſe Axis is $ACDKL$, and its *Parameter* $1 = a$, make AC equal to $\frac{1}{2}a$, ſo that the Point C will always be within the Parabola: Then take in the Axis (downwards from C, if P have a Negative Sign, but upwards in the Axis produced when it hath a Poſitive one) $CD =$ to $\frac{1}{2}p$. Then from the Point D (or C, if the Quantity p be wanting in the Equation) erect a Perpendicular to the Axis, as DE, and make it equal to $\frac{1}{2}q$; which DE muſt be on the Right-hand, if it have a Negative Sign, but on the Left if it be $+q$. After which, deſcribing a Circle on the Center E with the Radius EA, it will (if the Equation be



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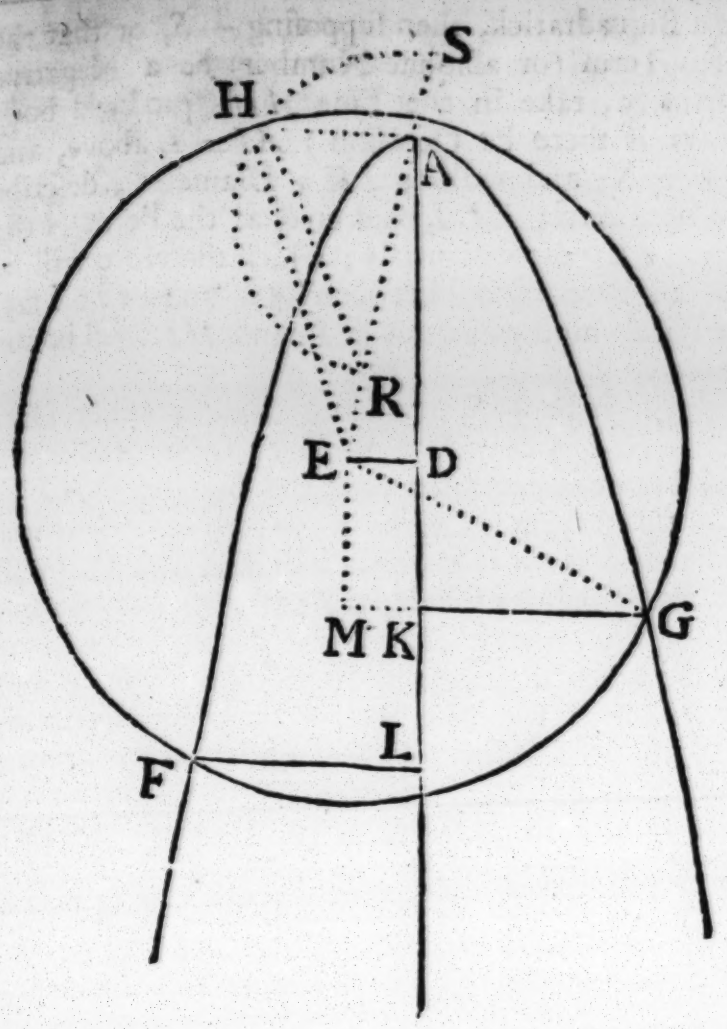
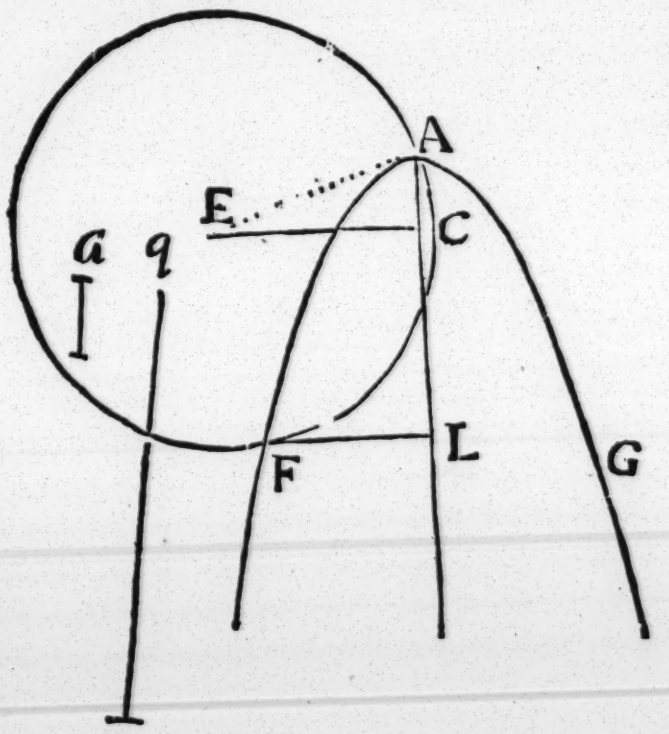


only a Cubick one) cut the Parabola in as many Points as the Equation hath true Roots; and the Affirmative ones will be Ordinates or Perpendiculars let fall from thence to the Axis on the Right-hand; and the Negative Roots Perpendiculars let fall on the Left-hand of the Axis.

But if the Equation be a Biquadratick one, the fourth Term r being there, and having a positive Sign, then from A take $AR = r$, and produce $AS = c$ or 1. Make RS the Diameter of a Circle, and at A erect HA perpendicularly; I say, the other Circle must pass through H, and its Radius



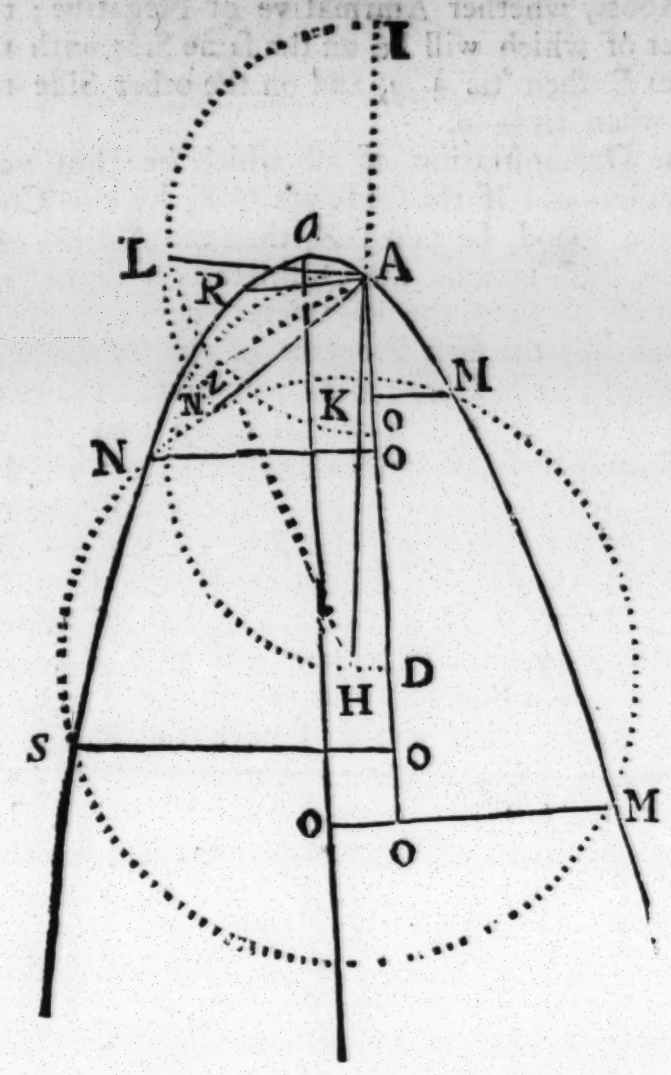
will be EH: But if r have a Negative Sign, there must yet another Circle be drawn on the Diameter AE, in which AI must be applied equal to AH, and that will find the Point I, through which the intersecting Circle must pass, and whose Radius will be IE, and Center E; which Circle may cut the Parabola in 1, 2, 3 or 4 Points, from whence perpendicularly let fall to the Axis, will be all the Roots, whether Affirmative or Negative; the former of which will be on the same Side with the Center E when 'tis $+ q$, and on the other Side the Axis when 'tis $- q$.

The Demonstration of all which he thus very easily gives us: If the Ordinate $G K$, by this Construction found, be called Z, then the Abscissa Ak will be ZZ, because the Ordinate is a mean Proportional between the Parameter (here 1) and the Abscissa (by the first Property of the Parabola;) wherefore, if from AK you take $AC = \frac{1}{2}$, and also $CD = \frac{1}{2}p$, you will find, by that Means, the Remainder DK or EM, which, in this Notation, will be $ZZ - \frac{1}{2}p - \frac{1}{2}$ (*See Figure the First*) whose Square will be $Z^4 - ZZp - ZZ + \frac{1}{4}pp + \frac{1}{2}p + \frac{1}{4}$. And because, by the Construction, DE or $KM = \frac{1}{2}q$, the Whole GM will be $= Z + \frac{1}{2}q$, and its Square will be $ZZ + qZ + \frac{1}{4}qq$. Add then this and the former Square of EM together, and you will have the Square of the Radius EG, $Z^4 - ZZp + qZ + \frac{1}{4}pp + \frac{1}{4}qq + \frac{1}{2}p + \frac{1}{4}$ (by 47 *e. Euclid.*) which Radius, or its equal EH, may be expressed another way, if we consider that $ED = \frac{1}{2}q$, and $AD = \frac{1}{2}p + \frac{1}{2}$, for then the Hypothenuse EA will be $\surd : \frac{1}{4}qq + \frac{1}{4}pp + \frac{1}{2}p + \frac{1}{4}$. Wherefore, since AH is a mean Proportional between $AS = 1$, and $AR = r$, it must it self be noted by $\surd : r$; Also since EAH is a Right Angle, the Square of EH = the Sum of the Squares of HA and EA, that is, $\square$ of HE or $EG = \frac{1}{4}qq + \frac{1}{4}pp + \frac{1}{2}p + \frac{1}{4} + r$; which last Quantity being equal to $Z^4 - ZZp + qZ + \frac{1}{4}pp + \frac{1}{4}qq + \frac{1}{2}p + \frac{1}{4} = \square EG$, as was proved before: If you compare them together, you will find this Equation to arise $Z^4 = .*. + pZZ - qZ + r$; whence 'tis plain IK is the true Root. *Q. E. D.*

Thus far went *Des Cartes* in this Matter; but he considering only the Axis of the Parabola, and not thinking of what might be done by the other Diameters, could not construct any Equations, but from which he had first ejected the Second Term. But our *Baker* took the Diameters or Parallels to the Ax also into Consideration, and by that Means did exceedingly perfect and improve this Construction of *Des Cartes*, and made it universal for all Equations not exceeding four Dimensions, without any previous Reduction of them, or taking any of the Terms.

And his Method is this, as you may find in his *Clavis Geometrica*.

Taking any Parabola, let the *Parameter* or *Latus Rectum* be called $1 = L$, (that so the Power of L may create no Trouble) and its Vertex a; then, at Right Angles to the Axis, inscribe $RA = \frac{1}{2}p$, (for half the second Term in the Equation) and then shall its Point A be the Vertex of the Diameter AD, to be drawn parallel to the Axis; so that the Distance of this Diameter from the Axis is always $\frac{1}{4}$ of p, or $\frac{1}{4}$ of pL (for L is = but to 1;) and consequently, when $p = o$, or when the second Term is wanting (as in *Des Cartes* his Construction) AD will be in the Axis, and the Points R, a and A all co-incident. Next in this Diameter AD, he determines the Point D by the Length of AD, and then erects in D a Perpendicular to DA, as DH, whose Length he determines also, and by that Means finds H the Center of the Circle, which is to intersect or touch the Parabola:



And this he performs by what he calls his *Central Rule*, viz.

1. $\frac{L}{2} + \frac{p}{8}\frac{p}{L} \pm \frac{q}{2L} = b = AD$; And,
2. $\frac{p}{4} \pm \frac{p\,p\,p}{6\,LL} \pm \frac{p\,q}{4\,LL} + \frac{r}{2\,LL} = d = DH.$

Which two Rules are demonstrated in his Book and *here*, under the Word *Central Rule*, which see; and because $L = 1$, they may be contracted thus,

1. $\frac{1}{2} + \frac{p\,p}{8} \pm \frac{q}{2} = B = AD.$
2. $\frac{p}{4} + \frac{p\,p\,p}{6} \pm \frac{q\,p}{4} \pm \frac{1}{2}r = d = DH.$

And you must observe, That in the Former of these Rules + signifies downwards from the Point *A*, and — upwards from it; and in the latter Rule + signifies towards the Left Hand, as — doth towards the Right; So according as the Affirmative or Negative Roots prevail, *H* will be on the Left or Right Hand of *D*.

And in both Parts if $p\,q$ or r be $= o$, the Member where it is found will vanish and become also $= o$.

As to the Signs of the Quantities in his Rule, he makes p always retain the Sign it hath in the Equation, but q always puts on a contrary one to what it had there: r is always with a positive Sign, except when $p\,r$ have contrary Signs in the Equation, and then r will always have a Negative Sign in the Rule.

Having thus, by his *Central Rule*, found *H* the Center of the Circle, the next Work is to determine the Radius; and if the Equation be no higher than a Cubick, *HA* is always the *Radius*; but if it be a Biquadratick, then supposing $-S$, or that the Fifth Term (or absolute Number) be a Negative Quantity, take in the Line *AH* (produc'd both Ways if there be Occasion) $AI = L$ above, and $AK = S$; and making *IK* a Diameter, describe the Semi-circle *KLI*, and erect at the Point *A* the Line *AL* perpendicularly; which therefore will be a mean Proportional between *AK* and *AI*: I say, the Circle must pass through *L*, and *HL* will be the Radius.

But if it be $+S$, you must draw another Diameter *HA*, and therein fit in or apply $AZ =$ to *LA* before found (for now the Square of *AL* is to be taken from *HA*, as in the former Case it was to be added to it) which will find the Point *Z* through which the Circle must pass, and the Radius will be *HZ*, which Circle being drawn, it will cut the Parabola in 4, 3, 2 or 1, or in no Point; and according to the Number of such Intersections, will the real Roots of the Equation be found, which will be always so many Perpendiculars from those Points to *AD*, as *e. gr. NO* on the Left Hand, *Mo* on the Right, &c. Of which, if there be no *p* or Second Term, and also it be $-r$, then on the Left Hand are the Positive Roots, and the Negative ones on the Right Hand: But if the Second Term be there, and with a Negative Sign, as $-p$, then *No* on the Left Hand are Affirmative, and the others *Mo* on the Right Negative; but if it be $+p$, 'tis on the contrary, *No* Negative, and *Mo* Positive.

The Demonstration of all which is very easy to one that hath considered the Demonstration above given from *Des Cartes*, on which this entirely depends; taking into Consideration also the Property of the Parabola, which *Baker* had from Mr. *Strode* of *Maperton*, that *The Latus Rectum: Is to the Sum of any two Ordinates :: As their Difference: Is to the Difference of the Abscissæ.*

CONSTRUCTION, in Geometry, is the drawing of such Lines as are previously necessary for the making any Demonstration appear the more plain and undeniable; and this Construction is always of such things as are well known and sought before.

CONSTRUCTION, in Grammar, is the natural, just and regular placing and disposing of Words in a Discourse, so as to make proper and intelligible Sense.

CONSULTATION, is a Writ whereby a Cause being formerly removed by Prohibition from the Ecclesiastical Court, or Court Christian, to the King's Court, is returned thither again; for the Judges of the King's Court, if, upon comparing the Libel with the Suggestion of the Party, they do find the Suggestion false, or not proved, and therefore the Cause to be wrongfully called from the Court Christian, then, upon this *Consultation* or Deliberation, they decree it to be returned again; whereupon the Writ in this Case obtained is called a *Consultation.*

CONSUMPTION, in general, signifies a Defect of Nourishment, or the consuming, wasting or decaying of the Body, and particularly of the Muscular Flesh: 'Tis frequently attended with a *Hectick* Fever, and is divided into several Kinds according to the Variety of its Cause, and the Parts it principally affects, as a *Scorbutick Consumption*, a *Consumption of the Lungs*, &c.

CON-

CONTACT, is when one Line, Plane or Body is made to touch another, and the Parts that do thus touch are called the Points or Places of *Contact*.

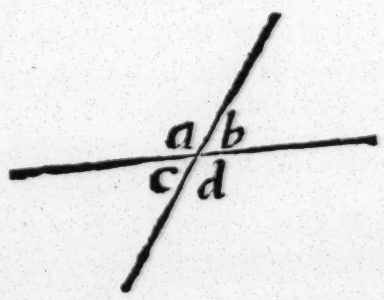
CONTAGION, the communicating or transferring of a Diſeaſe from one Body to another, by certain Steams or Effluvia tranſmitted from the Body of the Sick Perſon. Some Diſeaſes are *Contagious* by immediate contact or touch, as the Madneſs of a Dog, which is communicated by Biting; and the Venom of the *French-Pox*, which is tranſmitted from the infected Perſon in the Act of Copulation; ſometimes the *Contagion* is propagated by infected Cloaths, as in the Itch and Leproſy: And there are ſome *Contagions* that are tranſmitted through the Air to a conſiderable Diſtance, as the Plague and other Peſtilential Diſtempers; in which Caſe the Air is ſaid to be *Contagious*; that is, full of *Contagious* Particles or *Effluvia*.

CONTEMPLATION, is the preſerving of the *Idea* which is brought into the Mind for ſome time actually in view.

CONTENEMENT, ſeems to be Free-hold-Land which lies next a Man's Tenement or Dwelling-Houſe, that is, in his own Occupation.

CONTENT, in *Solid Geometry*, is the Meaſure of any Solid Figure, *viz.* in Cubick Inches or Feet, &c.

CONTIGUITY, is only the Surface of one Body's touching that of another. But *Continuity* is the immediate Union of the Parts which compoſe any Natural Body, ſo that one cannot tell where one begins, and another ends.



CONTIGUOUS *Angles*, in *Geometry*, are ſuch as have one Leg common to each Angle, and are otherwiſe called *Adjoining Angles*. Thus, the Angles *a* and *d* are called *Contiguous Angles*, but *b* and *c* *Oppoſite* or *Vertical*: See *Angle*.

CONTINENT, in *Geography*, is a great Extent of Land, which comprehends ſeveral Regions and Kingdoms, and which is not interrupted or ſeparated by Seas.

CONTINENT Cauſe of a Diſtemper, is that on which the Diſeaſe depends ſo immediately, that it continues ſo long as that remains, and no longer. Thus a Stone ſticking in the *Ureters*, is the Continent Cauſe of a Suppreſſion of Urine.

CONTINENT *Fever*, is that which performs its Courſe without either Intermiſſion or Remiſſion.

CONTINGENT, is a Caſual Event, which may or may not happen to come to paſs: 'Tis ſometimes alſo in *Mathematicks* uſed for the Word *Tangent*.

CONTINGENT *Line*, in Dialling, is ſuppoſed to ariſe from the Interſection of the Plane of the Dial with the Plane of the Equinoctial; and conſequently in this Line the Hour Lines of the Dial and the Hour Circles interſect each other. This Line is always at Right Angles with the Subſtilar Line.

CONTINGENT *Line*, the ſame with *Tangent Line*.

CONTINUAL *Claim*, is a *Claim* made from Time to Time within every Year and Day, to Land or other Thing, which, in ſome reſpect, we cannot attain without Danger.

CONTINUAL *Fever*, is that which ſometimes remits or abates, but never perfectly intermits; that is, the ſick Perſon is ſometimes better, but never perfectly free from the *Fever*.

CONTINUAL *Proportion*, *Arithmetical* and *Geometrical*: See *Progreſſion*.

CONTINUANDO, is a Word uſed in Law, when the Plaintiff would recover Damages for ſeveral Treſpaſſes in the ſame Action: For in one Action of Treſpaſs they may recover Damages for divers Treſpaſſes, laying the firſt with a *Continuando* to the whole Time, and in this Form;

CONTINUANDO *Tranſgreſſionem prædictam*, &c. *à prædicto die*, &c. *uſque talem diem*; ſo including the laſt Treſpaſs.

CONTINUED *Quantity* or a *Continuum*, is that whoſe Parts are inſeparably joined and united together, ſo that you cannot diſtinguiſh where one begins and another ends: See *Diſcrete Quantity*.

CONTINUED *Zocle*: See *Zocle*.

CONTRABANDED *Goods*, are ſuch as are prohibited by Act of Parliament or Proclamation to be imported into, or exported out of this into other Nations.

CONTRACT, is a Covenant or Agreement, with a valuable or lawful Cauſe or Conſideration; or elſe one thing muſt be given for another, which is called *Quid pro quo*; as if I ſell my Horſe for Money, or Covenant to make you a Leaſe of my Mannor in Conſideration of ſo much Money; theſe are *Good Contracts*, becauſe one thing is given for another: But if a Man make Promiſe to me that I ſhall have Twenty Shillings, and that he will be Debtor to me thereof; and after I aſk the Twenty Shillings, and he will not deliver it; yet I ſhall never have an Action to recover, becauſe the Promiſe was no *Contract*, but a bare Promiſe, and *ex nudo Pacto non oritur Actio*: But if any thing were given for the Twenty Shillings, though it be but the Value of a Penny, then had it been a *Good Contract*.

CONTRACTILE, is a Word uſed by ſome Phyſicians to expreſs ſuch Muſcles, and other Parts of the Body, as are uſually contracted.

CONTRADICTORY *Propoſitions*, in Logick, are either ſuch as conſiſt of an Univerſal and Particular, of which one Affirms, and the other Denies, as thus; *All Right lined Triangles have the Sum of their Angles equal to two Right ones*; *ſome Right lined Triangles have not the Sum of their Angles equal to two Right ones*; or elſe they are both Singular and Particular, one Affirming, the other Denying the ſame Thing, as the *Circle is Squarable*, *the Circle is not Squarable*.

CONTRA-*Fiſſura*, or *Counter-Fiſſure*, is a Fiſſure on one Side of the Head, occaſioned by a Blow or Fall upon the other.

CONTRA *Formam Collationis*, is a Writ that lies where a Man hath given Lands in perpetual Alms to any Religious Houſe, Hoſpital, &c. For if they Alien the Lands, then the Donor or his Heirs may recover them by this Writ, but not of the Alienee, although he be Tenant; tho' in all other Actions, where a Man demands Free-hold, the Writ ſhall be brought againſt the Tenant.

CONTRA *Formam Feoffamenti*, is a Writ that lies for the Heir of a Tenant infeoffed of certain Lands

Lands or Tenements by Charter of *Feoffment* of a Lord, to make certain Services and Suits to his Court, and is afterwards diſtrein'd for more than is contained in the ſaid Charter: This Writ lies not for the Plaintiff, who claims to purchaſe from the firſt *Feoffee*, but for the Heir to the firſt *Feoffee*.

CONTRA-*Indications*, are divers Conſiderations in a Diſeaſe that diſſwade a Phyſician from uſing ſuch a Remedy, when other Things induce him to it.

CONTRAMANDATIO *Placiti*, in Law, ſeems to ſignify a Reſpiting, or giving the Defendant further Time to anſwer; or an Imparlance, or Countermanding what was formerly ordered.

CONTRA *Mure*, in Fortification, is a little Wall built before another Partition Wall to ſtrengthen it, ſo that it may receive no Damage from the adjacent Buildings.

CONTRARY *Propoſitions*, in Logick, are two univerſal Enunciations, of which one Affirms, and the other Denies; as *all Squares are Parallelograms*; *no Squares are Parallelograms*.

CONTRATE *Wheel*, is that Wheel in Pocket-Watches and others which is next to the Crown-Wheel, whoſe Teeth and Hoop lie contrary to thoſe of other Wheels, whence it hath its Name.

CONTRAVALLATION, or *The Line of Contravallation*, in Fortification, is a Trench guarded with a Parapet, and uſually cut round about a Place by the Beſiegers, to ſecure themſelves on that Side, and to ſtop the Sallies of the Garriſon; 'tis without Muſket-Shot of the Town; ſo that the Army forming a Siege, lies between the Lines of *Circumvallation* and *Contravallaion*.

CONTRE-*Queve d'yronde*, a Term in Fortification, the ſame with the the *Counter-Swallow's Tail*, which ſee.

CONTRIBUTIONE *Facienda*, is a Writ that lieth where more are bound to one Thing, and but one is put to the Burden: As if Joint-Tenants, or Tenants in Common hold a Mill, *pro indiviſo*, and are equally to take the Profits thereof; the Mill falling to Decay, and one or more of them refuſing to contribute towards the Reparation, the reſt ſhall have this Writ to compel them.

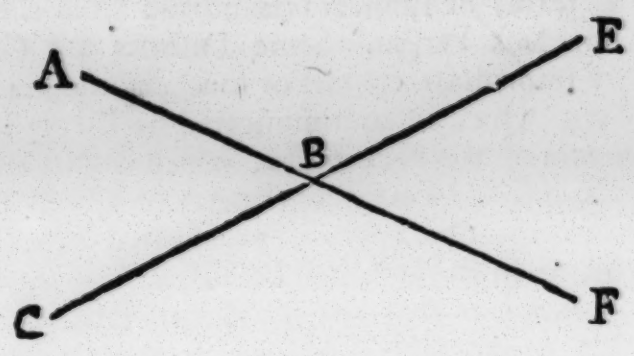
CONTROLLER, is an Officer who keeps a Roll of all other Officers Accounts; and in *England* we have divers Officers of this Name, as *Controller of the King's Houſe*, *Controller of the Navy*, *Controller of the Cuſtoms*, *Controller of Callis*, *Controller of the Mint*, *Controller of the Hamper*, who takes all Things ſealed in Leather Bags from the *Clerk of the Hamper*; and *Controller of the Pipe*, who writes Summons to the Sheriffs to levy the Debts of the Pipe.

CONTUSION of a Bone, is the bruiſing of a Bone by ſome hard and blunt Thing, that though it outwardly appear Whole, yet inwardly it is really Injured and out of Order.

CONVENTIO, is a Word uſed frequently both in Ancient and Modern Pleadings at Law.

CONVENTION, is a Writ that lieth for any Covenant in Writing not performed. *Fitz-Herbert* calls it a *Writ of Covenant*: *Nat. Brev. Fol.* 145.

CONVERGING, or *Convergent Rays*, in *Opticks*, are thoſe Rays which going from divers Points of the Object, incline towards one another, till at laſt they meet and croſs, and then become



Diverging Rays. Thus the Rays *AB* and *CB* do *Converge* till they come to the Point *B*, and then they *Diverge* and run off from each other in the Lines *B E*, *B F*.

CONVERSE: In Mathematicks one Propoſition is called the *Converſe* of another, when after a Concluſion is drawn from ſomething *ſuppoſed* in the *Converſe* Propoſition, that *Concluſion* is *ſuppoſed*; and then that which in the other was *ſuppoſed*, is now drawn as a *Concluſion* from it. Thus, as when two Right Lines are ſuppoſed to be parallel, and another croſſes them, 'tis demonſtrable that the Alternate Angles are equal; ſo 'tis equally true Converſly, that if the Alternate Angles are equal, the Lines which are croſſed muſt be parallel.

CONVERSION *of Equations*, in *Algebra*, is thus; if the Quantity ſought, or any Part or Degree of it be in Fractions, let all be reduced to one common Denomination (by Multiplication of the Whole, by the Denomination of the Fractional Part) and then omitting the Denominators, continue the Equation in the Numerators only. Thus, ſuppoſe $a - b = \frac{aa + cc}{d} + b + b$; multiply all by d, and it will ſtand thus, $da - db = aa + cc + db + db$. 'Tis called by *Vieta*, *Iſomeria*.

CONVERSION *of Propoſitions*, in *Logick*, is the changing of the Subject into the Place of the Prædicate, and the Prædicate into the Place of the Subject, and yet always retaining the ſame Quantity of both Propoſitions; as, Every Right-lined Triangle hath the Sum of its Angles equal to two Right ones; every Right-lined Figure that hath the Sum of its Angles equal to two Right ones, is a Triangle.

CONVEXITY, ſignifies any Protuberancy or ſwelling out of any thing; as Glaſſes are ſaid to be Convex, when they are thicker in the Middle than at the Edges; or rather, when their Surface riſes up regularly (ſo *Vitellio* defines it) above the Plane of the Baſe; as they are Concave, when the Surface ſinks down regularly, or with a regular Curvity below it; ſo that the ſame Thing may be, and often is, Concave within, and Convex without.

Here follow ſome Properties of *Convex Glaſſes*.

1. If an Object be in the Focus of a Convex Glaſs, and the Eye on the other Side the Glaſs, the Object will appear erect and diſtinct.

2. If any Object be in the Focus of a Convex Glaſs, and the Eye in the oppoſite Focus on the other Side, it will appear under the ſame Angle, as if

if the Eye were in the Place of the Glaſs; and conſequently the Diſtance being double in that Poſition of the Eye and Object, it will appear thro' the Glaſs magnified under an Angle almoſt double of what it would appear to the naked Eye; but the Eye can ſee no more of its Area than the Breadth of the Glaſs will permit.

Mr. *Molyneux*, in his *Dioptrica Nova*, ſhews how to determine the viſible Area of an Object in the Focus of a *Convex Glaſs* from the Diſtance of the Object, and of the Eye from the Glaſs, and the Glaſs's Breadth. *P.* 126. *Prop.* 34.

3. If an Object be farther from a *Convex Glaſs* than the Focus, and the Eye on the other Side be nearer than the diſtinct Baſe of the Glaſs, it will ſee the Object erect but confuſed; and it will be moſt confuſed when the Eye is placed in the diſtinct Baſe.

4. But if the Object being placed as before, the Eye be farther from the Glaſs than a diſtinct Baſe, it begins to ſee the Object *Inverted*, and at a due Diſtance diſtinct.

5. If the Object be nearer than the Focus, it will appear erect and diſtinct to an Eye placed on the other Side the Glaſs, at any Diſtance within the Eye's Power to diſcern it.

CONVICT, in the Common Law, is he that is found guilty of an Offence by the Verdict of a Jury: But *Crompton* ſays, that *Conviction* is either when a Man is Out-lawed, or appeareth and confeſſeth, or elſe is found Guilty by the Inqueſt.

CONVOCATION, is commonly taken for the General Aſſembly of the Clergy, to conſult of Eccleſiaſtical Matters in Parliament; and as there are two Houſes of Parliament, ſo there are two Places called *Convocation Houſes*, the one called *The Higher*, where the Archbiſhop and Biſhops ſit ſeverally by themſelves; the other, *The Lower Convocation Houſe*, where all the reſt of the Clergy ſit. An Engliſh *Convocation* or *Synod*, as it now ſtands for the Province of *Canterbury*, conſiſts of a *Preſident* (the Lord *Archbiſhop*) and 21 *Biſhops*, 22 *Deans*, 53 *Archdeacons*, 24 Proctors of *Chapters*, 44 Proctors for the *Dioceſan Clergy*, (2 for each Dioceſe) and one *Præcentor*. Cowell's *Interpreter*.

CONVOLUTION, is a winding or turning Motion which is proper to the *Trunks* of ſome Plants, as the *Convolvulæ* or *Bindweeds*, and to the Claſpers of Vines and of *Briony*; and Dr. *Grew* thinks that all thoſe Plants whoſe Roots are twiſted, have ſuch a *Convolution*; and he aſſigns two great Efficient Cauſes of this winding Motion, the *Sun* and the *Moon*: Methinks 'twere worth the while, as 'tis very eaſy, to try whether there be any ſuch *Convolution* or not in the Trunks of Plants, which may eaſily be done, as he hints, by tying a little Bit of Paper to any of the Branches which are exactly *South*, *North*, &c. and then ſeeing whether it will change its Poſition or not, in reſpect of the Point of the Compaſs.

CONVOLVULUS: See *Iliac Paſſion*.

CONUS *Fuſorius*, is a ſort of Crucible made to melt Iron or any other Metal. *Blanchard*.

CONUSANCE, the ſame with *Cogniſance*.

CONUSANT, in the Common Law, ſignifies Knowing or Underſtanding; as if the Son be *Conuſant*, and agrees to the Feoffment. *Cook* upon *Littleton*. Fol. 159. *b*.

CONVULSION, is a Motion whereby the Nerves, Muſcles and Members are contracted or remitted againſt the Will, or without it, as in the *Cramp*, *Epilepſy*, &c. *Blanchard*.

CONVULSIVE *Motions*, are ſudden and ſwift Concuſſions or Shakings that ceaſe and return alternately.

COOK-*Room*, in a Ship, is variouſly ſeated in ſome, and generally in great Ships it is in the Fore-Caſtle; in ſome other Ships it is ſeated in the *Hatch-way*, upon the firſt *Orlope*; and for Ships of War (which are termed Men of War) it might moſt properly be there, in regard of Danger by Fire, and the freer Uſe of the Guns that lie in the Fore-Caſtle, eſpecially if this *Cook-Room* (as ſome conceive) may be contrived to be moveable, and ſo in a Fight be ſtruck down into the Hold of the Ship. But after all, I cannot apprehend how it can be otherwiſe placed than in the Fore-Caſtle in great Ships, by reaſon of the Multitude of Men, which require, neceſſarily, the dreſſing of much Meat, and as neceſſarily a large and private Room to dreſs it in.

COPERCENERS, or *Parceners*, in Common Law, are ſuch as have equal Portions in the Inheritance of their Anceſtors; and as *Littleton* in the Beginning of his Third Book, ſaith, *Parceners* be either by *Law* or by *Cuſtom*; *Parceners by Law* are the Iſſue Female which (no Heir-Male being) come in Equality to the Lands of their Anceſtors. *Parceners by Cuſtom*, are thoſe that by Cuſtom of the Country challenge equal Part in ſuch Lands; as in *Kent*, by the Cuſtom called *Gavel kind*: This, amongſt the *Feudiſts*, is called *Adæquatio*.

COPERNICAN *Syſtem*, the ſame with the moſt Ancient or Pythagorean Syſtem of the World, which *Copernicus* revived; and it is ſince improved, and now generally adhered to by Aſtronomers, and is as follows.

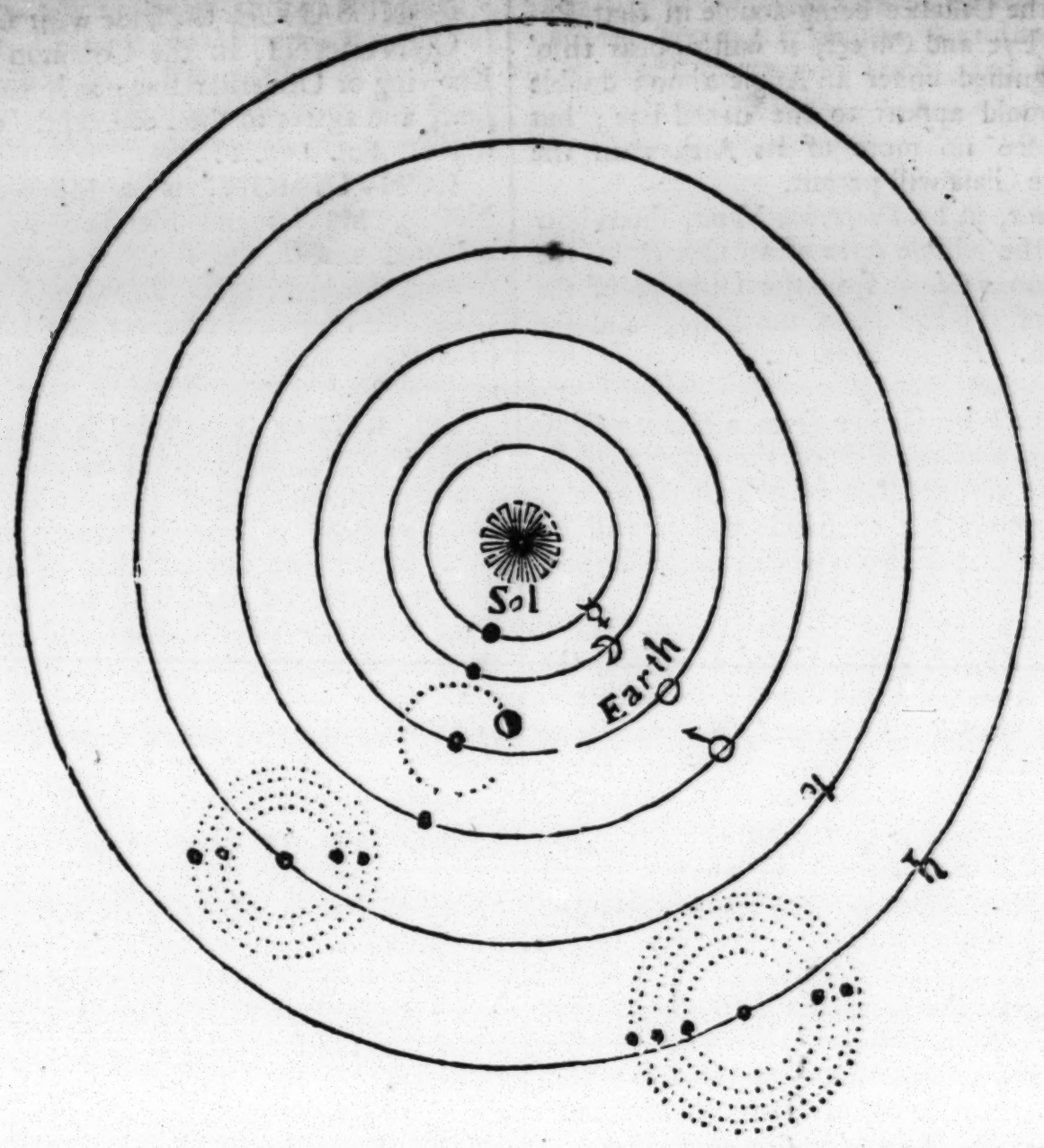
1. The Sun is ſuppoſed to be placed in the Middle, very near the Center of Gravity of the entire *Syſtem*, in the common *Focus* of every one of the Planetary Orbits.

Next to him *Mercury*, in about three Months Time, deſcribes his *Ellipſis*, and that ſo near, that we on the Earth rarely obtain a diſtinct View of him.

Next to *Mercury* is the *Elliptick* Orbit of *Venus*, whoſe Period is 7 Months $\frac{1}{2}$; and next to *Venus*, our Earth with its Attendant the *Moon* perform a joint Courſe, and meaſure out the Annual Period.

Next to the *Earth*, *Mars* alone, without any viſible Guard or Satellite accompanying him, revolves about the ſame Center in about two Years Time.

Next to *Mars*, tho' at a mighty Diſtance from him, the largeſt of the Planets *Jupiter*, with his four remarkable Satellites, takes his Round in 12 Years.



And Laſtly, *Saturn* with his five little *Moons* about him, according to *Caſſini*, deſcribes in 30 Years time, the fartheſt and moſt remote Orbit; and compleats the intire Planetary *Chorus*, as the Figure repreſents.

Beſides the Planets, whoſe Orbits are not very different from Circles, there are another *Species* of Bodies which are called *Comets*, revolving about the *Sun* in ſuch *Ellipſis*, as may paſs almoſt for *Parabola*'s, they are ſo exceeding Eccentrical; but as regularly retaining their ſeveral Periods and Orbits as the Planets themſelves, of which ſee *Comets*.

COPHOSIS, is a Deafneſs in the Ears. *Blanchard.*

COPIA *Libelli deliberando*, is a Writ that lieth, in Caſe when a Man cannot get the *Copy* of a Libel at the Hands of a Judge Eccleſiaſtical.

COPOS, is a Wearineſs of the Body, when the *Muſcles*, or their *Fibres* rather, are loaden and obſtructed with ſuch viſcous Humours, that they are rendred unfit for Motion. *Blanchard.*

COPPEL, or *Copple:* See *Cuppel.*

COPROCRITICA, are Medicines which purge away the Excrement in the Guts. *Blanchard.*

COPULA, in *Logick*, is the Verb that connects any two Terms in an Affirmative or Negative Propoſition; as God is Good, where (*is*) is the *Copula*. Riches alone *make* not a Man Happy, where (*make*) is the *Copula*.

COPULATIVE *Propoſitions*, are thoſe that include ſeveral Subjects or ſeveral Attributes joyn'd together by an Affirmative or Negative Conjunction; that is to ſay, *and* (*not*) or (*neither:*) For (*neither*) does the ſame thing as (*and*) in theſe ſorts of Propoſitions, for that (*neither*) ſignifies (*and*) with a Negative, which falls upon the Verb, and not upon the Union of the two Words which it joins; as if I ſhould ſay, *That Knowledge and Riches don't make a Man happy:* Here I unite Knowledge and Riches, affirming of both that they don't make a Man happy.

COPY-*hold*, is a Tenure for which the Tenant hath nothing to ſhew but the Copy of the Rolls made by the Steward of the Lord's Court; for the Steward as he doth inroll and make Remembrances of all other things done in the Lords Court; ſo he doth alſo of ſuch Tenants as he admitteth into the Court, to any parcel of Land or Tenement belonging to the Mannor; and the Tranſcript of this is called *The Copy of the Court Roll*, which is all the Tenant taketh from him, and keeps as his own Evidence: This Tenure is call'd *A Baſe Tenure*, becauſe it holdeth at the Will of the Lord: It is wont to be called *Tenure in Villanage* by ſome, who alſo ſay, that *Copy-hold* is but a new Name, yet it is not ſimply at the Will of the Lord, but according to the Cuſtom of the Mannor: So that if a *Copy-holder* break not the Cuſtom of the Mannor, and thereby forfeit his Tenure, he ſeemeth not ſo much to ſtand at the Lord's Curteſie for his Right, that he may be diſplaced hand over head at his pleaſure. Theſe Cuſtoms of Mannors be infinite, varying in one Point or other almoſt in every ſeveral Mannor.

Firſt, Some *Copy-holds* are *fineable* at Will, and ſome *certain:* That which is *fineable* at Will, the Lord

Lord taketh at his Pleaſure, but if it exceed two Years Revenue, the *Chancery*, *King's-Bench*, *Common-Pleas*, or *Exchequer*, may reduce them to Reaſon. That which is *certain*, is a kind of Inheritance, and called in many places *cuſtomary*, becauſe the Tenant dying, and the *Hold* being void, the next of Blood, paying the cuſtomary Fine (as 2*s.* for an Acre, or ſuch like) may not be denied his Admiſſion.

Secondly, Some *Copy-holders* have, by Cuſtom, the Wood growing upon their own Land, which by Law they could not have.

Thirdly, *Copy-holders*, ſome be ſuch as hold by the *Verge* in ancient *Demeſne*; and although they hold by *Copy*, yet are in Account a kind of *Free-holders*, For if ſuch a one commit Felony, the King hath *Annum*, *Diem* & *Vaſtum*, as in the Caſe of *Free-hold*. Some other hold by *Common Tenure*, called *Meer Copy-hold*, and they committing Felony, their Land eſcheateth to the Lord of the Mannor.

COR, the Heart, is a fleſhy *fibrous* Subſtance made up of ſeveral *Muſcles* and Tendons; it has two *Auricles* or *Ears*, and as many *Ventricles*: the *Vena Cava*, or great Vein, is faſten'd to the Right *Auricle*, and the *Pulmonary Vein* to the Left; the *Pulmonary Artery* is joyn'd to the Right *Ventricle*, and the great *Artery* to the Left. It is cloath-ed with a little *Membranous* Bag, called the *Pericardium*, wherewith it is joyned to the *Mediaſtinum*, and the *Diaphragm*; its Baſis is upwards, and Point downwards, and it is placed in the Middle of the Cheſt amongſt the Lobes of the Lungs. Its Uſe is to receive and diſperſe the Blood to all Parts in the Body. The Baſe of the Heart is environed round with a Plexus of Veins and Arteries.

Our Excellent Dr. *Lower* was the firſt that gave us the true Mechanical Structure of the Heart, and a very good rational Account of its Action: He explains the Syſtole of the Heart, by the natural Method of muſcular Contraction; but in order to account for its Diaſtole, he hath recourſe to a certain unaccountable Motion of *Reſtitution*, which ſeems not to be ſo well grounded.

The Heart being a ſingle Muſcle without an Antagoniſt, appears to be of the *Sphincter kind*; and *Borellus* in his *Oeconomia Animalis*, computes the Motive Power of a Man's Heart to be more than that of a Weight of 3000 lb. The Obſtacles to the Motion of the Blood through the Arteries, he judges equivalent to 18000 lb. *i. e.* 6 times as much as the Power of the Heart: He eſtimates the Power of the *Elaſtick Coat of the Arteries* at 45000 lb. whoſe Adventitious Help to move the Blood being deducted, he leaves the Heart with a force but of 3000 lb. to ſurmount a Reſiſtance of 135000 lb. that is, with one to move 45; and this mighty Power in the Heart he aſcribes to the Force of Percuſſion. Dr. *Drake*, in his Diſcourſe of the Motion of the Heart in *Phil. Tranſact.* N. 280. ſuppoſes that Reſpiration hath a great Influence to aſſiſt it; and that even the *Syſtole* or *Conſtriction* of the Heart is occaſioned in ſome meaſure by the help of the Diaphragm and Intercoſtal Muſcles, by whoſe Means the Blood hath a Paſſage opened for it into the Lungs, which denied, would be an Invincible Obſtacle: And he thinks alſo that the Syſtole is furthered by the Situation and Capacity of the Blood-Veſſels of the Lungs, in the ſeveral Times of the Elevation and Depreſſion of the Ribs; for by this Means a Paſſage is opened to the Blood to flow from the Right Ventricle of the Heart to the Left thro' the Lungs, to which it could not otherwiſe paſs; and the Oppoſition which the Blood contained in that Ventricle, muſt otherwiſe have made to its *Conſtriction*, is taken off. And thus the Dr. with great probability, ſuppoſes the Syſtole of the Heart to be much facilitated by the Action of the *Thorax*: But he ſaith, that neither the Diaphragm nor Intercoſtal Muſcles can contribute any thing towards the *Diaſtole*, the Cauſe of which, be it what it will, muſt be equal to that of the Heart, the Intercoſtal Muſcles, and the Diaphragm, to all which it acts as an *Antagoniſt*, dilating the Heart, as they conſtrict or cloſe it. The Dr. thinks ſuch a Power or Cauſe is not to be found any where in an Animal Body, and therefore it muſt be ſought without it; and he concludes that this Cauſe is the Weight of the incumbent Atmoſphere preſſing upon the *Thorax* and other parts of the Body, which he proves from Mr. *Boyle's* Experiments upon Animals in *Vacuo*, where, as ſoon as the Preſſure of the Incumbent Atmoſphere is removed, the Intercoſtal Muſcles and Diaphragm are contracted, and the Ribs elevated in an Inſtant, and can't by any Power of the Will be made to ſubſide, till the Air is let in again to bear them forcibly down: And, as in the *Elevation of the Coſtæ*, the Blood is in a manner ſolicited by the Paſſage now opened for it to flow into the Lungs; ſo in the *Depreſſion* of them by the Subſidence of the Lungs, and the Contraction of the Blood Veſſels (both which are conſequent thereupon) the Blood is forcibly driven, as it were by an Embolus, through the Pulmonary Vein into the Left Ventricle of the Heart; and that, together with the *general Compreſſion* of the whole Body, by the *Weight* of the *Atmoſphere*, which ſurrounds and gravitates upon the whole Surface of it, is *that Power* which cauſes the Blood to mount in the Veins, after the force impreſs'd upon it by the Heart is broken and ſpent, and which is ſufficient to force the Heart from its Natural State to Dilatation. And thus by the Contraction of the Heart (the proper Action of all Muſcles) and its Dilatation again this way, is the Circulation of the Blood ſet forward and kept going on.

COR, is by the *Botaniſts* uſed to ſignify the inward ſoft pithy and ſpongy part of any *Tree* or *Plant*, which they call alſo *Medulla* and *Matrix Arboris*.

COR *Caroli*, an extraconſtellated Star in the Northern Hemiſphere, ſituated between the *Coma Berenices*, and *Urſa major*, ſo called in Honour of King *Charles*.

COR *Hydræ*, a fix'd Star of the firſt Magnitude in the Conſtellation of *Hydra*; its *Longitude* is 142 *deg.* 49 *min.* *Latitude* 22 *deg.* 23 *min.*

COR *Leonis*: See *Regulus* or *Baſilicus*.

CORACOBRACHIALIS, or *Coracobrachieus*, is a Muſcle ſo called from its Origination and Inſertion: It ariſes partly fleſhy, and partly tendonous, from the Extremity of the *Proceſſus Coracoides Scapulæ*, and in its Deſcent it becomes larger, ſtrictly adhering to the Internal Tendon us beginning of the *Biceps*, and parts from it near its Tendonous Inſertion at the Middle of the Internal Part of the *Os Humeri*: Thro' this Muſcle paſſes a large Nerve, wherefore by ſome it is called *Perforatus*. When it acteth, the Arm is moved upwards, and turned ſomewhat obliquely outwards.

CORACOHYOIDES, are *Muſcles* which proceed from the Proceſs of the Shoulder-bone, call'd

Coracoides, and go on as far as the Bone *Hyoides*; their Uſe is to move obliquely downward.

CORACOIDES, is the Proceſs of the Shoulder-blade, in form of a Beak.

CORAM *non Judice*, is a Term in the Common Law, when a Cauſe is brought into a Court wherein the Judges have no Juriſdiction.

CORBEILS, in Fortification, are little Baskets about a Foot and a half high, eight Inches broad at the bottom, twelve at the Top; which being filled with Earth, are frequently ſet one againſt another upon the Parapet, or elſewhere, leaving certain Port-holes, from whence to fire upon the Enemy under Covert, without being ſeen by them.

CORD, in Geometry: See *Chord*.

CORDAGE at Sea, ſignifies in general all the Ropes belonging to the Rigging of a Ship.

CORDIALIA, are Medicines which are commonly thought to ſtrengthen the Heart; but they only put the Blood into a fine gentle Fermentation, which corroborates and facilitates the Motion of the Heart. *Blanchard*.

CORDON, in Fortification, is a Row of Stones made round on the outſide, and ſet between the Wall and the Fortreſs which lies in *Talu*, or a Slope, and the Parapet which ſtands perpendicular after ſuch a manner, that this Difference may not be offenſive to the Sight; ſo that thoſe *Cordons* ſerve only as Ornaments ranging round about the Place; neither are they uſed but in Fortifications made of Maſon's Work, the void Space being filled up with pointed Stakes in thoſe that are raiſed with Earth.

CORDS, in Muſick, properly ſignifies the Strings of a Harp, Violin, Lute, or any other Muſical Inſtrument: But the Term is alſo applied to denote the Sounds which proceed from ſuch Inſtruments, even from thoſe that have no Strings.

CORINTHIAN *Order of Architecture*, is ſo called from *Corinth*, the Place of its Invention. It obſerves the ſame Meaſure with the *Ionick*, and the Difference between them is chiefly in the *Capital*. See *Order* and *Column*.

Vitruvius makes the Height of the *Capital* to be two Modules, and this he divides into ſeven parts, of which the firſt is for the *Abacus*, and the other ſix downwards are for the Ornament.

CORNACHINE *Powder*, the ſame with what is ſometimes called the *Earl of* Warwick's *Powder*, and by Foreign Writers frequently *Pulvis de tribus*; it is a purging Powder made of equal parts of *Antimonium Diaphoreticum*, *Diagridium*, and *Cream of Tartar*.

CORNEA *Lunæ*: See *Lunæ Cornea*.

CORNEA *Oculi Tunica*, which is alſo called *Sclerotes*, and *Dura*, the *hard Tunick*, proceeds from a *Tunick* in the Brain called *Dura Meninx*; it is *pellucid* forwards, that it may tranſmit the viſible *Species*: Its Sides are covered with the *Albugineous Tunick*; inwardly it contains the *Aqueous Humour*.

CORNICHE, or as we pronounce it, *Corniſh*, in Architecture, is the third and higheſt part of the *Entablature*, and is commonly uſed to ſignifie the uppermoſt Ornament of any Wainſcot, &c. In reference to the *Pillar*, 'tis different according to the different Orders of Architecture. In the *Tuſcan* 'tis without Ornaments, and this Pillar of all others hath the leaſt Mouldings. The *Dorick* is adorn'd with *Dentils* like the *Ionick*, and which ſometimes hath its Mouldings cut into it. The *Corinthian* Pillar hath of all others the moſt Mouldings, and thoſe very often cut with *Modillons*, and ſometimes *Dentils*. The *Compoſite* hath its *Dentils* and its *Mouldings* cut, with its Channels or Chamferings under its *Platfond*.

CORNICULARIS *Proceſſus*: See *Ancyroides*.

CORNICULATE *Plants and Herbs*, are ſuch as after each Flower produce many diſtinct and horned Seed-pods; which Seed-veſſels are called *Siliquæ*: This kind is called alſo *Multiſiliquous*; ſuch as the *Sedum* or *Sempervivum*, *Telephium*, *Sedum Stellatum*, *Juncus Floridus*, *Helleborus Niger*, *Fraxinella*, *Aconitum* (or *Napellus*) *Aquilegia*, *Delphinum*, *Pæonia*, *Caltha Paluſtris*, *Althæa Lutea*, &c.

CORNISH *Ring of a Gun*, is the next from the Muzzle Ring backwards: See *Ordnance*.

CORNUA *Uteri*, are two lateral parts of the Womb in ſome Brutes, as Cows, Harts, Sheep, Goats, &c. yet ſome Authors have attributed the ſame parts to a Woman's Womb from ſomething which imitates them there; for at the Sides of the Bottom of the Womb, there is a ſort of *Protuberance* on both Sides, where the *Vaſa Deferentia* are inſerted; yet a Woman's Womb is rarely *Bipartite*, as it is in Brutes.

CORODIO *Habendo*, is a Writ whereby to exact a *Corody* of an Abby, or Religious Houſe.

CORODY *Habendo*, in Common-Law, ſignifies a Sum of Money, or Allowance of Meat, Drink, and Cloathing, due to the King from an Abby, or other Houſe of Religion, whereof he is Founder, towards the reaſonable Suſtenance of ſuch a one of his Servants, being put to his *Penſion*, as he thinketh good to beſtow it on. And the Difference between a *Corody* and a *Penſion* ſeems to be, That a *Corody* is allowed towards the Maintenance of any of the King's Servants that liveth in an Abby: a *Penſion* is given to one of the King's Chaplains, for his better Maintenance in the King's Service, until he may be better provided of a Benefice. It appears in *Weſt.* 2. *Cap.* 25. That an Aſſize ſhall lie for a *Corody*; and in others, That *Corodies* belonged ſometimes to Biſhops from Monaſteries; and alſo, That a *Corody* may be due to a common Perſon, by Grant from one to another; or of common Right, to him that is a Founder of a Religious Houſe, not holden in *Franc-Almoine*, for that Tenure was diſcharged of all *Corodies* in it ſelf. And a *Corody* is ſaid to be either certain or uncertain, and that it may be for Life, for Years in Tail, or in Fee.

COROLLARY or *Conſectary*, is an uſeful Conſequence drawn from ſomething which hath been already advanced or demonſtrated; as if from this, *viz. That a Triangle which has two equal ſides, has alſo two Angles equal*; you ſhould draw this Conſequence, *That a Triangle which has the three Sides equal, has alſo its three Angles equal.*

CORONA, in Architecture, is properly the flat and moſt advanced part of the Cornice, called by the *French Larmier*, and by us *the Drip*, becauſe it defends the reſt of the Work from Wind and Weather; but it is often taken by *Vitruvius* for the whole *Cornice*.

Corona, or the *Flat-Crown*, is alſo a particular Member in the *Dorick* Gate, made by ſo extraordinary an Enlargement of the *Larmier* or *Drip*, that it hath ſix times more breadth than Projecture. This ſort of *Corona* is no where found amongſt

mongſt the Ancients, except only in the Writings of *Vitruvius*.

CORONA *Borealis*, or the *Northern Garland*, a Conſtellation in the Northern Hemiſphere, conſiſting of about 20 Stars.

CORONA *Meridionalis*, a Southern Conſtellation conſiſting of 13 Stars.

CORONALE: See *Frontis*.

CORONALIS *Sutura*, is a Cleft in the Head made like a Comb, and joins as if the Teeth of two Saws were cloſely compacted into one another: It is placed in the upper Part of the Skull from one Temple to another, and is circumſcrib'd with the Bones of the Forchead, and that particularly called *Bregma*; in the Middle whereof the *Suture*, ſtiled *Sagittalis*, is terminated.

CORONARIA *Vaſa*, are the Veins and Arteries which ſurround the Heart to nouriſh it: They ariſe out of the *Aorta* before it comes out of the *Pericardium*; they encompaſs the *Baſis* of the Heart like a Garland; in their Circuit ſend down divers Twigs length-ways of the Heart, and when they have encompaſſed the *Baſis* and meet, they inoſculate with one another, but not with the *Veins*.

CORONATORE *Eligendo*, is a Writ which, after the Death or Diſcharge of any *Coroner*, is directed to the Sheriff out of the *Chancery*, to call together the Free-holders of the County for the Choice of another *Coroner*; and to certify into the *Chancery* both the Election and Name of the Party elected, and to give him his Oath.

CORONE, is an Acute Proceſs of the lower Jaw-bone, from its Likeneſs to the Beak of a *Raven* called *Roſtriformis*, in the Form of a Beak.

CORONER, is an ancient Officer of this Land, ſo called, becauſe he dealeth wholly for the King and Crown: There be four of them commonly in every County, and they are choſen by the Free-holders of the ſame upon Writ, and not by Patent. His Office eſpecially concerneth Pleas of the Crown. There be alſo certain ſpecial *Coroners* within divers Liberties, as well as thoſe ordinary Officers in every County; as the *Coroner of the Verge*, which is a certain Compaſs about the King's Court: And there are certain Charters belonging to Colleges and other Corporations, whereby they are licenced to appoint their *Coroner* within their own Precincts.

CORPORA *Cavernoſa Penis* (by *D'Graaf* called *Nervoſa*, and by others *Nervea Spongioſa*) are two *Capſulæ* or oblong *Folliculi*, fenced every where without with a thick Membrane. They ſpring with two diſtinct Originals from the lower Side of the *Oſſa Pubis*, whence ſtretching forwards, they meet one another, leaving an Interſtice before their Conjunction, in which the *Urethra* is conveyed: Where they leave the *Oſſa Pubis* they are each covered with a Membrane, and afterwards joined to each other by the Intervention of a *Septum Intermedium*, which, the nearer it comes to the Glans, is the more diminiſhed.

CORPORA *Olivaria*: See *Olivaria Corpora*.

CORPORA *Pyramidalia*, are Protuberances of the under Part of the Brain; they are in Length of about an Inch.

CORPORA *Striata*, are Protuberances upon the *Crura Medullæ Oblongatæ*.

CORPORAL, is an inferior Officer in a Foot Company, who hath charge over one of the Diviſions; places and relieves Centinels, and keeps good Order in the *Corps de Garde*: He receives the *Word* of the Inferior Rounds that paſs by his *Corps de Garde*.

CORPORATION, is a Body Politick authoriſed by the King's Charter, being of Capacity to take and grant, having a Common Seal, &c. Theſe are conſtituted either by Preſcription, by Letters Patent, or by Act of Parliament, and are either *Spiritual* or *Temporal*.

CORPOREITY, the School Term for the Nature of a Body.

CORPS *de Garde*, is a Poſt in an Army ſometimes under Covert, ſometimes in the open Air, to receive a Number of Men who are relieved from time to time to watch in their Turns for the Security of ſome more conſiderable Poſt; and it often alſo is taken for the Men thus watching, who are called the *Corps de Garde*.

CORPUS *cum Cauſa*, is a Writ iſſuing out of the *Chancery*, to remove both the Body and the Record touching the Cauſe of any Man lying in Execution upon a Judgment for Debt, into the *King's-Bench*, &c. there to lie till he have ſatisfied the Judgment.

CORPUS *Calloſum*, is the upper Part or Covering of a Space made by the joining together of the Right and Left Side of the internal Subſtance of the Brain. This Space forms the three Ventricles or *Foramen Ovale*, and its Bottom is the Internal Subſtance of the two Sides of the *Cerebrum* gather'd as it were into two Bundles, and are called the *Crura* of the *Medulla Oblongata*.

CORPUS *Glandulojum*, the ſame with the *Proſtata*.

CORPUSCLES, in Natural Philoſophy, ſignify the Minute Parts, or Particles, or Phyſical Atoms of a Body; and by this Word is not meant *Elementary Parts*, nor the *Hypoſtatical Principles* of the Chymiſts, but ſuch Particles, whether of a ſimple or compounded Nature, whoſe Parts will not be *diſſolved*, *disjoined*, or *diſſipated* by ordinary Degrees of Heat.

And that way of Philoſophizing which endeavours to explain things, and to give an Account of the *Phænomena* of Nature by the Motion, Figure, Reſt, Poſition, &c. of Corpuſcles or Minute Particles of Matter, is by the Honourable Mr. *Boyle* called very properly the

CORPUSCULAR *Philoſophy*; which was ſo very Ancient, that both before *Epicurus* and *Democritus*, and even before *Leucippus* taught in *Greece*, there was a *Phœnician* Philoſopher that explained Natural *Phænomena* by the Motions and Affections of the Minute *Corpuſcles* of Matter, as very old Writers inform us: and therefore this kind of Philoſophy ſhould rather be called *Phœnician* than *Epicurean*.

The chief Principles of the *Mechanical Hypotheſis* or *Corpuſcular Philoſophy*, Mr. *Boyle* ſums up in theſe Particulars:

1. They ſuppoſe that there is but one Catholick or Univerſal Matter, which is an extended, impenetrable and diviſible Subſtance common to all Bodies, and capable of all Forms.

2. That this Matter, in order to form the vaſt Variety of Natural Bodies, muſt have *Motion* in ſome or all its deſignable Parts: and that this Motion was given to Matter by God the Creator of all things, and has all manner of Directions and Tendencies.

3. Matter muſt alſo actually be divided into Parts, and each of theſe Primitive Particles, Frag-

ments or Atoms of Matter muſt have its proper Magnitude or Size, as alſo its peculiar Figure and Shape.

4. They ſuppoſe alſo, that theſe differently fiz'd and ſhap'd Particles may have as different *Orders* and *Poſitions*, *Situations* or *Poſtures*, from whence great Variety may ariſe in the Compoſition of Bodies.

CORRECTOR *of the Staple*, is a Clerk belonging to the *Staple* that Writeth and Recordeth the Bargains of Merchants made there.

CORRIDOR, in Fortification, is the *Covert-way* lying round about the whole Compaſs of the Fortifications of a Place, between the Outſide of the Moat and the Palliſado's.

CORROSIBILITY, is the Power of being corroded, eaten or diſſolved by any *Corroſive Menſtruum* or Liquor; and the Honourable Mr. *Boyle* reckons theſe Qualifications neceſſary to render any Body *Corroſible:*

1. That it be furniſhed with Pores of ſuch a Bigneſs and Figure, that the *Corpuſcles* of the *Menſtruum* or *Solvent* may enter them, and yet not be much agitated in them, without alſo giving briſk Knocks or Shakes to the ſolid Parts which conſtitute the Pores or Cavities: For ſometimes, though the Pores of a Body may be large enough to let in ſome groſs Corpuſcles, yet if theſe, for want of Solidity or Rigidity, are too flexible, or are of an Incongruous Figure to thoſe Pores, a Diſſolution may not enſue; as it happens when pure Spirit of Wine is in the cold put upon Salt of Tartar; or when *Aqua Fortis* is put upon powdered Sulphur.

2. That its conſiſtent Corpuſcles be of ſuch a Bulk and Solidity as doth not incapacitate them from being diſ-joined by the Action of the inſinuating Corpuſcles of the *Menſtruum*.

3. That the Coheſion of the Parts of the *Corrodible* Body be not ſo ſtrict, as that they are not ſeparable by the Action of the Diſſolvent.

CORROSIO *Chymica*, is a Diſſolution of mixed Bodies by *Corroſive Menſtruums*.

CORROSIVE *Medicine*, is one that has a Power of Corroding, as Lime, *Lapis Infernalis*, and other Cauteries.

CORROSIVENESS, is the Quality that ſome Liquors which are called *Menſtruums*, have of diſſolving or corroding Bodies.

And the Attributes or Qualifications which ſeem proper to render any Liquor *Corroſive*, Mr. *Boyle*, in his Mechanical Original of this Quality, reckons to be ſuch as theſe:

1. That the *Menſtruum* or diſſolving Liquour conſiſt of, or abound with ſuch Particles as are not too big to get in at the Pores or Commiſſures of the Body to be diſſolved; nor yet ſo ſmall, as readily to paſs through them, as the Rays of Light do through Glaſs; nor muſt they be unable, by reaſon of their great Slenderneſs and Flexibility, to disjoin the Parts they invade.

2. That theſe Corpuſcles be of a Shape fitting to inſinuate themſelves more or leſs into the Commiſſures or Pores of the Body, in order to diſſociate its ſolid Parts.

3. That theſe Particles have alſo a competent degree of *Solidity*, in order to disjoin the Particles of the Body to be diſſolved: And this Solidity differs much from the Bulk of the *Corpuſcles* mentioned in the firſt Requiſite; for one thing may be much more ſolid than another, tho' it have, as to Bulk, the ſame Dimenſions: Thus the Stalk of a Plant may be as big as a ſmall Iron or a Steel Rod, but the Latter is much ſolider than the Former.

4. That the Particles of the *Menſtruum* be Agile, and advantaged for Motion, in reſpect of their Shape, or their Smallneſs, or their Fitneſs, to have their Action befriended by the Preſſure of the Atmoſphere, which may help to drive them into the Pores of Bodies, or by the Agitation which theſe intruding Particles may be fitted to receive in thoſe Pores by the Tranſcurſion of ſome ſubtle Æthereal Matter.

CORRODENTIA: *Corroding* things, are things which eat up and conſume Excreſcent Fleſh with their ſharp *Particles*. Blanchard.

CORRUGANT *Muſcles*, according to ſome, are thoſe that help to knit the Brows when one frowns; but they ſeem to be only a Part of the *Frontal Muſcles* that have their Fibres running in this Place ſomewhat obliquely.

CORRUGATOR *Supercilii*, is by ſome Anatomiſts reckoned as a Muſcle of the Eye-brows, helping to knit them when we frown; but it ſeems to be only a Part of the Frontal Muſcles, having Fibres in this Place a little oblique.

CORRUPTION, is the Deſtruction, Extinction, or, at leaſt, the *Ceſſation*, for a Time, of the proper Mode of Exiſtence of any Natural Body: For whenever any Body loſes all, or any of thoſe Accidents which are eſſentially neceſſary to the conſtituting it of ſuch a kind, it is then ſaid to be corrupted or deſtroyed, and loſes its former Denomination, being not now a Body of the Kind it was before. But, as in *Generation*, nothing *Subſtantial* is produced, ſo here nothing *Subſtantial* is loſt or deſtroyed, but only that Modification of the Body which was its Form, and made it be of ſuch a *Species*.

CORTICAL *Part of the Brain*, is the outward Subſtance of the Brain, full of *Labyrinths* and *Meanders* in the Outſide; it is covered with a thin Skin, and is of an Aſh-griſly Colour, being, as *Malpighius* ſaith, only an Heap of little Oval Glands, and full of little Veſſels; inwardly the *Medullary Subſtance* is next to it. Its Uſe is thought by ſome to be for the generating Animal Spirits from the Blood, and hence they are conveyed by the *Medullary Subſtance* to the *Nerves*, and diſtributed through the whole Body: And the Seat of the Memory and Sleep is placed there by many Anatomiſts.

CORTIN, in *Fortification*, ſignifies the Wall or Diſtance between the Flanks of two Baſtions.

CORUSCATION or *Flaſhing*, is (by the *Carteſians*) an Exhalation ſpread under a Cloud, which ruſhing downwards is ſet on Fire and flaſheth.

CORVUS, a Southern Conſtellation in the Heavens, conſiſting of ſeven Stars.

CORYMBUS, in general, ſignifies the Top of any thing; but among the old Writers about Plants, *Corymbi* were the Bunches or Cluſters of Ivy Berries: Some alſo call the Top of the Stalk of a Plant, when 'tis ſo ſubdivided and adorned with Flowers or Fruits that it makes a round Spherical Figure, by this Name *Corymbus*, as the Tops of Leeks, Onions, and of the *Sambucus Aquatica*, *&c.* and others confound the Word with *Umbella*, which expreſſes the Flowry Top of ſuch Plants as have their Branches and Flowers ſpread round into the Form of what our Women now call an *Umbrella*.

But

But among our Modern Botaniſts it is uſed for a compounded diſcous Flower, whoſe Seeds are not *Pappous*, or do not fly away in Down; ſuch are the Flowers of *Daiſies*, *Corn-Marygold*, &c. and therefore the Accurate Botaniſt Mr. *Ray* makes one large Genus of Plants to be ſuch as have a compound diſcous Flower, but without any downy Wings to carry off their Seeds, and theſe he properly calls

Corymbiferous Plants; and theſe he diſtinguiſhes into,

1. Such as have a Radiate Flower, as the *Flos Solis*, *Calendula*, *Caltha*, *Flos Africanus*, *Chryſanthemum*, *Sagetum*, *Buthphalmum*, *Ptarmica*, *Abſinthium Umbelliferum*, *Millefolium*, *Bellis Major & Minor*, *Parthenium*, *Chamæmelum*, &c.

2. Such as have a Naked Flower, as the *Abrotanum Fœmina*, *Eupatorium Cannabinum fœmina*, *Coſtus Hortorum*, *Ageratum*, *Abſinthium*, *Artemiſia*, &c.

To which he adds ſuch as he calls

Corymbiferis Affines, *i. e.* ſuch Plants as ſeem akin to the *Corymbiferous* Kind, as *Scabioſa*, *Dipſacus*, *Carduus*, *Sphærocephalus*, *Eryngium*, &c.

CORYPHE, is the Crown of the Head; alſo the interior Extremity of the Fingers near the Nails. *Blanchard.*

CORYZA or *Gravedo*, is a Defluxion of a ſharp, ſalt, and thick Humour into the Mouth, Lungs, and Noſtrils, from the *Ventricles* of the Brain by the Olfactory *Nerves*; for when it grows thick, it can neither be *Percolated* by the Reins, nor paſs from the *Pituitary Glandule* through the *Infundibulum* into the *Veins*, and therefore it diſtils into the Noſtrils by the aforeſaid *Nerves*. *Blanchard.*

CO-SECANT, is the Secant of an Arch which is the Complement of another to 90°.

CO-SINE, is the Right Sine of an Arch, which is the Complement of another to 90 Degrees.

COSENAGE, or *Cognatione*, is a Writ that lies where the great Grandfather is ſeized in his Demeſne, as of Fee, at the Day of his Death, of certain Lands and Tenements, and dieth, and then a Stranger entreth and abateth; for then ſhall his Heir have this Writ of *Coſenage*.

COSHERING, in the Feudal Laws; as there were many Privileges inherent by Right and Cuſtom, ſo were there ſeveral then grievous Exactions impoſed by the Lords, by a ſort of Prerogative or Seignioral Authority, as to lie and feaſt themſelves and their Followers (called *Coſhering*) at their Tenant's Houſes.

COSMETICKS, are Medicines which whiten and ſoften the Skin, or, in general, any thing that helps to promote the External Beauty or good Appearance of the Perſon that uſeth it.

COSMICAL, a Term in Aſtronomy, expreſſing one of the Poetical Riſings of a Star; for a Star is ſaid to *riſe Coſmically*, when it riſes together with the Sun, or with that Degree of the *Ecliptick* wherein the Sun then abides; and the *Coſmical Setting*, is when a Star ſets and goes down in the *Weſt*, at the ſame time as the Sun riſes in the *Eaſt*.

COSMOGRAPHY, is a Deſcription of all the ſeveral Parts of the viſible World, delineating them according to their Number, Poſitions, Motions, Magnitudes, Figures, and their other Properties. The Two Parts of which are *Aſtronomy* and *Geography*.

COSSE and *Coſſick*, the old Word for *Algebra*.

COST, (in the Plural Number *Cotizes*) a Term in Heraldry, ſignifying a fourth Part of a *Bend*.

COSTÆ, the Ribs, are thoſe Bones which, with other Parts, makes the *Cheſt* or *Thorax*; Backward they are connected with the *Vertebræ* of the Back; Forward with the *Cartilages* of the Breaſt Bone: They are Twelve in number on each Side, the Seven upper are called *Coſtæ Veræ*, *True*, becauſe their Cartilaginous Ends are received into the *Sinus* of the *Sternum*; the Five lower *Spurious*, becauſe they are ſhorter and ſofter; the broader Part of the Rib is called *Palmula*, the ſtraighter towards the *Vertebræ*, *Remulus*. The Ribs are crooked like the Segments of Circles, and grow flat and broad as they approach the *Sternum*, but nearer the *Vertebræ* they are rounder and thicker, and at thoſe Ends have each a round Head, which being covered with a Cartilage, is received into the *Sinus* in the Body of each *Vertebra*; and at the Neck of each Head there is a ſmall Tubercle, which is alſo received into the *Sinus* of the Tranſverſe Proceſſes of the *Vertebræ*; and as they are thus articulated, the Ribs make an Acute Angle with the lower *Vertebra*. Each one hath a ſmall Canal or *Sinus* running along the under Side, in which lies a Nerve, Vein and Artery: Their Extremities, which are faſtened to the *Sternum*, are Cartilaginous, and the *Cartilages* make an Obtuſe Angle with the Bony Part of the Rib. Theſe *Cartilages* are harder in Women than Men, that they may the better ſuſtain the Weight of the Breaſts.

Dr. *Keil* obſerves very well in his *Anatomy*, P. 227. That if the Ribs had been articulated with the Bodies of the *Vertebræ* at Right Angles, the Cavities of the Thorax could never have been enlarged in breathing: If each Rib had been a rigid Bone articulated at both Ends to two fix'd Points, the whole Cheſt had been immoveable. If the Ribs had not been articulated to the Tranſverſe Proceſſes of the *Vertebræ*, the *Sternum* could not have been thruſt out to that Degree it is now, nor the Cavity of the Thorax increaſed ſo much as is requiſite in Inſpiration; for when the Ribs are pull'd up by the Intercoſtal Muſcles, the Angle which the Cartilages at the *Sternum* make with the Bony Part of the Rib, muſt be increaſed, and conſequently its Subtenſe, or the Diſtance between the *Sternum* and the Tranſverſe Proceſſes, lengthened. Now becauſe the Rib can't move beyond the Tranſverſe Proceſs, on the account of its being articulated with it, therefore the *Sternum* muſt either be thruſt to the other Side, or elſe outwards: It cannot move to the other Side, becauſe of an equal Preſſure upon the ſame Account there, and therefore 'tis thruſt outwards, or the Diſtance between the *Sternum* and the *Vertebræ* is increaſed: The laſt Ribs, which do not reach the *Sternum*, and conſequently conduce nothing to this Action, are not articulated with the Tranſverſe Proceſſes.

If we ſuppoſe the Cavity of the *Thorax* to be half a *Spheroid*, whoſe *Semi-Axis* is equal to the Height

Height of the *Thorax*, or about 15 Inches, and the Diameter of its greateſt Circle 12 Inches, then the Cavity of the *Thorax* will contain about 1130 Cubick Inches; but in an eaſy Inſpiration the *Sternum* is raiſed $\frac{1}{10}$ of an Inch (as I am aſſured by an exact Experiment) and therefore on that Account the *Thorax* is enlarged to the Capacity of 1150 Cubick Inches. To this, if we add the Space which the Diaphragm leaves, which is the Segment of a Sphere, whoſe Diameter is about 15 Inches, and the Solidity of that Segment 183 Inches, we ſhall have 22 Inches more, if the Diaphragm deſcends but one Inch; but if it deſcends an Inch and $\frac{1}{2}$, it then leaves room for 32 Inches of Air more to enter; and if it deſcends two Inches, the Cavity of the *Thorax* will be increaſed on the Account of the Motion of the Diaphragm alone to 86 Inches; ſo that in the leaſt Inſpiration which we can fairly ſuppoſe, the Lungs are diſtended with 42 Inches of Air, and ſometimes may receive above 70 or 100.

CO-TANGENT, is the *Tangent* of an Arch, which is the Complement of another to 90 *Degrees*.

COTYLE, the ſame with *Acetabulum*, is the Cavity of the Huckle Bone, which is appointed to receive the Head of the Thigh Bone.

COTYLEDON, the ſame with *Cotyle*.

COTYLEDONES, or *Acetabula Uterina*, are Glandules diſperſed up and down the uttermoſt Membrane inveſting the *Fœtus*, called *Chorion*, which ſeparate the *Nutritious Juice* from the Womb to nouriſh the *Fœtus*; but this is found only in ſome Animals; the *Placenta* in the Womb ſupplies their Place in Women: The gaping meeting of the Veins in the Womb alſo are called *Cotyledones* and *Acetabula*: Theſe Glandules are ſo called from the Reſemblance they bear to the Leaves of the Herb *Pennywort*, in Latin *Cotyledon*.

COUCHANT, the Term in Heraldry for a Lion born in any Coat of Arms, lying on his Belly, but with his Head erect.

COVENANT, is the Conſent of two or more to one thing, to do or give ſomewhat. *Covenant* is either in *Law* or in *Fact*; A *Covenant in Law*, is that which the Law intendeth to be made, though in Words not to be expreſſed; as if the Leſſee do demiſe or grant, &c. to the Leſſor for a certain Term, the Law intendeth a *Covenant* on the Leſſor's Part, that the Leſſee ſhall quietly enjoy his Leaſe for his Term againſt all Incumbrances.

Covenant in Fact, is that which is expreſly agreed between the Parties. There is alſo a *Covenant Real*, and a *Covenant meerly Perſonal*; A *Covenant Real* is that whereby a Man tieth himſelf to paſs a thing *Real*, as Lands or Tenements, as a *Covenant* to levy a Fine or Land, &c. A *Covenant meerly Perſonal*, on the other Side, is where a Man *covenanteth* with another by Deed to build him a Houſe, or any other thing, or to ſerve him, or to infeoff him, &c.

COVENANT is alſo the Name of a Writ: See *Convention*.

CO-VERSED *Sine*, is the remaining Part of the Diameter of a Circle, after the Verſed Sine is taken from it.

COVERTURE, in Law, is particularly applied to the Eſtate and Condition of a married Woman, who, by the Laws of our Realm, is *ſub poteſtate viri*, and therefore diſabled to make Bargains with any, to the Prejudice of her Self or her Husband, without his Aſſent and Privity, or at leaſt without his Allowance and Confirmation; and if the Husband alien the Wife's Lands during the Marriage, ſhe cannot gainſay it during his Life.

COVERT-WAY, in Fortification, is a Space of Ground level with the Field, on the Edge of the Ditch three or four Fathom broad, ranging quite round the Half-Moons and other Works toward the Country: It is otherwiſe called *Corridor*, and hath a Parapet raiſed on a Level, together with its *Banquets* and *Glacis*, which from the Height of the Parapet ought to follow the Parapet of the Place till it is inſenſibly loſt in the Field: It hath alſo a Foot Bank. One of the greateſt Difficulties in a Siege is to make a Lodgment on the Covert-way, becauſe uſually the Beſieged Palliſade it along the Middle, and undermine it on all Sides: This is ſometimes called, and that commonly, the *Counterſcarp*, becauſe 'tis on the Edge of it.

COVINE, (in Law) is a deceitful Aſſent or Agreement between two or more, to the Prejudice of one another.

COUNT, (in Law) ſignifies as much as the Original Declaration in a Proceſs, though more uſed in Real than in Perſonal Actions, as Declaration is more apply'd to Perſonal than Real.

COUNT-WHEEL, is a Wheel in the ſtriking Part of a Clock, moving round once in 12 or 24 Hours: It is by ſome called the *Locking Wheel*, becauſe it hath commonly 11 Notches in it at unequal Diſtances from one another, in order to make the Clock ſtrike 1, 2, 3, 4, &c. 'tis driven round by the *Pinion of Report*.

COUNTER-APPROACHES, in Fortification, are Works made by the Beſieged to hinder the Approach of the Enemy; and when they deſign to attack them in Form,

COUNTER-BATTERY is one raiſed to play againſt another.

COUNTER-BREAST-WORK, a Term in Fortification, the ſame with *Falſe Bray*.

COUNTER-CHANGED, is a Term in Heraldry, when there is a *mutual changing* of the Colours of the *Field* and *Charge* in an Eſcutcheon, by Reaſon of one or more Lines of Partition. Thus in the Coat of the Famous *Chaucer*, he beareth *Party per Pale, Argent and Gules, a Bend Counter-changed, i. e.* that Part of the Bend which is in that Side of the Eſcutcheon which is *Argent*, is *Gules*, and that Part of it which is in the other Side, is *Argent*.

COUNTER-COMPONED, the Herald's Term for a *Bordure*, or any Ordinary which hath two Rows only of *Checkers* of two different Colours; but when it hath three or more, they call it *Checky*.

COUNTER-FORTS, are certain Pillars and Parts of the Walls of a Place, diſtant from 15 to 20 Foot one from another, which are advanced as much as is poſſible in the Ground, and join'd to the Height of the *Cordon* by Vaults to ſupport the Way of the Rounds and Part of the Rampart; as alſo to fortify the Wall, and ſtrengthen the Ground; nevertheleſs they are not at preſent much uſed, except in large Fortifications.

COUNTER-FUGUE, in Muſick, is when the *Fugues* proceed contrary to one another.

COUNTER-GUARDS, or *Envelopes*, in Fortification, are large Heaps of Earth in Form of a Parapet, raiſed above the Moat before the Faces and the Point of the Baſtion to preſerve them; and then they conſiſt of two Faces, making an Angle Saliant, and parallel with the Faces of the Baſtion. If they are deſigned to cover one of the Faces of the Baſtion, they are ſhaped like a Demi-Baſtion, with a Parapet on the Face and Capital, but none on the Flank, which muſt lie open and be expoſed to the Fire of the Place; but there are few Places now fortified after this Manner by reaſon of the exceſſive Charge it requires.

COUNTERMAND, is where a thing formerly executed, is afterwards, by ſome Acts or Ceremony, made void by the Party that had firſt done it.

COUNTER-MARCH, in the Art of War, ſignifies changing the Face or the Wings of a *Battalion*, and this is done either by *Files* or by *Ranks*.

COUNTER-MARCH *by Files*, is when thoſe Men that are in the Front of the Battalion, go into the *Rear*.

COUNTER-MARCH *by Ranks*, is when the Wings or Flanks of the Battalion change Ground with one another.

COUNTER-MINE, in Fortification, is a Subterraneous Paſſage made by the Beſieged in ſearch of the Enemy's Mine, to give Air thereto, to take away the Powder, or by any other Means to fruſtrate the Effect of it, though it ſhould even happen to be fired by the Aſſailants.

COUNTER-PART, a Term in Muſick, only denoting one Part to be oppoſite to another; as the *Baſe* is ſaid to be the *Counter-part* of the *Treble*.

COUNTER-PASSANT; when two Lions are born in a Court of Arms, and one appears to be paſſing or walking quite the contrary way with the other, the Heralds call it by this Term *Counter-paſſant*.

COUNTER-PLEA, in Common Law, ſignifies that which the Demandant alledgeth againſt a Tenant in Courteſy or in Dower, who prayeth in Aid of the King; or him who hath the Reverſion for his better Defence.

COUNTER-POINT, in Muſick, is a Term whereby is underſtood the old Manner of compoſing Parts, before Notes of different Meaſure were invented; which was to ſet Pricks or Points one againſt another to denote the ſeveral Concords; the Length or Meaſure of which Points was ſung according to the Quantity of the Words or Syllables whereto they are apply'd; ſo that in regard that in compoſing our Deſcant we ſet Note againſt Note, as the Ancients did Point againſt Point; the Term *Counter-point* is ſtill retained in theſe Compoſitions.

COUNTER-SAILIENT, is when two Beaſts are born in a Coat of Arms in a Poſture of leaping from each other directly the contrary way.

COUNTERSCARP, in Fortification, is that Side of the Ditch which is next the Camp, or properly the *Talus* that ſupports the Earth of the *Covert-way*; although by this Term is often underſtood the *whole Covert-way*, with its *Parapet* and *Glacis*; and ſo it is to be underſtood when 'tis ſaid, *The Enemy lodged themſelves on the Counterſcarp*.

COUNTER *Swallow's Tail*, is an Out-work in Fortification, in the Form of a ſingle Tenaile, wider next the Place, *i. e.* at the Gorge, than at the Head, or next the Campaign: The Sides of this *Counter Swallow's Tail* are not ſo well flank'd from the Place as thoſe of the *true Swallow's Tail*, and therefore 'tis not ſo good.

COUNTER-TENOR, one of the mean or middle Parts of Muſick, ſo called as it were oppoſite to the *Tenor*.

COUNTER-TRIPPING; when two Staggs, or other Beaſts, are born in a Coat of Arms tripping, *i. e.* in a walking Poſture, and the Head of one is to the Tail of the other, the Heralds ſay they are *Counter-Tripping*.

COUNTERS, are Two Parts of a Ship; the *upper Counter* is reckoned from the Gallery to the lower Part of the ſtraight Piece of the *Stern*: The *lower Counter* is between the Tranſom and lower Part of the Gallery.

COUNTING-HOUSE, in the King's Houſhold: See *Green Cloth*.

COUNTY-COURT, is a *Court* held every Month by the *Sheriff*, or his Deputy the *Under Sheriff*.

COUPED, is the Herald's Word for any thing in an Eſcutcheon which is born, cut clear and evenly off, in oppoſition to its being torn off, which they call Eraſed: Thus the Arms of *Ulſter* which all Baronets carry, is a Dexter Hand *Couped* or cut off at the Wriſt.

COUPLE *Cloſe*, a Term in Heraldry, ſignifying the fourth Part of a *Chevron*: Theſe are never born but in Pairs, except a *Chevron* be between them, ſaith *Guillim*, but *Bloom* gives us an Inſtance to the contrary.

COURSE, in Navigation, is that Point of the Compaſs or Coaſt of the *Horizon* on which the Ship is to be ſteered from Place to Place; or rather the Angle between the *Rumb-Line* and the *Meridian*.

COURSES, in a Ship, are her *Main-ſail* and *Fore ſail*; when ſhe ſails under them only without lacing on any Bonnets, they ſay then ſhe goes under a *Pair of Courſes*.

COURT, is a Word that has divers Significations, but in Law 'tis the Place where Juſtice is judicially adminiſtred, of which you find Thirty Two ſeveral ſorts in *Crompton*'s Book of *Juriſdictions*, well deſcribed, and of them moſt are *Courts of Record*; ſome be not, and therefore are accounted *Baſe Courts*, in Compariſon of the reſt. Beſides theſe, there are alſo *Courts Chriſtian*, which are ſo called, becauſe they handle Matters eſpecially appertaining to Chriſtianity; and ſuch as, without good Knowledge in Divinity, cannot be well judged of; and therefore the Judges are Divines, as Archbiſhops, Biſhops, Archdeacons, and the like.

COURT-BARON, is a Court that every Lord of a Mannor hath within his own Precincts: And this Court is twofold; as if a Man having a Mannor in Town, to grant the Inheritance of the Copyholders thereunto belonging to another; this Grantee may keep a Court for the Cuſtomary Tenants, and accept Surrenders to the uſe of others, and make both Admittances and Grants. The other Court is of Free-holders, which is properly called *the Court Baron*, wherein the Suitors, that is, the Free-holders, be Judges, whereas of the other, the Lord or his Steward is Judge.

COURT *of Chivalry*, or the *Marſhal's Court*; the Judges are the *Lord High Conſtable* and the *Earl Marſhal of* England. This Court is the Fountain of Martial Law, and the *Earl Marſhal* is not only one

one of the Judges, but alſo to ſee Execution done.

COURT *of Delegates*: See *Delegates*.

COURT *of Peculiars*, is a Spiritual Court held in ſuch Pariſhes as are exempt from the Juriſdiction of the Biſhops, and are peculiarly belonging to the Archbiſhop of *Canterbury*.

COURT *of Requeſts*, is a Court of Equity of the ſame Nature with the *Chancery*, but inferior to it, being principally inſtituted for the Help of ſuch Petitioners as in Conſcionable Caſes deal by Supplication to His Majeſty. This *Court* had aſſumed ſo great Power to it ſelf, that it grew Burthenſome and Grievous, and therefore was taken away with ſome others by a Statute made 16 and 17 *Car.* I. *Cap.* 10.

COURTINE, or *Courtain*: See *Curtain*.

COURTESY, or *Curteſy of* England, ſignifies, with us, a certain Tenure, whereby a Man marrying an Inheritrix, that is, a Woman ſeized of Lands of Fee-ſimple or Fee-tail General; or ſeized as Heir of the Tail Special, and getteth a Child by her, that cometh alive into the World, though both it and his Wife die forthwith; yet if ſhe were in Poſſeſſion, he ſhall keep the Land during his Life; and is called *Tenant per legem* Angliæ, or *Tenant by the Curteſy of* England, becauſe this Privilege is not allowed in any other Countrey except *Scotland*, where 'tis called *Curialitas* Scotiæ.

COUTEUTLAUGH, he that willingly receiveth and cheriſheth, or hideth Out-Law.

COWARD; when a Lion is born in any Eſcutcheon with his Tail doubled or turned in between his Legs, they call it a *Lion Coward*.

COXÆ *Os*, the Hip Bone, called otherwiſe *Innominatum*, and *Ilium Coxendicis*, becauſe it contains the Gut called *Ilium*; it is annexed to the Sides of the *Os Sacrum*: In Infants it conſiſts of Three Bones, *Ilium*, *Iſchium*, and *Os Pubis*, which are joined together by *Cartilages* till ſeven Years of Age, then it is diſtinguiſh'd by a Triple Line: It grows into one continued Bone in Adult Perſons.

COXENDIX, the ſame with *Coxa*, and the *Os Iſchium*, is the Third and Inferior of the *Oſſa Innominata*, having a large Cavity called *Acetabulum Coxendicis*, which receives the Head of the Thigh-Bone; the Circumference of this Cavity is tipt with a Cartilage called its *Supercilium*: Where it joins the *Os Pubis*; it hath a large Hole called the *Foramen Iſchium* and *Pubis*, about whoſe Circumference the Muſcles called *Obturator Externus* and *Internus* do ariſe. At its lower End it hath a large Protuberance, on which we ſit, and from whence the Benders of the Legs ariſe; and a little above this, behind, it hath a ſmall acute Proceſs, between which and the former Protuberance lies the *Sinus* of the *Iſchium*, through which the Tendon of the *Obturator Internus* paſſes.

CRABB, an Engine of Wood with three Claws placed on the Ground like a Capſtern, which is uſed to launch Ships, or to heave them into the *Dock*.

CRADLE, ſo the Ship-wrights call a Frame of Timber raiſed along the Outſide of a Ship by the *Bildge*, ſerving the more ſecurely and commodiouſly to help to Launch a Ship: This is much uſed in *Italy*, *Spain*, and *Turkey*, where, for Safety's ſake, they alſo *trim* a great Ship in the *Cradle*.

CRAFT, is a Sea Word ſignifying all manner of Lines, Nets, Hooks, &c. which ſerve for Fiſhing; and becauſe thoſe that uſe the Fiſhing Trade uſe ſmall Veſſels, ſuch as Ketches, Hoys and Smacks, &c. they call all ſuch little Veſſels *Small Craft*.

CRAMA, *Croma*, *Chrama*, is a Mixture of any thing, whether Medicines or Elements. *Blanchard*.

CRANAGE, (in Law) is a Liberty to uſe a Crane for the drawing up of Wares from the Veſſels at any Creek of the Sea or Wharf unto the Land, and to make Profit of it: It ſignifies alſo the Money taken and paid for the ſame.

CRANE *Lines*, in a Ship, are Lines going from the upper End of the Sprit-Sail-Top-Maſt to the Middle of the Fore-ſtays; they ſerve to keep the Sprit-Sail-Top-Maſt upright and ſteady in its Place, and ſtrengthen it, in order that it may bear its Yard and Sail the better.

CRANE's *Bill*, a ſort of *Forceps* uſed by *Surgeons*, ſo Named from its Figure.

CRANIUM, is the *Compages* of the Bones of the Head, to which belongs the Bones of the Forehead, of the Sides of the Head, of the hinder Part of the Head, of the Temples, the Bone called *Sphenoides*, and another called the *Os Cribriforme*: It is like a Κράνος, or Helmet to the Head, which defends it from external Injuries; its upper Part is double: Some call it *Calva* and *Calvaria*: See *Calva*.

Each Bone in the *Cranium* is made up of two Tables or *Lamina*, between which there is a thin and ſpungy Subſtance made up of ſome Bony Fibres which come from each *Laminæ*, called in Greek *Diploe*, in Latin *Meditullium*. In it there are a great number of Veins and Arteries, which bring Blood for the Nouriſhment of the Bones. The Tables are hard and ſolid, becauſe in them the Fibres of the Bones are cloſe to one another. The *Diploe* is ſoft, becauſe the Bony Fibres are at a greater Diſtance one from another, by which Contrivance the *Cranium* is not only made lighter, but is alſo leſs ſubject to be broken. The External *Lamina* is ſmooth, and covered with the *Pericranium*; the Internal alſo is ſmooth, but on it there are ſeveral Furrows made by the Pulſe of the *Arteries* and the *Dura Mater*, whilſt the *Cranium* was ſoft and yielding.

The Bones of the *Cranium* are joined by four Sutures, the *Coronalis*, the *Lambdoidalis*, the *Sagittalis*, and the *Squamoſa*: The Three Firſt of which are called *Suturæ veræ*, the Laſt *Falſa*. The Bones of the *Cranium* are *Six proper*, as the *Os Frontis*, making the Front of the Skull; the *Os Occipitis*, which makes the hinder Part; the *Oſſa Parietalia* and *Temporum*, which conſtitute the Sides; and two *common Bones*, as the *Os Phenoides*, and the *Os Ethmoides*; all which ſee under thoſe Words.

CRANK, the Sea Term for a Ship that cannot bear her Sails, or can bear but a ſmall Sail for fear of overſetting; and they ſay ſhe is *Crank by the Ground*, when ſhe cannot be brought on Ground without Danger of overthrowing her.

CRAPULA, is an Head-ach proceeding from too much Wine. *Blanchard*.

CRASIS, in *Grammar*, is the ſame with *Synæreſis*, and draws two Letters belonging to different Syllables into one Syllable, as *Vement* for *Vehement*.

CRASIS, or *Temperamentum*, is a convenient Mixture of Qualities in an Animal Body. *Blanchard*.

CRATER, the Name of one of the Southern Conſtellations conſiſting of 11 Stars.

CRA-

CRATICULA, is a Chymical Inſtrument, made of ſquare Pieces of Iron as thick as one's Finger, placed ſo near one another in Acute Angles, that there's half a Finger's Space betwixt them: It is uſed in making of Fires to keep up the Coals. *Blanchard.*

CREAM *of Tartar*, is Tartar boiled in a great deal of Water, ſo that as much of it as can, may be there diſſolved; then the Diſſolution is paſſed hot through *Hippocrates* his Sleeve, and about half the Liquor being evaporated, the Remainder is ſet in a cool Place, and the Tartar will ſhoot into Cryſtals, and ſome of it be like a Cream on the Top of the Water: This Latter is properly the *Cream of Tartar*, and the Former are *Cryſtals of Tartar*, though both are of the ſame Nature and Uſe.

Sometimes the Ruſt of Iron powdered is boiled in the Water along with the Tartar, and then the *Cryſtals* are called the *Chalybeate Chryſtals of Tartar.*

CREEPING *Index*: See *Brachiolum.*

CREMASTER, the Name of a Muſcle, otherwiſe (from its uſe) called *ſuſpenſor Teſticuli:* 'Tis deſigned to keep the *Teſtes* from hanging down too much, and alſo to raiſe them up in *Coitu.*

CRENELLE, a Term in Heraldry, ſignifying the ſame as *Embatteled:* Which ſee.

CRENYLES, in a Ship, are ſmall Ropes ſpliced into the Bolt-ropes of the Sails of the Main-Maſt and Fore-Maſt; they are faſtened to the Bowling Bridles, and are alſo to hold by, when a Bonnet is ſhaken off.

CREPUSCULUM ſignifies Twilight, either Morning or Evening: See *Twilight.*

CRESCENT, the Herald's Term for an Half Moon, which they draw of this Figure; and though it be ſometimes born as Coat Armour, yet it is uſually the diſtinguiſhing Mark of the 2d Brother or Family from the Firſt.

CREST, in Heraldry, ſignifies that Repreſentation, whatever it be, whether of Animal, Vegetable, or other Artificial things, which is born on a *Wreath Chapeau*, &c. on the Top of the Helmet in any Atchievement: This they call alſo the *Cogniſance.*

CRIBRATION, the Chymiſt's Word for ſifting any Powder, or paſſing it through a fine Sieve.

CRIBROSUM *Os:* See *Ethmoides.*

CRIBRUM *benedictum antiquorum*, the Ancients fancied two Cavities placed long ways in the Reins; one uppermoſt, wherein the ſerous Blood was poured from the Emulgent Arteries; another lowermoſt, which they fancied was diſtinguiſhed with a certain Tranſverſe Membrane full of little Holes like a Sieve; whence they called it *Colatorium*, a Strainer; and *Benedictum Cribrum*, a bleſſed Sieve, through which they would have the *Serum* percolated into the *Ureters*, and the good Blood ſtay behind for the Nouriſhment of the Reins. *Blanchard.*

CRICOARYTÆNOIDES, are Muſcles which proceed from the Cartilage called *Cricoides*, laterally, and are inſerted into the *Arytænoides*, which, whilſt they draw the *Arytænois* ſideways and outwardly, the Opening or Rimula of the *Larynx* is dilated. *Blanchard.*

CRICOIDES, is the Cartilage of the *Larynx* or Wind-pipe in Faſhion of a Ring.

CRICOTHYROIDES, a Pair of Muſcles which proceed from the Cartilage of the *Larynx* like a Ring from the Fore-part of the *Cricoides*, and are terminated in that which is call'd the *Scutiformis*; they dilate the opening of the *Larynx* by moving a little obliquely: Its uſe is to pull up the *Annularis.*

CRIMNOIDES, or *Crimoides*, is Urine with thick Sediments at the Bottom like Bran. *Blanchard.*

CRISIS, is a ſudden change in a Diſeaſe, either towards a Recovery or Death: It ſometimes ſignifies a *Secretion* of Humours, but is more frequently taken for a Judgment paſſed upon a Diſeaſe; one *Criſis* is called *perfect*, another *imperfect*; the *Perfect* is that which frees the Patient perfectly from the Diſtemper, and it is either *Salutary* or Deadly, an *Imperfect Criſis* is that which does not clearly determine the Tendency of the Diſeaſe, but leaves Room for another *Criſis*; and this is two-fold, either *for the Better*, or *for the Worſe*; the Former is that which does not quite take away the Diſeaſe, but enables the Patient to bear it better; the latter is when the Diſeaſe becomes more violent and dangerous. *Blanchard.*

CRISTA *Galli*, is the Third Part of the Bone *Ethmoides*, or the inner Proceſs, not much unlike the Comb of a Cock; it ariſes betwixt the *Olfactory Nerves*, and has the Extremity of the third Cavity of the hard Skin of the Brain, called *Dura Mennix*, implanted in it.

CRISTÆ, are Excreſcencies of Fleſh growing about the Fundament, the Roots whereof are often chapt and cleft. *Blanchard.*

CRITERIUM, or *Criterion*, is a Judgment made of the Truth or Falſhood of a Propoſition, the Nature or Qualities of any Effect, &c.

CRITHE, or *Hordeolum*, is a little oblong Puſh or Swelling which grows to the Eye-brows where the Hairs are; ſo called from its Reſemblance to a Barly Corn. *Blanchard.*

CROCI, is a Word the *Botaniſts* uſe ſometimes for the *Apices* of Plants: Which ſee.

CROCUS *Martis*, or Saffron of Steel, ſo called from its reddiſh Colour: Of this there are ſeveral kinds, and diverſe ways prepared.

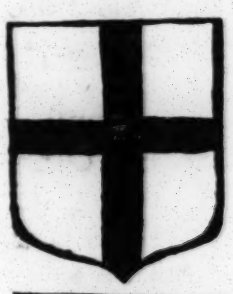
CROCUS *Martis Aperiens*, opening Saffron of *Mars:* Mr. *Lemery*, with great probability, aſſerts the beſt way of preparing this, is only to waſh Iron Plates, and then expoſe them to the Dew till they have contracted a Ruſt, which Ruſt is the *Crocus*, and may be ſcraped off, and the Plates waſhed and expoſed for more. He gives another good Way, which is, to expoſe Filings of Iron (for Steel is not ſo fit for Medicinal Uſes) in an Earthen Pan to the Rain, till they become a kind of Paſte, which is dried and powdered, and expoſed again to the Rain, and this for twelve times. Others calcine Filings of Iron or Steel with an equal Weight of common Sulphur; and ſome heat a Bar of Iron Red or rather White Hot, and then clap it between two Rolls of Brimſtone, and the Iron will melt and run down into a Veſſel of Water below: Steel ſo prepared, or by the former way, is called *Mars cum Sulphure præparatus.* Dr. *Willis*'s Way was to mix *Tartar* with Steel Filings, and no doubt many other Proceſſes of this kind there are,

all of which may be good Aperitives; tho' many aſſert the giving Filings in Subſtance, is as good a Way as any.

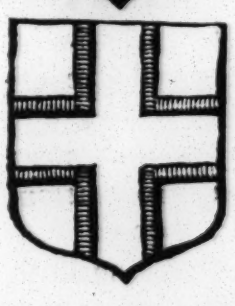
CROCUS *Martis Aſtringens, Binding Saffron of Steel*, is the Filings of Iron deprived of their more Saline Parts, which is done by waſhing them 5 or 6 times in ſtrong Vinegar, and then calcining them 5 or 6 Hours in a ſtrong Fire in a Pot, or upon a Tile. There are many other ways of preparing this *Aſtringent Crocus*, but this is a very good one.

CROCUS *Metallorum*, is a kind of Impure and *Opaque Glaſs* of Antimony, of a Liver Colour, whence often called *Hepar*, or Liver of Antimony, made by firing equal Parts of Powder of Antimony, and Salt Petre well mix'd, in an Iron Mortar covered with a Tile. 'Tis kindled by dropping in a Coal of Fire, a great Detonation enſues, which when over, ſtrike the Mortar to make the Matter fall to the Bottom: The ſhining Part is the *Crocus* or Liver, which muſt be ſeparated from the Droſs, waſhed and kept for uſe. Of this uſually is made the *Emetick Wine*, or *Vinum Benedictum*, by infuſing an Ounce of the *Crocus* powdered, in a Quart of Wine for 24 Hours.

CRONICAL: See *Acronical*.



CROSS, one of the Honourable Ordinaries in Heraldry, containing one fifth of the Field. There is great Variety in its Form, according to the Lines that compoſe it; but a plain *Croſs* is figured thus, by the Name of *Rainsford*. He beareth *Argent*, a *Croſs Sable*.



Sometimes there is a Line drawn parallel to the Out-line of the *Croſs*, and then the Field is ſuppoſed to appear through; this is called *a Croſs voided*, and born thus,

He beareth *Argent*, *a plain Croſs voided Azure*; and ſometimes the *Croſs* is *couped* as well as *voided*.

CROSS-*Bar-Shot*, is a round Shot or great Bullet, with a Bar of Iron put through it.

CROSS-LETTS, are little plain Croſſes, whoſe Ends alſo bear the Form of a plain Croſs. They are thus Figured, and are frequently born *Fitchee*, that is, pointed at Bottom: *Vid. Fitchee*.

CROSS-*Staff*, is an Inſtrument made of Box or Pear-Tree, commonly called the *Fore-ſtaff*, becauſe of taking forward Obſervations; and may be made alſo a *Back-ſtaff*, by adding a fourth Vane and Sight. 'Tis uſed by Seamen to take the Meridian Altitude of the Sun or Stars, in order to find the Latitude; 'Tis alſo by ſome uſed in Surveying, to take *Angles*.

CROSS *Jack*, in a Ship, is a ſmall Yard ſlung at the upper End of the Mizen-Maſt under the Top; it hath no *Halliards* nor *Tyes* belonging to it. Its Uſe is to ſpread and hale out the Mizen-Top-Sail Sheets. This is alſo called the *Croſs-Tree-Yard*.

CROSS *Piece*, is a great Piece of Timber going a-croſs the *Bitts* of a Ship, and unto it is the Cable *belayed* when ſhe rides at Anchor.

CROSS *Trees*, in a Ship, are 4 Pieces of Timber bolted and let into one another a-croſs at the Head of the Maſt: Their Uſe is to keep and bear the Top-maſts up, for the Foot of the Top-maſt is always faſtened into them. Thoſe who are more nice, call only thoſe two of theſe Timbers which go athwart Ships, the *Croſs Trees*; and then the others they call the *Treſſel Trees*.

CROSS *Tree Yard*, is a Yard ſtanding ſquare juſt under the Mizen Top, and to it the Mizen-Top-ſail is faſtened below.

CROSSIERS, are four Stars in form of a *Croſs*, which ſerve to ſhew thoſe that ſail in the *Southern* Hemiſphere, the *Antartick Pole*.

CROTAPHICK *Artery*, ſo ſome erroneouſly call the Tendon of the Muſcle called *Crotaphites* or *Temporalis*.

CROTAPHITES: See *Temporalis*.

CROTAPHIUM, a Pain in the Head.

CROTCHET, a Term in *Muſick*: See *Notes* and *Time*.

CROWN, in Geometry, ſignifies a plain Ring included between two concentrick Perimeters, and is generated by the Motion of ſome Part of a Right Line round a Center, the ſaid moving Part not being contiguous to the Center.

The *Area* of which will be had, if you multiply its Breadth by the middle Perimeter; for a Series of Terms in Arithmetick Progreſſion being $n \times \frac{a + \omega}{2}$, *i. e.* the Sum of the firſt and laſt multiplied by $\frac{1}{2}$ the Number of Terms, the middle Element muſt be $\frac{a + \omega}{2}$; wherefore that multiply'd by the Breadth or Sum of all the two Terms, will give the Crown.

CROWN-WHEEL, of a Watch, is the upper *Wheel* next the *Balance*, which, by its Motion, drives it; and this in *Royal Pendulums* is called the *Swing-Wheel*.

CROWN-WORKS, in Fortifications, are certain Bulwarks advanced towards the Field to gain ſome Hill or riſing Ground, being compoſed of a ſpacious *Gorge*, and two Wings that fall on the *Counterſcarp* near the Faces of the *Baſtion*, ſo that they are defended by them, and preſent on the Side of the Field an entire *Baſtion* between two *Demi-Baſtions*, whoſe Faces look towards one another. Thoſe Works have alſo their *Half-Moons*, and are raiſed only to take up and ſecure ſome large Space of Ground, or to defend the Head of a Camp when it is intrenched.

CROWNED *Horn-work*, is a *Horn-work* with a *Crown-work* before it.

CROW-FEET, in a Ship, are ſmall Lines or Ropes put through the Holes of the *Dead Men's Eyes*, and divided by that Means into 6 or 10, or ſometimes more Parts: They are of no uſe at all, but are there left hanging by the Boat-Swain to make a ſhew of ſmall Rigging. They are placed at the Bottom of the Back-Stays of the Fore-Top-Maſt, Mizen-Top-Maſt, and Gallant-Top-Maſt.

There goes alſo a Rope divided into 2 or 4 Portions from the upper End of the Sprit-Sail-Top-Maſt to the Fore-Top-Maſt Stay, which they call the *Sprit-Sail Top-Sail Crow-Foot*.

CROWS-FEET, (called alſo *Caltrops* and *Chauſſe Trapes*) are Irons ſo made with 4 Points of 2, 3 or 4 Inches long, that which way ſoever they fall, one Point may be uppermoſt; the ſhorter are to ſtrow on Bridges, the longer on the Ground, to gall the Feet of a Body of Horſe.

CRUCIBLE, is a Chymical Veſſel made of Earth,

Thus, ſuppoſe 28 were propoſed to be cubed, write it down ſo that there may be room to write 2 Figures between each Place; as,

```
2   8
```

I ſay, the *Cube* of 2 or 8, is 8 or 8cOO; then 3 times the Square of 2 (which is 12) multiply'd by 8, gives 99 = 3*aab*, which place orderly under the 8, as you ſee. Next, 3 times the Square of 8 is 192, and that multiply'd by 2 gives 384 = 3*abb*, which write alſo orderly, as you ſee: And laſtly, the *Cube* of 8 is 512, which muſt be written down ſo, that the firſt Figure of it to the Right Hand may ſtand under 8 in the Root; and then adding all together, you have 21952, the true *Cube* of 28.

```
8 . . . a a a
96 . . = 3 a a b
384 . 3 a b b
512 .   b b b
21952 = Cube of a + b
        or of 28.
```

If the Number to be *Cubed* had conſiſted of 3 or more Places, as ſuppoſe 285,

You muſt proceed as before to find the *Cube* of 28, the two firſt Figures toward the Left-hand, which is 21952; then after that you are to account that Number as the *Cube* of *a*, and go on to find the other Members as follows.

Imagine the next Figure 5 to ſtand 2 Places farther to the Right-hand, and let that be *b*; and 28 or 280, *a*; proceed therefore thus, 3 times the Square of 28 is 2352, which multiply'd by 5, makes 11760 = 3*aab*; write that down therefore as you ſee: Then ſay, 3 times the Square of 5 is 75, which multiply'd by 28, gives 2100 = 3*bba*; write that alſo down as you ſee: And laſtly, write the *Cube* of 5, which is 125 = *bbb*, in its proper order, as was ſhewed above, and then adding all together, the Sum will be 23149125, the *Cube* of 285.

```
2  8   5
:  :   :
21952 = a a a
 11760 = 3aab
  2100 = 3bba
   b25 = bbb
23149125
```

And after the ſame manner you muſt proceed on, let the Number to be *cubed* be never ſo large.

And this Method of the Compoſition of a *Cube Number*, being well underſtood, the Extraction of the *Cube Root* will be very eaſy and intelligible by the following Directions.

Suppoſe you were to extract the *Cube Root* out of this Number 23149125:

1. Beginning at the Right-hand, make a Prick or Point over the firſt Figure 5, and then over every third Figure afterwards; as many Points as there are, ſo many Figures will you have in your Root.

2. Find that *Cubick Number* which is next leſs than 23 (the firſt Part of the given *Cube*) which is 8, and place its *Cube Root* 2 in the Quotient; then write down 8 under, and ſubſtract it from 23, and to the Remainder bring down the next *Cube* 149; ſo will 15149 be the *Reſolvend*. And thus have you found *a* the firſt Member of the Root, which is 2 or 200; you muſt next try to find *b*, (that is) ſuch a Number, as that 3*aab*, 3*abb*, and *bbb* added all together, ſhall not be greater than 15149 the *Reſolvend*, for from that Number it muſt be ſubſtracted. Since therefore *a* = 2, 3 times *aa* will 12, which write down as you ſee; and multiplying *a* alſo by 3, it produces 6, which ſet down under the Former in the order as you ſee. Add the two laſt Numbers together, and they make 126, which is to be called a *Diviſor*, and is to divide all the *Reſolvend* except the laſt Figure on the Right-Hand: Enquire therefore how often you can have 126 in 1514, and though you can have it 9 times and more, yet 9 times will be too much, as you may ſoon find if you multiply 9, which is *b*, according to the Conditions above mentioned; let therefore the Figure to be placed in the Quotient be 8 = *b*, then, by 8 multiplying 3*aa*, I find the Product to be 96, which I write down under the *Reſolvend* as you ſee: Alſo ſquaring 8, I multiply it by 3*a* or 6, and the Product, which is 384, I write down alſo under 96; and then *cubing* 8, I write 512 under the former Numbers, only one Place more to the Right-hand; and adding all together they make 13952, which ſubſtracted from the *Reſolvend* 15149, leaves 1197; to which bringing down the laſt *Cube* 125, you have 1197125 for a new *Reſolvend*: Then for a new *Diviſor* tripple *a* or 28, and it makes 84 = 3*a*, which place under the *Reſolvend* one Place backward to the Left-hand: Tripple alſo the Square of *a* or 28, and the Product 2352 = 3*aa* write under the laſt Number 84, a Place yet more backward to the Left-hand, as you ſee. Add the two laſt Products together for a new *Diviſor*, and write it on the Left-hand of the laſt *Reſolvend*; and ſince on trial you will find it may be had 5 times in the *Reſolvend*, place 5 in the Quotient after 28, then *cube* 5 and write it under the *Reſolvend*: Alſo ſquare 5, and multiply that Square by 3 times 28, it makes 2100, which write down under 125, only a Place backward to the Left-hand, as you ſee; then multiply 3 times the Square of 28 by 5, and the Product (which is 11760) ſubſcribe (after the ſame manner) under 2100. Laſtly, add the 3 laſt found Numbers together, and you will find their Sum to be 1197125, which is exactly the *Reſolvend*; and ſo the Work is over, and 285 the true *Cube Root* of the given Number 23149125.

```
.  .  .
23149125 (28
  8  aaa
  ---
15249 Reſolvend
  12 = 3aa
   6 = 3a
  ---
 126 Diviſor.
```

```
126) 15149 (8
     ---
  96 = 3aab
 384 = 3bba
 512 = bbb
 ---
 13952
 ---
1197125 Ref.
---
(84 = 3a
2352 = 3a a
---
 23604 Div.
---
---
 a b
23604) 1197125 (285
   125 = bbb
  2100 = 3abb
 11760 = 3aab
 ---
1197125
---
   0
```

If the Number be not an exact *Cube*, you muſt add to the laſt Remainder as many times 3 Cyphers as you deſign Decimal Places in the Root, and ſo proceed as before.

CUBIFORME: See *Cuboides*.

CUBIT, or the *Ulna*, in Anatomy is a long hard Bone with a Cavity in its Middle, and lies on the Inſide of the Arm, reaching from the El-

bow to the Wriſt; but ſome make it to conſiſt of two Bones, the one called the *Ulna*, and the other *Radius*.

CUBITÆUS *Internus & externus*, are Muſcles of the Wriſt, the one ſerves to bend, the other to extend it.

CUBITÆUS *Externus*, is one of the Extenders of the Wriſt, ariſing from the External Knob of the *Os humeri*, and is inſerted in the upper and external Part of the *Os metacarpi* of the little Finger.

CUBITÆUS *Internus*, is one of the Benders of the Wriſt, ſprings from the inner Extuberance of the *Os humeri*, and paſſing along the *Ulna*, ends in the fourth Bone of the *Carpus*, and the *Os metacarpi* of the little Finger.

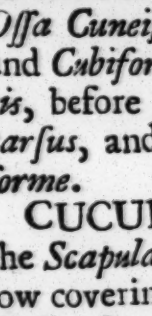
CUBITAL *Muſcle*: See *Anconæus*.

CUBO-*Cube*, the ſixth Power of any Number or Quantity.

CUBOIDES, is the ſeventh Bone of the *Tarſus* of the Foot; it lies in the ſame Rank with the *Oſſa Cuneiformia*: It is called alſo *Grandinoſum* and *Cubiforme*; behind 'tis joined to the *Os Calcis*, before to the two outer Bones of the *Metatarſus*, and on its inſide it is joined to the *Os Cuneiforme*.

CUCULLARIS, and *Trapezius*, is a Muſcle of the *Scapula*, ſo named, becauſe this with its Fellow covering the Back, repreſents a Cowl. It ariſes Fleſhy from the *Os Occipitis*, Tendinous from the *Ligamentum Colli*, and *Apex* of the Spine of the laſt *Vertebra* of the Neck, and eight ſuperior of the *Thorax*; from which broad Origination becoming Thick and Fleſhy, it's ſo inſerted to the *Clavicula*, and Tendinous to the *Spina Scapulæ*. Each Muſcle is Triangular, and both conjointly compoſe a Lozenge or *Trapezium*, whoſe large Diameter extends from the *Occiput* to the 15th *Vertebræ*; the ſhorter from near the Extremity of the *Spina Scapulæ* on one Side to that of the other. They contain a triple Series of Fibres, the Middle paſſing directly tranſverſe from the firſt *Vertebra* of the *Thorax*: Thoſe above deſcend, and thoſe beneath aſcend to their Inſertion, whereby the *Scapula* is variouſly moved according to their Directions, either obliquely upward, directly back, or obliquely down wards.

CUCUPHA, a Medicine for the Head, made of Odoriferous and Cephalick Spices beat to Powder, and ſtitched between two Pieces of Silk, or elſe ſewed within a Cap, and worn upon the Head againſt *Catarrhs* and other Diſeaſes of the Head. *Blanchard*.



CUCURBITE; ſo the Chymiſts call a Glaſs, Earthen or Copper Body of this Shape, becauſe it ſomething reſembles a Gourd. This Veſſel, with its *Head*, is moſt commonly uſed in Diſtillations or Rectifications. They call it uſually a *Body*.

CUCURBITINI *Lumbrici*, are broad Worms that breed in the Inteſtines, like the Seed of a Gourd.

CUCURBITULA, or *Cucurbita*, a *Cupping-Glaſs*, is a wide hollow Veſſel made of Glaſs or Tin, which is applied to the Body with Scarification or without it, to divert, to drive the Blood into the other Part, or to drive it out: If it be applied without Scarification, it is called *Cucurbita Cæca* and *Ventoſa*. *Cupping-Glaſſes* are applied to the more Fleſhy Parts, where the large Veſſels and Nerves cannot be hurt. The Drawing, which is performed by theſe Glaſſes, is done thus; After the Skin is ſcarify'd, the Air in the *Cupping-Glaſſes* is rarify'd and dilated by the Flame of the Tow that is fired within it, which, after it is cooled and condenſed, takes up leſs room than before; ſo that the External Air preſſing upon the Fleſh without, forces the Blood into the Glaſs. There are two ſorts of *Cupping-Glaſſes*, ſays *Celſus*, one of Braſs, and the other of Horn; the Former is open on one Part, and ſhut on the other; the Latter is equally open on one Part, on the other has a little Hole: Burning Tow is thrown into the Brazen one, and ſo its Mouth apply'd and forc'd upon the Body till it ſticks. That of Horn is apply'd ſingly by it ſelf, and by a violent ſucking at the little Hole, which muſt preſently be ſtopp'd up cloſe with Wax, it ſticks as faſt the other; but if other things fail, then a little Cup or Goblet with a ſtreight Mouth may be very fitly apply'd to the ſame Effect: After it has ſtuck, if the Skin be ſcarify'd before with a Pen-knife, it draws out the Blood; if it be whole and entire, it draws out the Flatulent Matter; therefore, where the Matter within is hurtful and offenſive, it muſt be apply'd the former Way; where there is an Inflammation, the Latter. The *Egyptians* at this Day uſe thoſe of Horn, as appears from *Proſper Alpinus*. *Blanchard*.

Now in *England* we commonly uſe *Cupping-Glaſſes* without Fire, which are evacuated by a ſmall Syringe which works like an Air-Pump; and for Scarification they have an Engine that doth it all at once with great Safety and very little Pain; and this was the Invention of the Ingenious Mr. *Hawksbee* in *Wine-Office Court* in *Fleetſtreet*, who makes the beſt Air-Pumps, and all Pneumatick Engines that ever I ſaw.

CUDDY, in a firſt Rate Man of War, is a Place lying between the Quarter-Deck and the Captain Lieutenant's Cabbin under the Poop, which is divided into Partitions for the Maſter and the Secretary's Officers.

CUI *ante Divortium*, is a Writ that a Woman divorced from her Husband, hath to recover Lands or Tenements from him, to whom her Husband did alienate them during the Marriage, becauſe ſhe could not gainſay it.

CUI *in Vita*, is a Writ of Entry that a Widow hath againſt him to whom her Husband aliened her Lands and Tenements in his Life-time; which muſt contain in it, That during his Life-time ſhe could not withſtand it.

CULMIFEROUS *Plants*, (ſee *Plants*, *N.* 23.) are by the *Botaniſts* accounted ſuch as have a ſmooth jointed Stalk, and uſually hollow; and at each Joint the Stalk is wrap'd about with ſingle, narrow, long, ſharp pointed Leaves, and their Seeds are contained in chaffy Husks.

CULMIFEROUS *Plants*, are of two kinds, either having, 1. a greater, or 2. a ſmaller Grain or Seed.

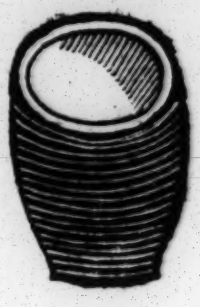
CULMIFEROUS *Plants*, with a greater or larger Seed or Grain, are ſuch as are called *Frumentaceous* and *Cereales*, becauſe their Seeds are uſed for Food; as for Bread, Beer, Broth, &c. Theſe they call the *Frumenta*, and are

Spicata,

Earth, and ſo tempered and baked as to endure the greateſt Fire. They are uſed to melt Metals, to flux Minerals, Oars, &c. and are of this Figure.

A *French Crucible.*

A *German Crucible.*



CRUDITY, in Diſeaſes, is when the Blood (as in continued *Fevers*) is not yet duly fermented and brought to a right Conſiſtence. *Crudity* of the Stomach, is when Meat, out of a Defect of Nouriſhment, or ſome other Cauſe, is not rightly fermented and turned into Chyle; and it is Threefold, *Apepſia*, *Bradypepſia*, and *Dyſpepſia*, of which in their proper Places. *Blanchard.*

CRUOR, Blood: See *Sanguis*. *Helmont* makes a Diſtinction betwixt *Sanguis* and *Cruor*; the Former whereof, he ſays, *is the Blood in the Arteries*, the Latter, *that in the Veins*.

CRURA, are the two Heads or Beginnings of the marrowy Subſtance of the Brain, called *Medulla Oblongata*.

CRURA *Medulla Oblongata*, the Internal Subſtance of the two Sides of the *Cerebrum*, gathered together as it were into two Bundles.

CRURAL *Artery*, by ſome ſaid to be the Artery of the Thigh, among whoſe Muſcles it divideth it ſelf: It is a Continuation of the *Iliack Artery*, which paſſing out of the Abdomen, and entring into the Thighs, it loſes its former Name, and is called *Cruralis*. Beſides ſome leſs remarkable Branches, before it come to the Ham, it ſends forth the External and Internal *Muſcle*; under the Ham it produces the Two *Poplitæa's*, and ſomewhat lower the *Surales*. Afterwards the Trunk it ſelf is divided into the Branches called *Anterior* and *Poſterior*; and the laſt of theſe is alſo ſubdivided into two ſmaller Branches which deſcend to the Foot.

CRURAL *Vein*; the Blood is conveyed from the lower Extremity of the Body by Six *Veins*, called, *The greater and ſmaller Iſchia*, *Muſcula*, *Poplitæa*, and *Saphœna*; which joined together, compoſe the Trunk of the *Crural Vein*, which aſcends to the Groin, and ends in the *Iliaca*.

CRUREUS, or *Femoreus*, is a Muſcle of the Leg, ſo called from its Situation on the Bone of the Thigh, like the *Muſculus Branchiæus*, on that of the Arm; its Origination is large and fleſhy, being continued from between the greater and leſs *Trochanter* of the Thigh Bone forwards to its lower Part; that is, immediately above its Inferior *Appendix*. Its Fleſhy Fibres deſcend directly, and become perfectly Tendinous a little below the upper Part of the Tendon of the *Rectus*, where it joins with it, and the Tendons of the *Vaſtus Externus* and *Internus*, which paſſes over the external Part of the *Patella*, (or on each Side of it) and is inſerted to a Prominence at the Superior and Fore-Part of the *Tibia*; it helps to extend the *Tibia*.

CRUS, or *Magnus Pes*, is all that Part of the Body which reaches from the Buttocks down to the End of the Toes; and it is divided into the Thigh, Leg and Foot. *Blanchard.*

CRUSTA *Lactea*, is a Species of *Achor*, Scurf, or cruſty Scab, only with this Difference, that an *Achor* infects only the Head, but this not only the Face, but almoſt the whole Body of an Infant at the time of its firſt Sucking. *Blanchard. Cruſta Lactea* turns white, but *Achors* have only one Colour.

CRUSTACEOUS Shell-Fiſhes, are ſuch as Lobſters, Crabs, Craw-Fiſhes, &c. which are covered with Shells conſiſting of ſeveral Pieces, and which uſually are ſofter too than thoſe of the *Teſtaceous Shell-Fiſhes*, which are all entirely of one Piece, and uſually much harder, thicker and ſtronger than the former, as the Oyſter, Scollop, Cockle, &c.

CRUSTULA, is the ſame as *Ecchymoma* in the Eye, being a Deſcent of Blood from the Arteries into the *Tunica Conjunctiva*, occaſioned by a Wound, Stroak, &c.

CRYMODES, is a cold ſhivering Fever, but many Times accompanied with an Inflammation of the inner Parts. *Blanchard.*

CRYSORCHIS, is an abſconding of the Teſticles in the Belly. *Blanchard.*

CRYSTALLINUS *Humor Oculi*, called alſo *Glacialis*, the Cryſtalline Humour of the Eye, lies immediately next to the Aqueous, within the opening of the *Tunica Uvea*; like a Glaſs put over a Hole, it collects and refracts the Rays which ſtrike upon it from all Parts: Its Subſtance is like Glue or the Gum of a Tree, very pellucid, and of a Conſiſtence like melting Wax, which, though it be preſs'd, does not eaſily yield and ſeparate. In Men it is ſhaped like a *Lens* or Convex Glaſs, which riſes thicker in the Middle than at the Edges: This Humour is the leaſt of all three, but is much more ſolid than any of them, and is cloathed with a ſmall Membrane of its own called *Aranea*, by reaſon of its Thinneſs, like to a Spider's Web.

CRYSTALLOIDES *Tunica*, the ſame with *Aranea Tunica*.

CUBATURE, in Geometry, is finding exactly the ſolid Content of any propoſed Body; as the *Quadrature* of a Surface is finding the Area of that Surface. There is a little Book lately written by one *Fantit* a *Frenchman*, entituled, *De la Cubature de la Sphere*, in which, with great Aſſurance, he pretends to find Geometrically the Solid Content of any Portion of a Sphere; but how little the Succeſs anſwers the Boldneſs of the Title, I leave the Reader to judge.

CUBBRIDGE-HEADS; ſo ſometimes are the *Bulk-Heads* of the *Fore-Caſtle* and the *Half Decks* called; the one the *Cubbridge-Head before*, the other the *Cubbridge-Head behind*.

CUBE, is a ſolid Body of ſix equal Sides, which are all Squares; 'tis one of the five regular Bodies, and its Content is found by multiplying any one Side or Face by the Height: See a Table of the different Weight of a Cubick Inch and Foot of ſeveral Bodies under the Word *Weight*.

CUBICAL *Artery*, by ſome is ſaid to be a Branch of the *Axillary*.

CUBICK *Equations*, in *Algebra*, are such whose highest Power consists of three Dimensions, or is a *Cubical Quantity*; as $aaa - 3bba = 2ccc$, where the highest Power of a the unknown Quantity, is a *Cube*.

Our excellent *Harriot* shews the Original of all such kind of Equations, to be either from the continual Multiplication of three Lateral or Simple Equations into one another, after they are first reduced to the Form of Binominals; or else by multiplying a Lateral Equation into a Quadratick; by both which Ways the same Quantity will be produced, as in this Example.

Let $a+b=o$, $a+b=o$, $a+b=o$ } by multiplying of which continually, you will produce the following Quantity, *viz.* $aaa + baa + bca + caa - bda - daa - cda - bcd = o$; which is an Original *Cubick Equation*, as he calls it. And by this Means he shews, That every *Cubick* hath, either Real or Imaginary, three Roots, sometimes all Affirmative, sometimes all Negative, or some Affirmative and some Negative: Of this see more in *Harriot* himself, or in Dr. *Wallis*'s *Algebra*, where he gives a large Account of this Method.

As to the Solution of *Cubick Equations*, though *Harriot*, *Des Cartes*, and others, have given very good Rules, yet no Body hath deduced so easy, natural and demonstrative a Method for it, as the profound Dr. *Wallis* in his *Algebra*, Chap. 46. which he tells us he did in the Year 1647, and is as followeth.

Since *Oughtred* proves, *Ch.* 18. *Art.* 15. of his *Clavis*: That $Zc = Z + 3ÆZ$, and $Xc = Z - 3ÆX$, they may be reduced thus, $Zc - 3ÆZ = Z$, and $Xc + 3ÆX = {}^cZ$: And then he found that $3AE$ was the triple Rectangle of the two Quantities A and E, whose Sum is Z, and ${}^cZ$ the Absolute Number was the Sum of their *Cubes* in the Former, but X the Difference of them, and ${}^cX$ the Difference of their *Cubes* in the Latter. And he found also, that all *Cubick Equations* might be reduced to one of these two Forms, for as for these two, $Zc - 3ÆZ = -Z$, and $Xc + 3ÆX = -Xc$, where ${}^cZ$ and ${}^cX$ are Negative Quantities, they only differ from the Former, in which they are Affirmative, in this, that here X and Z will be Negative Quantities, whereas there they will be Positive.

So that all *Cubick Equations* being reducible to these two Forms, the only Difficulty remaining is this, *Having the Rectangle of two Quantities, with the Sum or Difference of their Cubes, to find the Quantities themselves*, and consequently, *their Sum and Difference*.

Which is performed by resolving a Quadratick Equation of a solid Root (or one whose Root is a *Cube* or some higher Power.)

For $\frac{Æ}{A} = E$, $\frac{Æc}{Ac} = Ec$. $Ac + \frac{Æc}{Ac} = Ac + Ec = {}^cZ$, and so $\frac{Æ}{E} = A$ $\frac{Æc}{Ec} = Ac$, and $\frac{Æc}{Ec} + Ec = Ac + Ec = {}^cZ$, wherefore (multiplying by Ac or Ec, and then transposing the Terms) ${}^cAcc - {}^cZAc = -ÆcEcc - {}^cZEc$, whose Roots are $\frac{1}{2}{}^cZ \pm \sqrt{:\frac{1}{4}{}^cZq3 - Æc} = \frac{Ac}{Ec}$

And by the like Process it will be found, that $Ac - \frac{Æc}{Ac} = {}^cX = \frac{Æc}{Ec} - Ec$; and consequently, $Acc - {}^cXAc = Æc = Ecc + {}^cXEc$, whose Roots are $\sqrt{:\frac{1}{4}{}^cXq3 + Æc} \pm {}^cX = \frac{Ac}{Ec}$.

And then will the Sum or Difference of their *Cubick Roots* be $A + E = Z$, and $A - E = X$, the Roots sought in those *Cubick Equations*: That is, $\sqrt{c + \frac{1}{2}{}^cZ + \sqrt{:\frac{1}{4}{}^cZq3 - Æc}} + \sqrt{:C.} + \frac{1}{2}{}^cZ - \sqrt{:\frac{1}{4}{}^cZq - Æc} = A + E = Z$, $\sqrt{:C + \frac{1}{2}{}^cX + \sqrt{:\frac{1}{4}{}^cXq3 + Ec}} - \sqrt{C - \frac{1}{2}{}^cX + \sqrt{:\frac{1}{4}{}^cXq3 + Ec}} = A - E = X$.

N. B. If as we said above, the Absolute Quantity be Negative, as $-{}^cZ$, or $-{}^cX$, the Roots then will be $-A - E = -Z$, and $-A + E = -X$.

How to construct *Cubick Equations* after Mr. *Baker*'s Way by the *Parabola*, see *Construction of Equations*.

Mr. *Halley* (now our Learned Savilian Professer of *Geometry* at *Oxon*) in *Philos. Transact. N.* 190. gives a good Way to extract the Roots of all *Cubick Equations* by the Help of the Tables of Sines.

CUBICAL *Number*, is that which is produced by the Multiplication of a Square Number by its Root: Thus 64 is a *Cubick Number*, and is made by multiplying 16, the Square of 4, by the Root 4. In *Algebra* the third Power in a Series of Geometrical Proportionals continued, is called a *Cube*, as a is the Root, aa the Square, and aaa the Cube: And All *Cubick Numbers* may be ranged into the Form of *Cubes*, as 8 or 27, whose *Sides* are 2 and 3, and their *Bases* 4 and 9.

Theorem. Every true *Cubical Number* produced from a Binominal Root, consists of these Parts, *viz.* The *Cubes* of the greater and lesser Parts of the Root, and of 3 times the Square of the greater Part multiplied by the lesser, and of 3 times the Square of the lesser multiplied by the greater.

As is plain from bare Algebraical Multiplication in the following Example.

$$\begin{array}{r} aa + 2ab + bb \\ a + b \\ \hline aaa + 2aab + abb \\ \quad aab + abb + bbb \\ \hline aaa + 3aab + 3abb + bbb \end{array}$$

From whence 'tis very easy to understand both the Composition of any *Cubick Number*, and also the Reason of the Method for extracting the *Cube Root* out of any Number given.

Thus,

Spicatæ, whoſe Seed is either,

1. *Larger* and *more Oblong*, and that eaſily ſeparated from its Huſk by Pounding, or Beating, or Threſhing, as *Wheat (Triticum)* and *Rye (Secale;)* or not ſo eaſily parting with its Huſk, as *Spelt*, in Latin *Zea*, a ſort of Baſtard Wheat which grows plentifully in *Italy*, *Germany*, and *France*.

To which they add *Barley (Hordeum)* and *Rice (Oryza)* which are contained in a thicker Huſk than *Wheat* and *Rye*.

2. Whoſe Seed is cloſe and more round, as *Panick*, which is a Seed much ſown in *Germany*, and eaten by the Inhabitants.

Paniculatæ or *Jubatæ*, whoſe Seed is either
More Oblong, as *Avena Oats*; or
Roundiſh, as *Scordium* and *Milium*.
Paniculatæ and *Spicatæ ſimul*, as the *Indian Maeze*.

They reckon alſo ſome *Culmiferous Herbs* which are not *Eſculent*, or uſually eaten by Men; and theſe alſo are either
Spicatæ, as the *Phalaris (Canary Graſs)* and *Lolium*; or
Paniculatæ, as the *Lacryma Jobi*.

CULMINATE, is a Word uſed by Aſtronomical Writers, to expreſs a Star's or the Sun's being upon the Meridian, or having the greateſt Altitude that it can have that Day.

The *Culminating* of any Star, or being on the Meridian, may be found by the Globe thus;

Rectify your Globe and Hour Index, and bring the Star to the Brazen Meridian; then the Index will ſhew the Time of the Star's *Culminating*.

CULMUS, in Botanicks, is properly the Stalk of Corn or Graſs, but of no other Plant, for that is called *Caulis*.

CULVERING, a ſort of Ordnance, of which there are the *Extraordinary*, the *Ordinary*, and the *leaſt ſized Culvering*.

Culvering Extraordinary has $5\frac{1}{2}$ Inches Bore, 13 Foot long, weighing 4800 Pound Weight; its Load above 12 Pound, carries a Shot $5\frac{1}{4}$ Diameter, weighing 20 Pound Weight.

Culvering Ordinary, is a Size leſſer.

Culvering of the *leaſt Size*, is that whoſe Diameter is 5 Inches Bore, 12 Foot long, weighing about 4000 l. carries a Shot 3 Inches $\frac{3}{4}$ Diameter, weighing 14 l. 9 Ounces.

CULVERTAILE, the faſtening in of a Ship's *Carlings* into the Beam, is ſo called.

CUN, or *Cond*, a Sea Term, ſignifying to direct or guide: To *Cun* a Ship is to direct the Perſon at Helm how to ſteer her: See *Cond*.

CUNEIFORME *Os*, is a Bone ſo called from the Reſemblance which it hath to a Wedge; by the Ancients called *Multiforme*, by reaſon of the various *Proceſſes* on the Inſide and Outſide, which renders it rough and unequal: It is ſituate in the Midſt of the *Baſis* of the Brain, and is placed under it like a *Baſis*, ſo that it touches upon moſt of the Bones of the Head and the Upper Jaw. *Blanchard*.

CUNEIFORMIA *Oſſa*, are thoſe Bones of the *Tarſus* of the Foot which are accounted the Fourth, Fifth, and Sixth; and theſe are ſo called, becauſe they are large above, and narrow below, like Wedges: They link all three at the Side of one another, having their upper Part Convex, and their Lower Concave, by which means the Muſcles and Tendons in the Sole of the Foot are not hurt when we go. At one End, each hath a *Sinus* receiving *Os Naviculare*, and at the other End they are joined to the three inner Bones of the *Metatarſus*; the inmoſt of theſe Bones is the largeſt, and the middle one the leaſt.

CUNEUS, a Triangular Priſm, or a Wedge.

CUPPEL or *Coppel*, an Inſtrument in Chymiſtry in the Form of a Diſh, made of Aſhes well waſh'd (to cleanſe them from all their Salt) or of Bones throughly calcined: Its Uſe is to try and purify Gold and Silver; which is done by mingling Lead with the Metal, and ſo expoſing it in the *Coppel* to a violent Fire a great while; the Impurities of the Metal will then be carried off in Droſs, which Droſs is called *Litharge* of either Gold or Silver: 'Tis by the Refiners uſually called a *Teſt*.

CUPPING-GLASSES: See *Cucurbitula*.

CURATIO, is a right Way or Method of finding out by Symptoms and Indications proper Remedies for any Diſeaſe, in order to the Recovery of Health. *Blanchard*.

CURCULIO, the ſame with *Cion*.

CURIA *aviſare vult*, is a Deliberation that the Court intends to take upon any Point or Points of a Cauſe, before Judgment be reſolved on.

CURIA *Claudenda*, is a Writ that lieth againſt him that ſhould fence and cloſe up his Ground, if he refuſe or defer to do it.

CURIASSIERS, are Horſemen that wear Armour.

CURSITOR, is an Officer or Clerk belonging to the *Chancery*, that maketh out Original Writs: They are called alſo *Clerks of the Courſe*; and there be of theſe Twenty four in Number, which have allotted to each of them ſeveral Shires, in which they make out ſuch Original Writs, as are by the Subject required, and are a Corporation of themſelves.

CURTAIN, in Fortification, is the Front of the the Wall of a fortified Place between two *Baſtions*; or the longeſt ſtraight Line that runs about the Rampart, drawn from one Flank to the other, and bordered with a Parapat five Foot high, behind which the Souldiers ſtand to fire upon the Covert-way and into the Moat. Beſiegers ſeldom carry on their Attacks againſt the *Curtain*, becauſe 'tis the beſt flank'd of any Part.

CURTATION *of a Planet*, in Aſtronomy, according to ſome, is a little Part cut off from the Line of his Interval or Diſtance from the Sun.

CURTESY *of England*: See *Courteſy of England*.

CURVATURE, ſignifies Crookedneſs.

CURVE, the ſame with Crooked.

CURVES or *Curvilineal Figures*, are in Geometry, ſuch as are terminated or bounded by *Curved* or *Crooked Lines*: as *Circles* and *Ellipſes*; *and* all *Conick Sections*, *Spherical Triangles*, &c. are *Curves*.

CUSTODE *admittendo*, and *Cuſtode amovendo*, are Writs for the admitting or removing of Guardians.

CUSTODES *Libertatis Angliæ authoritate Parliamenti*, was the Stile wherein Writs and other Judicial Proceedings did run during the late Times of Trouble, *viz.* from the Murther of King *Charles* the Firſt, till the Uſurpation by *Cromwell*, mentioned

tioned and declared traiterous by the *Stat.* 12. *Car.* 2. *Cap.* 3.

CUSTOM, is (both by Common Lawyers and Civilians, taken to be) a Law or Right not committed to Writing, but eſtabliſhed by long uſe, and by the Conſent of our Anceſtors hath been, and is daily practiſed; and 'tis either *General* or *Particular*: A *General Cuſtom*, is that which is allowed through all *England*. *Particular Cuſtom* is that which belongeth to this or that County, or to this or that Lordſhip, Town, or City.

CUSTOMS *and Services*, or *Conſuetudinibus & Servitiis*, is a Writ of Right cloſe, which lieth againſt the Tenant that deforceth his Lord of the Rent or Service due to him: Of this ſee more at large in the *Old Nat. Brev.* Fol. 77.

CUSTOS *Brevium*, a Clerk belonging to the Court of *Common-Pleas*, whoſe Office is to receive and keep all the Writs, and put them upon Files, every Return by it ſelf; and at the End of every Term, to receive of the *Protonotaries* all the Records of the *Niſi prius*, called the *Poſtea*.

CUSTOS *Placitorum Coronæ*, ſeems to be the ſame with *Cuſtos Rotulorum*.

CUSTOS *Rotulorum*, is he that hath the Cuſtody of the Rolls, or Records of the Seſſions of Peace; and as ſome ſay, of the Commiſſions of Peace it ſelf: He is always a Juſtice of Peace and *Quorum* in the County where he hath his Office.

CUSTOS *Spiritualium*, or *Cuſtos of the Spiritualities*, is he that exerciſeth Spiritual or Eccleſiaſtical Juriſdiction in any Dioceſe during the Vacancy of the See, which, by the Canon-Law, belongs to the Dean and Chapter, but at preſent with us in *England*, to the Archbiſhop of the Province by Preſcription: Howbeit, divers Deans and Chapters do challenge this by ancient Charters from the Kings of this Land.

CUSTOS *Temporalium*, the Perſon to whoſe Cuſtody a vacant See was committed by the King as Supreme Lord, who as a Steward of the Goods and Profits, was to give account to the *Eſcheator*, and he into the *Exchequer*: His Truſt continued till the Vacancy was ſupplied by a Succeſſor, who obtained the King's Writ *De Reſtitutione Temporalium*, which was commonly after Conſecration, yet ſometimes before.

CUT *a Feather*; if a Ship hath too broad a Bow, they ſay ſhe will not *Cut a Feather*: that is, ſhe will not paſs through the Water ſo ſwiftly as to make it foam or froth.

CUTANEOUS *Diſtempers*, ſuch as affect the Skin, as the Itch, or Scab, *&c.*

CUTANEOUS *Glands* and *Veſſels*, are ſuch as are placed or terminated in the *Cutis* or Skin.

CUTICLE, *Scarff Skin*, is a Cover of the Skin without Senſe, extended outwardly over the whole Skin like a Membrane, full of innumerable ſmall Pores, accommodated to the avoiding of Injuries from Abroad, to the ſhutting up of the *Cutaneous Veſſels*, and to the more accurate perfecting of Tactile Qualities: It is nouriſhed by the Blood; for if it be loſt or periſhed, it comes again, though its Veſſels be but little conſpicuous. *Blanchard.*

Mr. *Luenhoeck* found by his Miſcroſcope, that the *Cuticula* conſiſted of an infinite Quantity of very ſmall Scales, ſo minute, that a ſmall Grain of Sand would cover near 200 of them; ſo that he thinks there are no proper Pores in the Skin, but that the Moiſture comes out under or from between the Scales.

CUTIS, is the Skin of a living Man, but *Pellis* is that which is flead off, and it is the outermoſt Cover of the whole Body, or a pretty thick Membrane wrought of ſeveral Filaments of the Veins and Arteries, Nerves and Nervous Fibres, complicated and interwoven with one another, full of Glandules and Lympheducts, or Veſſels that convey away the Vapours and Sweat, abounding with a great Number of Pores here and there, and ſenſibly perforated in many Places to let in and out, as occaſion requires; as at the Mouth, Noſtrils, Eyes, Ears, Privities, Fundament, *&c.* it is thickeſt of all upon the Head, moderately hard in the Neck and Back, finer in the Face, *Penis*, and outer Skin of the *Scrotum*; thin on the Sides, and thinneſt of all on the Lips; in ſome Places, as the Elbow, Forehead, Soles of the Feet, it ſticks very cloſe together. *Blanchard.*

CUTT-BASTION: See *Baſtion.*

CUTT-WATER, the Sharpneſs of the Head of a Ship below the Beak; 'tis ſo called becauſe it cuts or divides the Water before it comes to the Bow: This is called alſo the *Knee of the Head.*

CUVETTE, in Fortification, is a deeper Trench about four Fathom broad, which is uſually ſunk in the Middle of the great dry Ditch till you meet with Water, and ſerves both to prevent the Beſiegers Mining, and alſo the better to keep off the Enemy.

CYCLE, is a continual Revolution of certain Numbers, which ſucceſſively go on without any Interruption from the Firſt to the Laſt, and then return again to the Firſt, and ſo circulate perpetually. In the Calendar there are three principal *Cycles*, *viz.* the *Solar*, the *Lunar*, and the *Cycle of Indiction.*

CYCLE *of the Sun*, is a Revolution of 28 Years, in which time the ſame Dominical Letter comes about again in the ſame Order, and Leap-Years expire, and the 29th Year the *Cycle* begins again: This *Cycle* ſerves to find the Dominical Letter for any Year paſt, preſent, or to come.

To find the Cycle of the Sun.

Rule. To the Year add 9, and divide the Sum by 28, the Remainder is the *Cycle of the Sun.*

Example.

To 1701 add 9, the Sum 1710 divided by 28, the the Reſidue 2 is the *Cycle of the Sun.*

CYCLE *of the Moon*, is a Revolution of 19 Years, in which time the New Moons return to the ſame Days they were on before, and ſhe begins again her Courſe with the Sun. This was invented by *Meton* the *Athenian*, and is called the *Golden Number.* That which occaſioned probably the pitching upon this Number, was their Obſervations that the *Lunar* Eclipſes happen nearly again on the ſame Day of the Month 19 Years after the former; of which 'tis eaſy to give many modern Inſtances. *Enneadecaterides* is with ſome the Name of this *Lunar Cycle.*

CYCLE *of Indiction*, is a Revolution of three *Luſtrums* or fifteen Years, after which thoſe who uſed it began it again. This is more ancient than the precedent ones, and hath nothing to do with

with the Heavenly Motions, being eſtabliſhed by *Conſtantine*, *A. D.* 312. *Sept.* 24. who ſubſtituted them in the room of the *Olympiads*: They were ſo called, according to ſome Authors, becauſe they denoted the Year that Tribute was to be paid to the Republick. To find this *Indiction*, ſubſtract 312 from the Year given, and divide the Remainder by 15, and omitting the Quotient, what remains is the Year of the *Roman Indiction*.

Example, A.D. 1700
312

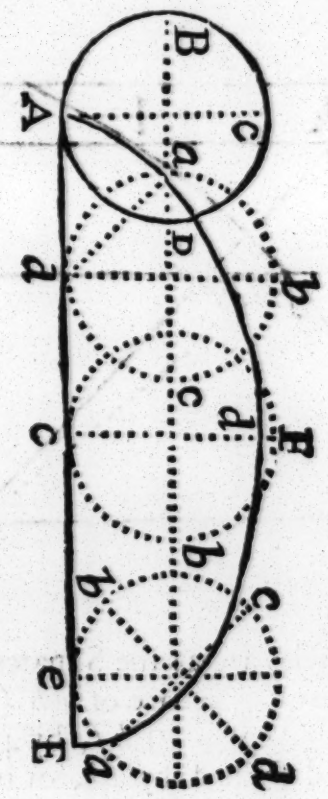
15) 1388 (92
135

38

8 = *Indiction.*

CYCLISCI, are Surgeons Inſtruments, wherewith they ſcrape away corrupt Fleſh, or the like: they are made in the Form of an Half-Moon.

CYCLOID: If on a Right Line, as *AE*, a Wheel or Circle be imagined to make one entire Revolution, or to move till the Point *A* come to touch the Line again at *E*: The Circle will deſcribe the Line *AE*, equal to its Periphery; and the Point

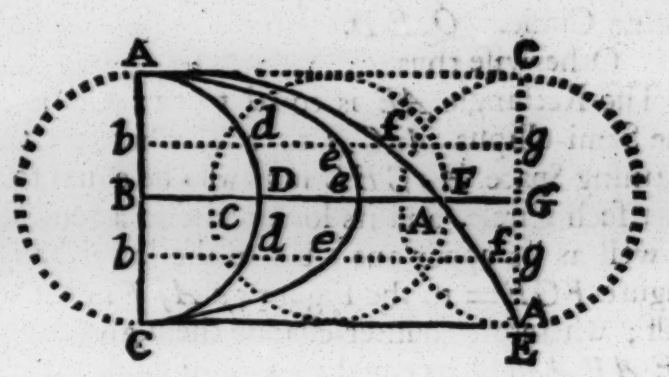


A will deſcribe a Curve Line *A a FE*, which is called a *Cycloid* or *Trochoid*, and the Space contained within this Curve and the Subtenſe *AE* is called the *Cycloidal Space*.

From the Conſideration of which Geneſis, 'tis very plain, that the Point *a* which deſcribes the Curve, will every where be diſtant from *d* the Point of Contact, by ſuch a Part of the Circle as is the Diſtance of that Point of Contact from *A*, the Beginning of the Line. Thus, when *Ad* is a Fourth Part of the whole Subtenſe, then will *da* be a Quadrant of the Generating Circle; when *Ac* is half that Line, then the Ark *a c* is a Semi-circle, &c. So likewiſe at the other End, when the Ark *a c* is an Octant, *eE* will be an Eighth Part of the Line *AE*.

Propoſition.

Any Semi-ordinate in the Cycloid *(or the Right Line* B F, *or* b f*) is equal to its correſponding Right Sine in the Generating Circle, (as* BD, b d*) together with the Arch of that Sine,* AD, *or* a d.



This is proved from the Conſideration of the Manner of the Generation of the *Cycloid* above delivered: For ſince the Right Line *CE* is equal to the Semi-circular Ark *ADC*, the Right Line *DF* muſt be equal to the Quadrantal Ark *AD*; for the ſeveral Arks of the moving Circle do every where generate Right Lines equal to themſelves; wherefore any Semi-ordinate drawn to the Curve of the *Cycloid* muſt be compounded of *df* or *DF*, *viz.* a Right Line equal to the Part of the Ark that hath revolved, and of *b d* and *BD* the Right Sine of that Ark in the Generating Circle. *Q. E. D.*

Corollaries.

1. Hence 'tis plain, that by means of the *Cycloid* a Right Line may moſt eaſily be found equal to any given Ark of a Circle, or to its whole Circumference; and conſequently the Quadrature of the Circle may Geometrically be had, if this *Cycloid* be a true Geometrical Curve, as indeed it is not.

2. If you ſuppoſe *de*, *De*, and *de* to be every where drawn equal to the Right Lines *bd*, *BD*, and *bd*; the Curve Line connecting their Extremities will be an Ellipſis (*by a* Propoſ. *which you will find under the Word* Elliptical Space) for the whole Aggregate of all theſe Right Lines, or the Elliptical Space will be double of the Semi-circular one; *i. e.* as *B e* is to *BB*; and conſequently the Curvilineal Space *Ae CDA* will be equal to the Semi-circular Space *ADCA*.

3. *DF* (*i. e. De* + *eF*) = Quadrant *DA*, wherefore ſince the Whole *BG* = to a Semi-circle, the Remainder *BD* + *FG* muſt alſo be equal to a Quadrant; but *BD* = *De* (by *Cor.* 2.) wherefore *eF* will be equal to *FG*; and the ſame Way of arguing will always prove *ef* above, equal to *fg* below, wherefore all the Indiviſibles in each being equal, the Space *ee Af F* will be equal to the Space *FGE*. Hence,

4. *'Tis plain, that the Cycloidal Space is always triple of the Generating Circle.*

For the Rectangle *BCEG* is equal to the whole Circle (becauſe on one Side is the Radius, and the other the Semi-circumference,) that is, is equal to the Semi-ellipſis *Ae CDA*; wherefore, if out of it you take the Quadrant of the Ellipſis *B e e CB*, what remains, which is the *Trapezium Ce GEC*, muſt be equal to the other Quadrant of the Ellipſis, or to the Semi-circle. But it was proved in *Cor.* 3. That the Trilinear Space *FGE* was equal

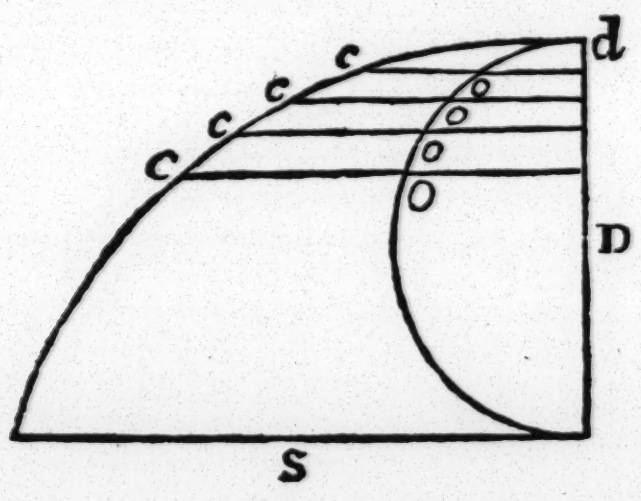
to *e e A f* F; wherefore the Trilinear Figure *A f F E C A* muſt alſo be equal to the Semi-circle; and conſequently the whole *Semi-cycloidal* Space *A F E C A* muſt be equal to three Semi-circles, and therefore the whole Cycloidal Space triple of the Generating Circle. *Q. E D.*

Otherwiſe thus;

The Rectangle *AE* is equal to two Circles, and the Semi-ellipſis *AeCA* to one, wherefore the remaining Space *AeCEC* muſt alſo be equal to another ſuch Circle, and its lower half to a Semi-circle, as well as its upper one; but in the lower half, the Figure *FGE* = to the Figure *e e A f F* in the upper half; wherefore counter-change them, and the Space *CE A F A* muſt be equal to a Semi-circle, and conſequently the Semi-cycloidal Space equal to three Semi-circles. *Q. E. D.*

The following *Demonſtration* of the ſame *Propoſition* I had from Mr. *Humphry Ditton*, who is very skilful in Things of this Nature: 'Tis very ſhort and plain, and depends on the Arithmetick of Infinites. Thus,

The Figure is a *Semi-cycloid*, where the Arks *d o*, *d o*, *d O*, &c. are ſuppoſed to be in Arithmetical Proportions, and conſequently ſo will the Lines *c o*, *c o*, *CO*, &c. which from the Nature of the *Cycloid* are all equal ſeverally to thoſe Arks: Now theſe being a Series of Arithmetical Proportions, will be to as many equal to the greateſt, as 1 to



2 (by *Prop.* 2. of Dr. *Wallis*'s *Arith. Infinit.*) wherefore the Space *C d O S* = $\frac{1}{2}$ *S D*, but $\frac{1}{2}$ *S D* = to the whole Circle; wherefore the whole Cycloidal Space *C D S* muſt be equal to three Semi-circles. *Q. E. D.*

The *Linea Celerrimi Deſcenſus*, as 'tis called, or the Curve which any heavy Body would deſcribe, ſuppoſing it to deſcend with the greateſt poſſible Swiftneſs, is *the Ark of a Cycloid.* This *John Bernoulli*, I think, firſt propoſed, as a *Problem* to be diſcovered, and it hath often been ſolved, but very briefly and eaſily by Mr. *John Craig*, in *Philoſ. Tranſact. N.* 268. In the *Acta Eruditorum Lipſ.* for *May* 1690, *p* 217. there is a Method of Inveſtigation for this Line by *James Bernoulli.*

CYEMA, the ſame with *Embryo.*

CYGNUS, the *Swan*, a Conſtellation in the Northern Hemiſphere, conſiſting of 35 Stars.

CYLINDER; the Hollow within every Piece of Ordnance, is called her *Concave Cylinder.*

CYLINDER, is a Solid Body, made by the Rotation of a Rectangled Parallelogram about one of its Sides.

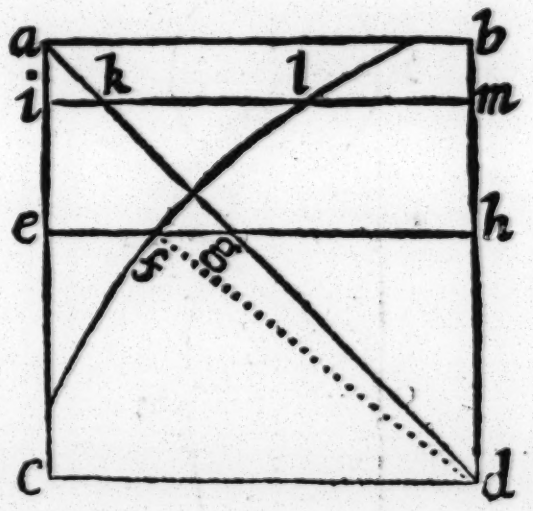
1. Since every *Cylinder* hath a Circle for its Baſe, it will be very proper to denote its Baſe thus, $\frac{1}{4}$ *r d d* (the Reaſon of which you have under *Circle:*) And then, if the Altitude of the *Cylinder* be called *h* (*i. e.* its height) the Solidity of the *Cylinder* will be expreſſed thus, $\frac{1}{4}$ *r d d h.*

2. If therefore the Altitudes of any two *Cylinders* be equal to the Diameters of their Baſes, *ſuch Cylinders muſt be to one another, as the Cubes of their Diameters or Altitudes*; for here, *h* the Height being the ſame with *d*, the Diameters of the Circle of the Baſe. If in one *Cylinder* it be called *d*, and in the other *D*, the Solidity of the former will be $\frac{1}{4}$ *r d d d*, and of the latter $\frac{1}{4}$ *r D D D*; but doubtleſs $\frac{1}{4}$ *r* being a common Efficient or Multiplier: $\frac{1}{4}$ *r d d d*: $\frac{1}{4}$ *r D D D* :: *d d d*: *D D D*; that is, the *Cylinders* are as the Cubes of their Diameters. *Q. E. D.*

3. Every *Cylinder* is triple of a Cone of the ſame Baſe and Height; which ſee proved in *Proportion of Solids.*

4. Every *Cylinder* is to a Sphere inſcribed, and of the ſame Baſe and Height as 3 to 2.

If the Square and Quadrant with the Diagonal *a d*, be ſuppoſed to revolve round the Axis *b d*, the Square will generate a *Cylinder*, the Quadrant an Hemiſphere, and the Triangle *a d b* a Cone all of the ſame Baſe and Height.



And ſince Circles are as the Squares of their Diameters, and that the Square of *e h* (= □ of *df*) = □ *g h* (= □ *h d*) + □ *hf*, by 47. *e.* 1; therefore the Circle deſcribed by *eh*, or its = *c d*, muſt be equal to two Circles deſcribed by *g h*, and by *hf*: Take away then the common Circle, deſcribed by *hf* from both, and there will remain the Circle deſcribed by *g h* = to the Ring deſcribed by *ef.* And thus it will always be, that (*v. gr.*) the Circle deſcribed by *k m*, will be equal to the Annulus or Ring made by the Motion of *i l*; wherefore all the Rings made by the Revolution of *e f*, *i l*, &c. muſt be equal to all the Circles deſcrib'd by the Motion of *g h*, *m k*, &c. that is, all the Solid, compoſed of the Rings made by the Motion of the Parts of the Trilinear Figure *c f l b a*, ſhall be equal to all the Circles generated by the Elements of the Triangle *a d b*: Wherefore ſince the Cone is $\frac{1}{3}$ of the *Cylinder* on the ſame Baſe and Height, and that the Solid made by the Trilinear *c f l b a*, is alſo another third Part, as being equal to the Cone; the Hemiſphere muſt be $\frac{2}{3}$ of the *Cylinder*, and conſequently, if the Baſe and Altitude of the *Cylinder* were equal to the Diameter of the Sphere, the whole Sphere would be $\frac{2}{3}$ of the *Cylinder.*

Cor.

Cor. 1. From hence we have the Dimenſions of the Sphere and Cylinder, both as to Solidity and Surface; for let *d* be the Diameter of the *Sphere* and *Cylinder*, and *r d* the Circumference of the Baſe of the *Cylinder*; then will the whole Baſe be $\frac{1}{4} r\,d\,d$, (which alſo is the Area of a great Circle of the Sphere;) and this Baſe multiply'd by *d* the Altitude, gives $\frac{1}{4} r\,d\,d\,d$ for the Solidity of the *Cylinder*; and therefore, by this *Prop.* $\frac{2}{3}$ of that gives the Sphere (*i. e.*) $\frac{1}{6} r\,d\,d\,d$ = Solidity of the Sphere; and that laſt Quantity divided by $\frac{1}{4} d$ (one Sixth of the Diameter) gives *r d d* the Surface of the Sphere.

2. Which Surface *r d d* is manifeſtly Quadruple of $\frac{1}{4} r\,d\,d$, the Area of a great Circle of the Sphere, or the Baſe of the *Cylinder*.

3. Wherefore, by multiplying *r d* (= to the Periphery of the Baſe of the *Cylinder* by *d* the Altitude) you have *r d d* for the Curve Surface of the *Cylinder*; which therefore is equal (taken without its proper Baſes) to the Surface of the Sphere; and conſequently, adding in the Baſes (each of which is $\frac{1}{4} r\,d\,d$) the whole Surface of the *Cylinder*, Baſes and all, will be $1\frac{1}{2} r\,d\,d$, that is, to the Surface of the Sphere as 3 to 2.

4. The Square of the Diameter (*d d*): To the Area of the Circle $\frac{1}{4} r\,d\,d$:: Is as $d : \frac{1}{4} r\,d$, (for $d\,d : \frac{1}{4} d\,d :: d : \frac{1}{4} r\,d$) that is, as the Diameter to $\frac{1}{4}$ of the Circumference.

5. Becauſe the Solidity of the *Cylinder* is $\frac{1}{4} r\,d\,d\,d$, therefore the Cone of the ſame Baſe and Height will be $\frac{1}{12} r\,d\,d\,d$, which is plainly the Difference between $\frac{1}{4} r\,d\,d\,d$ and $\frac{1}{6} r\,d\,d\,d$, the Solidity of the *Cylinder* and *Sphere*; ſo that *the Cone is equal to the Exceſs of the Cylinder above the Sphere*; and the *Cone*, *Sphere* and *Cylinder* are as 3, 2 and 1; ſo that the Sphere is two Thirds of the *Cylinder*. See this laſt proved much ſhorter under the Word *Indiviſibles*.

If you conſider a *Cylinder*, as compoſed of an infinite Number of *Cylindrical Surfaces* decreaſing (as the Circles of the Baſe on which they ſtand) in Arithmetical Progreſſion; if you call the outermoſt or greateſt Surface *S*, and the Radius of the Baſe *r*, the Solidity of the *Cylinder* will be expreſſed by $\frac{1}{2} r\,S$: And it will be diverting to meaſure a *Cylinder* by both of theſe different Ways, in order to ſee how nearly they will agree.

CYLINDROID, a ſolid Figure with Elliptical Baſes parallel and alike ſituated.

CYLINDRUS, is a Plaiſter made oblong, which ſome Phyſicians call *Magdaleo*. *Blanchard.*

CYLLOSIS: See *Cyllum.*

CYLLUM, ſignifies a Leg put out of Joint outwardly; alſo one Lame and Crooked.

CYMA, among the Botaniſts ſignifies the Top of any Plant or Herb.

CYMATIUM, a Member of Architecture, whereof one Half is Convex, and the other Concave: There are two Sorts of *Cymatiums*, *viz.* one called *Doucires* or *Right Gula*, the moſt advanced Part of which is Concave; and the other *Talon* or *Reverſed Gula*, which hath its moſt advanced Part Convex, but is hollow below, as the firſt is above.

CYMBIFORME *Os*: See *Os Naviculare.*

CYNANCHE and *Lycnanche*, ſo called becauſe it is frequently incident to Dogs and Wolves, is an Inflammation of the inner Muſcles of the *Larynx*, accompanied with a Difficulty of Breathing, and a continual Fever. *Blanchard.*

CYNANTHROPIA, is Madneſs given by a Dog, wherein the Patient flies Light, or any thing that is bright and ſplendid; fears Water, and trembles at the Sight and Remembrance of it: It proceeds uſually from a poiſonous Bite, or the like, of ſome mad Creature, as a Dog, a Wolf, *&c.* *Blanchard.*

CYNICUS *Spaſmus*, the Convulſion of the Muſcles of the Mouth, by which the Face is ſo diſtorted, that it reſembles the Countenance of a grinning Dog.

CYNODES *Orexis*, is a Canine Appetite, or an extreme Hunger join'd with Vomiting or a Looſeneſs: It ariſes from a too much or a too acid Ferment in the Stomach. *Blanchard.*

CYNODESMUS, is the Band which ties the little Skin of the Yard to the Glands.

CYNODENTES, are thoſe Teeth between the Axle-Teeth and the Grinders, called *Canini*, *Columellares*, and *Oculares*; Eye-Teeth, as we ſay. *Blanchard.*

CYNOREXIS: See *Cynodes Orexis.*

CYNOSURA, a Conſtellation conſiſting of ſeven Stars; otherwiſe called *Urſa Minor*, or the *Little Bear*, in the Tail of which is the *Polar Star.*

CYPHER, or *Nought*, thus noted (o), which put before a Figure, ſignifies nothing (except in Decimal Arithmetick, where it augments, being put before, in the ſame Proportion as when put after Integers) but after a Figure it increaſes it by Ten, and ſo onwards in Decuple Proportion, or by Tens, *ad Infinitum.*

CYPHOMA, or *Cyphoſis*, Crookedneſs of the Back.

CYPHOSIS, is the bending of the Vertebres of the Back toward the Back Parts.

CYRTOMA, is a Bunch on the Back, or a Tumor in any other Part.

CYRTOSIS, the ſame with *Cyrtoma.*

CYSTAROS, is the Gut call'd *Rectum*, the lowermoſt of all; alſo the Fundament.

CYSTICA, are Medicines uſed againſt Diſtempers in the Bladder.

CYSTICÆ *Gemelli*, a very ſmall Branch of the *Celiack* Artery diſperſed through the Gall-Bladder.

CYSTIS, is the Bladder that holds the Urine or the Gall.

CYSTIS *Choledochus*, the ſame with *Folliculus fellis.*

CYSTOTOMY, the cutting of a Bladder.

DACRYODES, are Ulcers which continually ſend forth Matter. *Blanchard.*

DACTYLE, is the Foot of a *Latin* Verſe conſiſting of three Syllables, whereof the firſt is long, and the other two ſhort; as *Carmina.*

DACTYLONOMY, is the Art of Numbring on the Fingers.

DADO, a Term in Architecture, by ſome Writers uſed for the *Dye*, which is the Part in the Middle of the Pedeſtal of a Column between its Baſe and Cornice: 'Tis of a Cubick Form, whence the Name of *Dye* is given to it.

DAILY MOTION of a Planet: See *Diurnal Motion.*

DAMAGE, is generally taken to ſignify any Hurt or Hindrance that a Man taketh in his Eſtate; but in Common Law it is Part of that the Jurors be to enquire of, paſſing for the Plaintiff or Defendant in a Civil Action, be it Perſonal or Real: For after Verdict given of the principal Cauſe, they are likewiſe asked their Conſciences (touching Coſts, which are the Charges of the Suit, called of the *Civilians*, *Expenſæ Litis*,) and Damages, which contain the Hindrances that the Plaintiff or Demandant hath ſuffered, by means of the Wrong done to him by the Defendant or Tenant.

This Word *Damage* (in Law) has two ſeveral Significations, the one *Properly* and *Generally*, the other *Strictly* and *Relatively*: *Properly*, as it is in Caſes where Damages are founded upon the Statute of 2 *H.* 4. *Cap.* 1. and 8 *H.* 6. *Cap.* 9. where Coſts are included within this Word *Damages*; for *Damage*, in its proper Signification, is ſaid *à Demendo*, when by Diminution a thing becomes worſe; and in this Senſe, Coſts of Suits are *Damages* to the Plaintiff, for by it his Subſtance is diminiſhed. But when the Plaintiff declares the Wrong done him to the *Damage* of ſuch a Sum, this is to be taken *Relatively*, for the Wrong which is paſſed before the Writ brought, and are aſſeſſed by Reaſon of the Treſpaſs aforeſaid, and cannot extend to the Coſts of Suit, which are future, and of another Nature.

DAMAGE CLEERE; *Damna Clericorum* is now aſſeſs'd by the Tenth Part in the *Common Pleas*, and the Twentieth Part in the *King's Bench* and *Exchequer*, of all *Damages* (exceeding five Marks) recovered either by Verdict, Confeſſion, or Judgment of the Court in all Actions upon the Caſe, Covenant, Treſpaſs, Battery, falſe Impriſonment, Dower, and all others wherein *Damages* are uncertain, which the Plaintiff was to pay to the *Prothonotary*, or chief Officer of that Court wherein they are recovered, before he ſhall have Execution for them. This was Originally only a Gratuity given to the *Prothonotaries*, and their Clerks, for drawing Special Writs and Pleadings, which afterwards grew to a Certainty; but now this is taken away by 17 *Car.* 2. *c.* 6. for that it was an unneceſſary Charge and Burden upon the King's Subjects.

DAMAGE *Feaſant*, in Common Law, is when Stranger's Beaſts are in another Man's Ground without Licence of the Tenant of the Ground, and there do feed, tread, and otherwiſe ſpoil the Corn, Graſs, Goods, and ſuch like; in which Caſe the Tenant, whom they *Damage*, may therefore take, diſtrain, and impound them, as well in the Night as in the Day: But in other Caſes, as for Rents and Services, and ſuch like, none may diſtrain in the Night.

DAMNATA *Terra*, is the ſame with the *Caput Mortuum* of the Chymiſts, being only the Earth or Maſs that remains in the *Retort*, &c. after all the other Principles are forced out by the Fire.

DANCETTE, a Term in Heraldry, when the Out-line of any Bordure or Ordinary is of this Shape, that is, indented in and out very largely, in which only it differs from *Indented.*

There is a bearing of a Bend called double *Dancette*; thus, he beareth *Azure*, a Bend double *Dancette Argent.*

DARKENED *Room*: See *Obſcura Camera.*

DARK *Tent*, is the Term which ſome Writers give to a Box made almoſt like a Desk with Optick Glaſſes, to take the Proſpect of any Building, Fortification, Landskip, &c. This is a Portable *Camera Obſcura*, or *Darkened Room*: See the Deſcription under *Obſcura Camera.*

DARSIS, is an Excoriation of the Skin. *Blanchard.*

DARTUS, is the ſecond or inner *Tunick* of the common Coats, which immediately cover the Teſticles; it ariſes from the *Membrana Carnoſa*, and ſeems to be Muſcular from its Power of conſtructing and wrinkling it ſelf up; it adheres to the *Tunica Vaginalis* that lies under it by many Membranous Fibres. *Ruyſch* ſaith, that it hath the *Membrana* alſo under the *Carnoſa Adipoſa.*

DASSYMA, is a ſuperficial Inequality of the inner Part of the Eye-lids, accompanied with a Redneſs. *Blanchard.*

DATA, is the Term in Mathematicks for ſuch Things or Quantities as are ſuppoſed to be given or known, in order to find out thereby other Things or Quantities which are unknown or ſought for; and *Euclid* uſes the Word *Data* (of which he hath a particular Tract) for ſuch Spaces, Lines, and Angles, as are given in Magnitude, or to which we can aſſign others equal: See *Given.*

DATIVE CASE, is the third Caſe in the Declenſion of Nouns, Pronouns, &c. and is ſo called, becauſe 'tis uſually governed by a Verb, which implies ſomething to be *given* to ſome Perſon, and the thing is put in the Accuſative Caſe, and the Perſon in the *Dative.*

DAVIS's *Quadrant*, is the common Back-Quadrant: See its Deſcription under the Word *Back-ſtaff.*

DAVIT, a Piece of Timber in a Ship, having a Notch at one End; in which, by a Strap, hangs a Block called the *Fiſh-Block*: And the Uſe of this Block is to hale up the Fluke of the Anchor, and to faſten it at the Ship's *Bow* or *Loof.* This *Davit* is ſhiftable from one Side of the Ship to the other, as Occaſion ſerves.

There is a ſmall *Davit* in the Ship's Boat, which is ſet over her Head with a Shiver, in which is brought the Buoy Rope wherewith to weigh the Anchor; and it is made faſt to the Carlings in the Boat's Row.

DAY, is either *Natural* or *Artificial*; the former is determined by the Motion of the Sun round the Earth in 24 Hours; the *Artificial* Day is the Time betwixt the Sun's Riſing and Setting; to which is oppoſed *Night*, which is the Time that the Sun is under the Horizon.

The *Natural Day* is alſo called *Civil*, becauſe it is by divers Nations reckoned divers Ways; the *Babylonians* began to account their *Day* from the Sun-riſing; the *Jews* and *Athenians* from the Sun-ſetting, whom the *Italians* follow to this Day, beginning their firſt Hour at Sun-ſet: The *Egyptians* began at Midnight, as we account our Aſtronomical Day, but the *Umbri* began at Noon.

The *Natural Day*, beginning at Noon or Midnight, is always equal; but that which is accounted from Sun-riſing or ſetting is unequal; and the *Artificial Day* is every where unequal, but juſt under the *Equinoctial Line*.

DEAD-MENS-EYES, in a Ship, are a Kind of *Blocks*, having many Holes in them, but no *Shivers*; and through them the *Lanniers* go, which make faſt the Shrowds below to the Chains. Sometimes, but rarely, the Main-Stays of a Ship are ſet taught by *Dead-Men's-Eyes* and *Lanniers*. The *Crowfeet* always do *reeve* through *Dead-Men's-Eyes*.

DEAD-RECKONING, at Sea, is that Eſtimation, Judgment, or Conjecture, which the Seamen make of the Place where a Ship is, by keeping an Account of her Way by the *Log*, by knowing the Courſe they have ſteered by the Compaſs, and by rectifying all with Allowance for *Drift*, *Lee*, *Way*, &c. according to the Ship's Trim; ſo that this Reckoning is without any Obſervation of the Sun, Moon, and Stars, and is to be rectify'd as often as any good Obſervation can be had.

DEAD-RISING, a Term in a Ship for that Part of her which lies aft between the Keel and her Floor Timbers, and next adjoining to the Stern-Poſt under the Bread-Room in a Man of War.

DEAD-WATER, is the Eddy Water juſt behind the Stern of a Ship; and if a Ship hath a great Eddy follows her Stern, they ſay *ſhe makes much Dead Water*: This is ſo called becauſe it doth not paſs away ſo ſwiftly as the Water running by her Sides doth.

DE BENE ESSE, a Term in Common Law, as when the Defendant's Depoſition or Bail is only allowed for the preſent, but after more full Examination is either to ſtand or fall.

DEBENTUR, was a Kind of Writing firſt given in the late Times of the Uſurpation to the Soldier, to ſecure the Payment of his Arrears; 'tis uſed alſo in the *Exchequer*; and in the King's Houſe *Debentures* are given uſually to the Servants, for the Payment of their Wages, Board-Wages, and the like. The Word is mentioned in the Act of Oblivion, 12 *Car.* 2. *c.* 2. and ſince the late Revolution hath been uſed in many Acts of Parliament, eſpecially in that which relates to the forfeited Eſtates in *Ireland*, out of which the Soldier's *Debentures* are appointed to be ſatisfied, 11 *W.* 3.

DEBET and *Solet*, is a Writ of Right which hath thoſe Words in it, as formal Words not to be omitted; as if a Man ſue for any thing that is now firſt of all denied, and which hath been enjoyed by himſelf and his Anceſtors before him; as for a Mill, common Paſture, &c. then both *Debet* and *Solet* muſt be uſed in the Writ of Right.

DEBILITY, is a Weakneſs of the Body proceeding from Swooning, Fainting, Hunger, Diſeaſe, or otherwiſe. *Blanchard.*

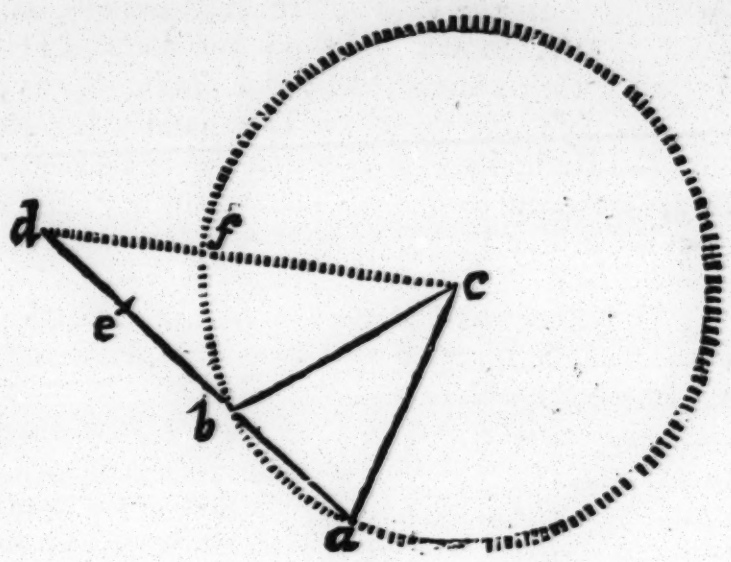
DEBITO, is a Writ that lieth where a Man oweth Money upon Obligation, or other Bargain for any thing ſold unto him.

DEBRUISED, a Term in Heraldry, when a *Pale*, &c. is born upon any Beaſt in an Eſcutcheon; for then they ſay, the *Beaſt is debruiſed of the Pale*.

DECAGON, is a plain Figure in Geometry, having 10 Sides and Angles; and if they are all equal to one another, 'tis then called a *Regular Decagon*, and it may be inſcribed in a Circle.

Propoſition.

The Side of a Regular Decagon is in Power and Length equal to the greateſt Segment of an Hexagon, cut according to Extreme and Mean Proportion. 9. *e.* 13. Euclid.



Let the Line *d b*, the Radius or Side of an *Hexagon*, cut into Extream and Mean Proportion in *e*, (*P.* 11. *e.* 2. *Euclid.*) be applied to the Circle in the Point *b*, and then produced till *b a* be the Side of a *Decagon*, or the Chord of 36°.

I ſay *b a* is equal to *b e*, and the □ *b a* = *b e*. Draw *b e*, *d c*, and *d c*.

Demonſtration.

The Angle *b c a* = 36°, and conſequently the equal ones *c b a* and *a*, each = 72°, wherefore *d b c* muſt be = 108°. Alſo ſince *d b* = *b c*, the = Angles *d* and *d c b* muſt be exact = 36°. and therefore the whole Angle *a c d* = 72°. or the Angle of a Pentagon; wherefore the △'s *a b c* and *a d c* are Similar, and conſequently *a d* : *a c* :: *a c* : *a b*, that is, *a d* : *d b* :: *d b* : *b a*; wherefore the whole Line *d a* is cut into Extream and Mean Proportion; and therefore, ſince *d b* is alſo ſo divided by the Suppoſition, the whole Line *d a* : *b d* :: as the whole Line *d b* : *b a*, but in the ſame Proportion is *b d* to *b e*; wherefore *b a* muſt be equal to *b e*, and the Power of one to the Power of the other.

A Fortification alſo conſiſting of 10 Baſtions, is ſometimes called a *Decagon*.

DECAMP, when an Army raiſes its Camp, and departs from the Place where it lay before, they ſay it is *Decamped*.

DECANT; to *Decant* a Liquor, is to pour off the clear Part of it by *Inclination*, as the Chymiſts ſpeak, that ſo it may be without any Matter or Sediment; and this Action the Chymiſts call a *Decantation*.

DECEMTALES: See *Tales*.

DECEPTIONE, is a Writ that lieth againſt him that deceitfully doth any thing in the Name of another, for one that receiveth Damage or Hurt thereby.

DECIDUOUS, is that which is apt or ready to fall, and is uſed in reference to the Flowers and Seeds of Plants: Thus the *Botaniſts* ſay, in ſome Plants the *Perianthium* or *Calyx* is *deciduous* with the Flow-

Flower, *i. e.* falls from off the Plant with it, but in others it is not.

DECIES TANTUM, is a Writ which lieth againſt a Juror which hath taken Money for the giving of his Verdict; called ſo of the Effect, becauſe it is to recover ten Times ſo much as he took.

DECIMAL *Fraction*, is that which hath for its Denominator 1. with a Cypher or Cyphers annexed; as $\frac{5}{10}$, $\frac{6}{100}$, $\frac{64}{1000}$, &c.

Which Denominator, for Brevity and Convenience ſake, is moſt commonly expreſſed by a Point or a Comma ſet on the Left-hand of the Numerator; thus, .5 is $\frac{5}{10}$. .46 is $\frac{46}{100}$. and .125 is a Hundred Twenty five Parts of any thing, ſuppoſed to be divided into 100 ſuch Parts.

N. B. As Cyphers ſet on the Right-hand of Integers do increaſe the Value of them *Decimally*, as 2, 20, 200, &c. ſo when ſet on the Left-hand of *Fractions*, they decreaſe the Value *Decimally*, as ,5. ,05. ,005. &c. but ſet on the Left-hand of Integers, or on the Right-hand of Fractions, they ſignify nothing, but only to fill up Places; thus, ,5000, or 0005. is but five Units.

1. To reduce any *Vulgar Fraction*, as ſuppoſe $\frac{5}{8}$ of a Pound, Shilling, Mile, Yard, Day, Hour, &c. to a *Decimal Fraction* of the ſame Value, whoſe Denominator ſhall be 1000; (I ſay 1000, for 10 or 100 are not large enough to do it without a Fraction.)

Say, by the *Rule of Three*, As 8 the Denominator of the *Vulgar Fraction*: Is to 5 its Numerator:: So will 1000 the Denominator aſſigned: Be to a 4th Term, which, by working, you'll find to be ,625. and therefore $\frac{625}{1000}$, or ,625. is a *Decimal* of the ſame Value with the former Fraction $\frac{5}{8}$.

2. *Addition* and *Subſtraction* of *Decimals* is performed juſt as Integers, only Care muſt be taken about duly placing each Part; as to which be ſure to place all the Points one under another, then add or ſubſtract as in common Arithmetick, diſtinguiſhing from the Sum or Remainder ſo many Figures for Decimals, as are the moſt Decimal Places in any of the given Numbers, as in the following Examples.

In *Addition*,

,73567	64,58
,705	9,7
,86	,005
,5	
2,80067	74,285

In *Subſtraction*,

From 35,5
Take 20,98679

Remains 14,51321

From 16,05
Take 10,9999

Remains 5,0501

Multiplication of Decimal Fractions.

General Rule.

'Tis no matter in what Order either Multiplicand or Multiplicator ſtand, only obſerve, *That there muſt be juſt as many Decimal Parts cut off by the ſeparating Point from the Product, as there are Decimals in both Factors:* The Work is juſt as in Integers.

Example 1. Where one *Decimal* multiplies another.

,365
,22
730
730
,08030

Here the Product is only 8030, but a Cypher is prefix'd to make up the five *Decimal* Places, there being ſo many in both Factors.

,0006	,464
,5	,9
,00030	,4176

Example 2. Where one Factor is an Integer, the other a *Decimal* Fraction.

4,64	3,65	46,4
9	22	9
41,76	730	417,6
	730	
	80,30	

Note, That when a *Decimal Fraction*, or mix'd Number, is to be multiplied by an Unit, with Cyphers annexed thereto, (as 10, 100, 1000, &c.) 'tis only removing the Separatrix ſo many Places towards the Right-hand in the Multiplicand, as there are Cyphers annexed to the Unit: Thus, if ,7652 were to be multiplied by

10	7 ,652
100	76 ,52
1000	765,2
10000	7652

The Product will be

The Reaſon of which is, becauſe there can be no more Decimals in the Product, than were in both the Factors; and the Cyphers any where on the Right-hand may be omitted, as being of no Value here.

By *Multiplication*, *Decimals* are reduced to the known Parts of ſuch Integers as they are *Decimals* of, *in this manner:* Multiply the given *Decimal* by the Number ſhewing how many known Parts of the next inferior Denomination are equal to that Integer, and purſue this as far as it will go, *v. gr.*

What is the Value of this *Decimal* ,8687; that is, ,8687 of a Day, or of a Pound Sterling, &c.

,8687 of a Day = 20 h.	,8687 of a Pound =
24 (50'. 55".	(20 17 s. 4 d. 1 q.
34748	17,3740
17374	12
20,8488	7480
60	3740
50,9280	4,4880
60	4
55,6800	1,9520

To find the Value of any Decimal of a Pound of *Engliſh* Money, there is this ready Rule in Practice: Suppoſe it were required to find the Value of ,8687 of a Pound; double the firſt Figure 8, and becauſe 6 (the next Figure) exceeds 5, add the Exceſs, which is 1, to the former Double, and 'twill make it

it 17; account thoſe for Shillings: Then imagining that 1, by which 6 exceeded 5, to be taken as 10, and to ſtand before the next Figure 8, it will make 18; from which abate 1, and the Remainder 17 is the Farthings, which make 4 *d.* 1 *q.* ſo that the Decimal was 17 *s.* 4 *d.* 1 *q.*

Alſo ,319 of a Pound = 6 *s.* 4 *d.* 3 *q.*

If the Second Figure be juſt 5, add one to the Shillings, and account the third Figure for the Farthings; if it be leſs than 5, add nothing to the Shillings, but account it as ſo many Tens, the third Figure for Farthings.

Diviſion of Decimal Fractions.

General Rule.

Work in all Caſes, as in Diviſion of Integers, but only obſerve, that there be juſt as many Decimal Places (and no more) in the Diviſor and Quotient together, as there were in the Dividend.

22)8,030(,3,65	22)8,030(3,65	22)80,30(3,65
66	66	66
143	143	143
132	132	132
110	110	110
110	110	110
0	0	0

In *Decimal Diviſion* there are Nine Caſes, all performed by the General Rule with a few Directions, as followeth.

1. To divide a whole Number by a greater whole Number;

To the Dividend add Cyphers at Pleaſure, and the Quotient will be all Decimal Parts, according to the Number of Cyphers added:

Thus, if 22 were to be divided by 365.

365) 22 ,0000 (,602, &c.
2190
1000
730
270

2. To divide a leſſer whole Number by a greater mix'd Number;

Add as many Cyphers to the Dividend, as (at leaſt) there are Places in the Diviſor:

Thus, 3,65) 22,0000 (6,02

Here, becauſe there are four Decimal Places in the Dividend (by the annexed Cyphers) and but two in the Diviſor, there muſt be two in the Quotient.

3. To divide a whole Number by a Decimal Fraction, annex (at leaſt) as many Cyphers to the Dividend, as there are Places in the Diviſor:

Thus, ,365) 22,0000(602

Here, there being three Places of Decimals in the Diviſor, and but three in the Dividend, there can be none in the Quotient.

4. To divide a mix'd by a whole Number:

22) 8,030 (,365

Here, there being no Decimals in the Diviſor, but three in the Dividend, there muſt be three in the Quotient.

5. To divide a mix'd Number by a mix'd Number:

2,2) 80,30 (36,5

Here, the Dividend having two Places of Decimals, and the Diviſor one, there muſt be one in the Quotient.

6. To divide a mix'd Number by a Decimal Fraction, as if 80,30 were to be divided by ,365, here add three Cyphers to 80,30 the Dividend, becauſe it may have as many or more Decimal Parts than are in the Diviſor, and it will ſtand

Thus, 365) 80,30000 (22,00
730
730, &c.

And becauſe the Dividend hath five Places of Decimals, and the Diviſor but three, there muſt be two in the Quotient.

7. To divide a Decimal by a whole Number:

22) ,8030 (,0365

Here needs no Cyphers be annexed, becauſe the Dividend is (apparently) bigger than the Diviſor; but becauſe the Dividend has four Places in it, and the Diviſor none, a Cypher muſt be prefixed in the Quotient to ſupply it, and ſo the true Quotient will be ,0365.

8. To divide a Decimal by a mix'd Number:

3,65) ,8030 (,22

Here, 'tis plain the Quotient muſt be ,22. becauſe there are four Decimals in the Dividend, and but two in the Diviſor.

9. To divide one Decimal by another:

,22) 8030 (3,65

Here 'tis plain by the General Rule.

But ſometimes Cyphers muſt be added to the Dividend, as when the Diviſor is bigger than the Dividend:

Thus ,365) ,22,0000 (,602

Where ſix Places of Decimals being in the Dividend, and three in the Diviſor, three muſt alſo be in the Quotient.

Note, That when any Number (either Decimal or Mix'd) is given to be divided by an Unit, with Cyphers annexed thereto (as 10, 100, 1000, &c.) it is only removing the Separatrix in the Dividend ſo many Places farther toward the Left-hand, as there are Cyphers annex'd to the Unit, prefixing Cyphers to the Dividend to ſupply the vacant Places (if need be:)

Thus, if 7562 were to be divided

By	The Quotient is
10	756,2
100	75,62
1000	7,562
10000	,7562
100000	,07562

DECIMIS *Solvendis pro Poſſeſſionibus alienigenarum*, is a Writ, or Letters-Patents, yet extant in the *Regiſter*, which lay againſt thoſe that had farm'd the *Priors Aliens* Lands of the Kings, for the Rector of the Pariſh to recover his Tythe of them.

DECK of a Ship, is a Planked Floor on which the Guns lie, and the Men walk to and fro. In great Ships there are three Decks, Firſt, Second, and Third, beginning to account from the loweſt; and ſome alſo have an *Half Deck*, which reaches from the *Main Maſt* to the *Stem* of the Ship. There is alſo a *Quarter-Deck*, which is from the *Steerage* aloft to the Maſter's Round-Houſe. There is alſo ſometimes a *Spare Deck*, which is the uppermoſt of all,

all, and is between the *Main Maſt* and the *Miſſen*: This *Deck* is called alſo the *Orlope*: Which ſee.

DECLARATION (in Common Law) is a ſhewing in Writing the Grief and Complaint of the Demandant or Plaintiff, againſt the Defendant or Tenant, wherein he is ſuppoſed to have received ſome Wrong: And this ought to be plain and certain, both becauſe it impeaches the Defendant, and alſo compels him to anſwer thereto.

DECLENSION, of a Diſeaſe, is when it recedes from its Height, and the Patient is beyond Danger: See *Acme*.

DECLINATION *Apparent*, is the Diſtance of the apparent Place of a Planet from the *Equator*.

DECLINATION *of the Sun*, is the Diſtance of the Parallel to the Equator which the Sun runs in any Day, from the Equator it ſelf: And this Diſtance (on the Globe) is reckon'd on the *Meridian*; and according as this Diſtance is towards either of the Poles of the World, 'tis called *North* or *South Declination*.

To find the Sun's greateſt *Declination*; you muſt, by ſome very large Quadrant, or ſuch like Inſtrument, take the Sun's greateſt Meridian Altitude, and his leaſt at the two Solſtices; the Difference between which is the Double of the Sun's greateſt Declination, or the Diſtance of the Tropicks; wherefore half of it is the thing ſought.

To find the Sun's or Star's *Declination* by the *Globe* or *Sphere*; bring the Sun's Place, or the Star to the Meridian, and the Degrees from the Equinoctial there reckoned either *North* or *South*, are the *Declination* at Noon.

To find the *Declination* of the Sun Trigonometrically, having given his greateſt *Declination* and Diſtance from the next *Equinoctial Point*:

Say, *As the Rad. is to the Sine of the Sun's Diſtance from the next Equinoctial Point, ſo is the Sine of the Sun's greateſt Declination to the Sine of the preſent Declination.*

Example: Suppoſe the Sun's Diſtance from the next Equinoctial Point to be 30°. 00. The greateſt Declination 23°. 30'.

Then to the Sine of 30°. 00'.	9,698970
add the Sine of 23°. 30'.	9,600700
And the Sum (leſs Rad.) = Sine of 11°. 30'.	19,299670

which is the Sun's preſent *Declination* required.

How to find the *Declination* of a Planet or Star that hath Latitude, ſee *Newton's Aſtron. Britan.* p. 10.

In the *Pythagorean* or *Copernican Syſtem*, the Sun's *Declination* is expreſs'd by the *Complement of his Diſtance from the Pole*, or by the *Diſtance of the Pole from the Horizon of the Diſk*, and is called *the Reflection*: And the Proportion to find it is this;

As the Rad. to the Sine of the Diſtance of the two Poles of the Ecliptick and the Equator:: So is the Sine of the Sun's Longitude to the Co-ſine of his Diſtance from the next Pole: The Complement of which laſt, is the *Reflection*, the Diſtance of the Sun from the Horizon of the Disk, or his *Declination*.

DECLINATION *of the Mariner's Compaſs*, is its *Variation* from the true Meridian of any Place. How to find this, ſee in *Variation*.

DECLINATION *True*, is the Diſtance of the *True* Place of a Planet from the *Equator*.

DECLINATION *of a Wall* or *Plane for Dials*, is an Arch of the Horizon, comprehended either between the Plane and the Prime Vertical Circle, if you account it from the *Eaſt* or *Weſt*, or elſe between the Meridian and the Plane, if you account it from the *North* or *South*.

There are many ways given by Authors, for finding the *Declination* of a Plane; of which, all thoſe that depend on the Magnetick Needle deſerve to be ſuſpected upon many Accounts. The common Method alſo, by finding the Sun's Horizontal Diſtance from the Pole of the Plane, is ſubject to many Errors and Difficulties. Mr. *Oughtred's* way, by a Semi-circle drawn on a Square Board, is the plaineſt and eaſieſt Method that can be well thought on of that Nature; but then there is Difficulty in ſetting the Pin truly perpendicular, as well as in placing the Board truly Horizontal; and at the ſame time is required the Sun's *Declination* and *Azimuth* to be had exactly. The very beſt way therefore that I ever met with for finding the *Declination* of a Plane, is to get, on a large ſquare Piece of Braſs or Wood, a Limb accurately divided into 360 Degrees, and (if it can be) every 5 Minutes; on the Center of which moves an Horizontal Dial, purpoſely made for the Latitude of the Place, and which hath a ſmall Bit of fine Braſs fixed on its Meridian Line, like a fiducial Edge, to cut the Degrees in the Limb. The Uſe of which is very eaſy; for at any time when the Sun ſhines, you need only apply that Side of the Square to the Plane where are 60 Degrees on the Limb; and then ſetting it as nearly as you can horizontally, turn the Dial about, till it ſhew exactly the true Hour of the Day (which before muſt be rightly found, and a Watch ſet to it) and then will the fiducial Edge cut the Degrees of the Plane's *Declination*; and which way to account it will be eaſily ſeen, becauſe the Dial pointing true *North* gives you an Idea of all the Points of the Compaſs.

And this Method will be of great Uſe to ſuch, whoſe Buſineſs is to make many Dials in or near the ſame Latitude.

DECLINATORIES, are Boxes fitted with a Compaſs and Needle, to take the Declination of Walls for Dialling, &c.

DECLINING *Erect Dials*, how to make; ſee *Dial* in *Erect declining Dials*.

DECLINING *Erect Planes*: See *Erect declining Planes*.

DECLINING { *Inclining* / *Reclining* } *Dials*, are thoſe whoſe Planes neither face directly any of the Four Cardinal Points; nor are they either perpendicular or parallel to the Horizon.

For the deſcribing of theſe Dials; firſt make an *Erect* one for the given *Declination*, according to the Direction in *Erect Declining Dials*; then let the *Height of the Stile* above the *Subſtile* be the { Difference between / Sum of } the Co-Latitude and *Inclination*, *Reclination*.

DECLINING { *Reclining* / *Inclining* } *Planes*: See *Dial Plan.*

DECLIVIS *Muſculus*: See *Obliquus deſcendens ſeu Declivis*.

DECOCTION, is a boiling of ſome Plants, Roots, Seeds, &c. for Medicinal Uſe, being the ſame as *Apozem*: Which ſee.

DECORTICATION, the peeling or unhusking of Roots, Seeds, Fruits, &c. or the freeing of them from their Barks, Rinds, Husks, or Shells.

DECORUM or *Decency*, in Architecture, is a ſuiting of all the Parts and Ornaments of a Building, ſo as they ſhall become the Station; as *Vitruvius* ſhews, when he ſpeaks of adjuſting the ſeveral Orders

ders to their Natural Affections; and he, as Mr. *Evelyn* obſerves, would never have placed a *Corinthian Column* at the Entrance into a Priſon, nor one of the *Tuſcan* Order before the *Portico* of a Church.

DECREPITATION *of Sea Salt*, or *of Sal Gemme*, is a Word uſed by the Chymiſts for a kind of Calcination of Salt thus; an earthen unglazed Pot is heated red hot over the Fire, and then an Ounce of Salt is thrown into it, and the Pot is preſently covered; a great cracking Noiſe ariſes, whence comes the word *Decrepitation*. If more Salt be to be decrepitated, the Pot muſt be kept ſtill red hot, and you muſt proceed as at firſt. The Deſign of it is to free the Salt from ſuperfluous Moiſture, but it renders the Salt ſo porous and apt to imbibe the Humidity of the Air, that it muſt always be kept in a Viol well ſtopp'd, or elſe the Air will ſoon moiſten it anew.

DECUPELATION, the ſame with *Decantation:* Which ſee.

DECUSSATION, a Term in Opticks, is the croſſing of any two Lines, Rays, &c. when they meet in a Point, and then go on apart from one another.

DECUSSORIUM, is a Surgeon's Inſtrument, wherewith the *Dura Mater* being highly preſſed, is accurately adjoined to the Skull, that the Purulent Matter gathered betwixt the Skull and the Skin, called *dura Meninx*, or *Mater*, may be evacuated by a Hole made with a Surgeon's Inſtrument, called *Trepanum. Blanchard.*

DE DEONERANDA *pro rata Portionis*, is a Writ that lies where a Man is diſtrained for Rent that ought to have been paid by others proportionably.

DEDIMUS *Poteſtatem*, is a Writ whereby a Commiſſion is given to a private Man, for the Speeding of ſome Act appertaining to a Judge; and by the *Civilians* is called *Delegation.*

DEEDS, in Common Law, ſignify Writings, that contain the Effect of a Contract made between Man and Man: See more in *Fait.*

DEEP *Sea-Line*, is a ſmall Line to Sound with, when a Ship is in very deep Water at Sea; at the End of it is a piece of Lead, called the *Deep-Sea-Lead*, at the Bottom of which is a *Coat of white Tallow*, to bring up Stones, Gravel, Sand, Shells, or the like from the Bottom, and to know the Differences of the Ground, which having been before diſcovered by other Obſervations, and entred in their Books, they gueſs by their Soundings what Coaſts they are upon, though they cannot ſee Land. If it happens that no Ground come up upon the Tallow, they gueſs they are upon *Ouzie Ground*, which they diſcover by ſounding again with a Woollen Cloth upon the Lead, whereby this Ground will be brought up.

DE *Eſſendo quietum de Tolonio*, is a Writ which lieth for them which are by Privilege freed from the Payment of Toll.

DE *Expenſis Militum*, is a Writ, commanding the Sheriff to levy ſo much a Day for the Expences of a Knight of the Shire; and a like Writ to levy Two Shillings a Day for every Citizen and Burgeſs, called *De expenſis Civium & Burgenſium.*

DEFAULT, in Law is a Non-appearance in Court, without ſufficient Cauſe made out.

DEFECTIVE or *Deficient Nouns*, in Grammar, are ſuch as want either a Number, a particular Caſe, or are *Indeclinable.*

DEFEIZANCE, ſignifies (in Law) a Condition relating to a Deed, as an Obligation, Recognizance, or Statute, which being performed by the Obligor or Recognizor, the Act is diſabled and annulled, as if it had never been done. The Difference between a *Proviſo* or a Condition in Deed, and a *Defeizance*, is this, That a *Proviſo* or Condition is annexed or inſerted in the Deed or Grant, whereas a *Defeizance* is uſually a Deed by it ſelf.

DEFENCES, in Fortification, are all ſorts of Works that cover and defend the oppoſite Poſts, as *Flanks*, *Parapets*, *Caſemates*, *Fauſſe-Brays:* 'Tis almoſt impoſſible to fix the Miner to the Face of a Baſtion till the Defences of the oppoſite one are ruin'd: *i. e.* till the Parapet of its Flank is beaten down, and the Cannon in all Parts that can fire upon that Face which is attacked, are diſmounted.

DEFENDANT, a Term in Law, is he that ſueth in an Action perſonal, as Tenant is he which is ſued in an Action real.

DEFENDEMUS, a word uſed in Feoffment or Donation, and bindeth the Donor and his Heir to defend the Donee.

DEFENSIVE, or *Defenſitive Medicines*, in Surgery, are Remedies applied outwardly to prevent an Inflammation, or any other Symptom that ſeems to threaten any Part, from arriving ſo far as to that Part.

DEFERENT, in Aſtronomy, an imaginary Circle or Orb (in the *Ptolemaick Syſtem*,) which is there ſuppoſed, as it were to carry about the Body of the Planet. 'Tis the ſame with the *Eccentrick.* The two Points where the Epicicle interſects the *Deferent*, are called the *Points of the greateſt Elongation.*

DEFICIENT *Nouns:* See *Defective.*

DEFICIENT *Numbers*, are ſuch, whoſe Parts added together make leſs than the Integer, whoſe Parts they be; as Eight, whoſe Parts being One, Two and Four, make but Seven; likewiſe the Parts of Sixteen make but Fifteen, and of Forty five make but Thirty three.

DEFILE, in Fortification, is a ſtraight narrow Lane or Paſſage, through which a Company of Horſe or Foot can paſs only in File, by making a ſmall Front, ſo that the Enemy may take an Opportunity to ſtop their March, and to Charge them with ſo much the more advantage, in regard that thoſe in the Front and Rear cannot reciprocally come to the Relief of one another. Hence to go off File by File is called *Defiling.*

DEFINITION, is an exact Deſcription, explaining the Nature of a thing by Eſſential Attributes. And there are three things neceſſary to make a *Definition* good.

1. It muſt be Univerſal; *i. e.* it muſt contain the whole Thing defined; therefore (as the Author of the *Art of Thinking* would have it) the common *Definition* of Time to be the Meaſure of Motion, is not good; for Time may be the Meaſure of Reſt as well as Motion.

2. It muſt be proper, that is, it muſt agree with the Thing defined.

3. It muſt be clearer than the Thing defined, that is, it ought to render the *Idea* of it more plain and diſtinct; and make us as much as may be to underſtand the Nature of it, and be ſerviceable to us to give a Reaſon of its principal Properties, which is that which we ought chiefly to conſider in *Definitions.*

DEFLAGRATION, in Chymiſtry, is the enkindling and burning of, in a Crucible, a Mixture of Salt or ſome Mineral Body, with a Sulphurous one, in order to make a Purification of the Salt, or a Regulus of the Mineral; of which ſee *Sal Prunella* and *Regulus of Antimony.*

DEFLECTION, is the Tendency of a Ship from her true Courſe by the Reaſon of Currents, &c. which divert her, and turn her out of her right way.

DEFLUVIUM, is a Diſtemper in Trees, whereby they loſe their Bark; 'tis cauſed by a ſharp Humour, that diſſolves the Glew whereby the Bark is faſtned to the Wood; and ſometimes by too much Drought.

DEFLUXION: See *Catarrh.*

DEGLUTITION, Swallowing, is an Animal Action, whereby Meat chaw'd in the Mouth, or any thing more liquid, deſcends into the Stomach by the Motion and Contraction of the Fibres of the Gullet. *Blanchard.*

DEGRADATION, is a Term in Painting, which expreſſes the leſſening and rendring confuſed the Appearance of diſtant Objects in a Landſkip, ſo as they ſhall appear there as they would to an Eye placed at that diſtance from them.

DEGREE, is the 360th Part of the Periphery of a Circle, it is ſub-divided into 60 Parts, called *Minutes*, and each of them again into 60 Parts more, called *Seconds*, and ſo into *Thirds*, &c.

DEGREE *Parodick:* See *Parodical.*

DEGREES *of Fire:* The Chymiſts reckon Four Degrees of Fire. The *firſt* is made by only 2 or 3 Coals, and is the moſt gentle Heat of all. The *2d*, is with 4 or 5 Coals, or only juſt to warm the Veſſel ſenſibly, but ſo that you may endure your Hand upon it for ſome Time. The *3d* Degree is when there is Heat enough to make a Pot boil that is full of 5 or 6 Quarts of Water. The *4th* Degree is as great a Heat as can be made in a Furnace; but all theſe muſt admit of ſome Variations, according to the Circumſtances of the Operations, Furnaces, Veſſels, Quantity of Matter, *&c.*

DEJECTION, the ſame with *Ejection*; is going to Stool, or an Evacuation of the Excrements by the Periſtaltick Motion of the Guts.

DELEGATES, in Law, are Commiſſioners delegated or appointed by the King's Commiſſion, to ſit upon an Appeal to him in the Court of *Chancery*, and is granted in Three Caſes; *Firſt*, When a Sentence is given in an Eccleſiaſtical Cauſe by the Archbiſhop, or his Official. *Secondly*, When a Sentence is given in any Eccleſiaſtical Cauſe in Places exempt. *Thirdly*, When Sentence is given in any Admiralty in Suits Civil or Marine, by order of the Civil Law.

DELETERIOUS, or *Deletery Medicines*, are ſuch Things or Particles as are of a poiſonous Nature.

DELF, one of the Abatements of Honour in Heraldry, being a Square in the Middle of the Eſcutcheon. See *Abatements of Honour.*

DELIGATIO, Swathing, is a part of Surgery that concerns the Binding up of Wounds, Ulcers, broken Bones, *&c.* and it is either Simple or Compound: The Simple is either equal or unequal; the equal is only round, which ſwathes the affected Member without any Declenſion to either Side; the unequal is divided into *Aſcia* and *Sima*, which at leaſt differ upon the Account of one being greater and the other leſs; *Aſcia* declines little from a Round, but *Sima* much. There are a great many more Diſtinctions of Swathing, taken from the Likeneſs of the Parts which are ſwathed, or from certain Animals and other Things. *Blanchard.*

DELIQUIUM *Animi*, Swooning, the ſame with *Eclipſis*, *Lipothymia*, *Syncope*, *Aſphyxea*, *Lipopſychia*, &c.

DELIQUIUM *Chymicum*, is either a Diſtillation by the Force of Fire; or a melting of the Calx, which is ſuſpended in moiſt Cellars, and a Reſolution of it into Lixivious Humour; thus when Salt of Tartar, or any ſuch fixed Alkali is ſet in a Cellar or ſome ſuch cool Place in an open Veſſel, it will run into a Kind of Water, which the Chymiſts call *Oil of Tartar per Deliquium.*

DELIRIUM, is a Depravation of the Imagination and Judgment, ariſing from a tumultuary and diſorderly Motion of the Animal Spirits, occaſioned by a Fever; whereupon the Perſons affected ſpeak ſeveral abſurd and incongruous things. *Blanchard.*

DELPHINUS, the *Dolphin*, a Conſtellation in the Northern Hemiſphere, containing 10 Stars.

DELTOIDES, is the Name of a triangular Muſcle, in Form like the *Greek* Letter Δ; it proceeds from the *Clavicula* or Channel-Bone, from the upper Proceſs of the Shoulder-Blade, and from the Proceſs of the ſame, which is called *Spiniforme*; and being faſtned to the Middle of the *Os humeri*, lifts it directly upwards, or ſomewhat forwards or backwards, according to the Direction of its differing Series or Fibres.

DELUGE, the ſame with an Inundation or overflowing of the Earth, either in part, or in the whole, by Water. There have been ſeveral very notorious Deluges or Floods, whoſe Memorials are recorded in Hiſtory; as that of *Ogyges* which overflow'd almoſt all *Attica*, and that of *Deucalion* which drowned all *Theſſaly* in *Greece*; but the moſt terrible one that ever was, was that which is uſually and very properly called the *Univerſal Deluge*, or *Noah's Flood*, which *overflow'd* and *deſtroyed* the whole Earth, and out of which only *Noah* and thoſe with him in the Ark eſcaped.

Men have been very ſollicitous to account for this diſmal Judgment Philoſophically, and to diſcover from whence ſuch an amazing Quantity of Water could come as was neceſſary to cover all our Globe to the Height of 15 Cubits above the higheſt Hills, for to that Height, *Moſes* ſaith expreſly, *Gen.* vii. 20. *the Waters prevailed*; and ſome have made ſo bold with him, as to deny there were any Mountains at all before the Flood, though he expreſly mentions them as a Standard for the Height of the Water; and others have denied the Univerſality of the Deluge, though the Text be as plain as Words can deliver, *That all the Hills over the whole Earth were covered.* Others have had recourſe to the ſhifting of the Earth's Center of Gravity, and ſo will have its Parts all drowned ſucceſſively: And our famous Theoriſt, Dr. *Burnet*, makes an Earth as it were on Purpoſe to be drowned at that time; which being in the Form of an orbicular Cruſt on the Face of the *Sea* (as we now call it, for he ſaith there was none before the Deluge) fell down into the Water, and ſo drowned its Inhabitants.

Now for my own part, I ſhould not at all be in care how to find Water for ſuch a Cataſtrophe, if that were all that appeared neceſſary to enquire after; for I could eaſily believe, that the Great Creator of the World could ſoon either educe *Subterraneam*, bring down *Superceleſtial*, or create Waters on purpoſe for ſuch an Occaſion; for nothing can be too hard for Omnipotence to effect; and I dare not make my Underſtanding a Judge how far it may be expedient for Him to make uſe of His Almighty Power without Secondary Cauſes.

But the Matter lies not here, the *S. S.* tells us, That the Waters of the Deluge came from two Funds, the *Great Deep below* and the *Rains above*; to theſe therefore we muſt ſtick, and look no further. Again, when we look into the Internal Parts of the Earth, even to the Greateſt Depth Men have ever digg'd or min'd, we find there that the Body of the Terreſtrial Globe is compoſed of *Strata*, Rows or Layers lying one over another, and which appear to every one that obſerves them to be Sediments of a Flood; beſides, in the Bodies of theſe *Strata*, though never ſo ſolid, nay even incloſed

ed within the Solidity of the firmeſt Flints, Marble, Stone, &c. we find a prodigious variety of the *Exuviæ* or Remains of Fiſhes, ſuch as their Shells, Teeth, &c. as well Marine ones, as thoſe which live in Lakes and Rivers: And from a due Obſervation of theſe, and repeated Conſiderations upon them, it was, that the Learned and Ingenious Dr. *Woodward*, Profeſſor of Phyſick in *Greſham College*, founded what he delivers upon this Subject; which therefore is not ſo much a *Theory*, as neceſſary Deductions, and unavoidable Conſequences drawn from Matter of Fact.

And from hence it is, and hence only, that he deduces the following *Inferences* relating to the *Univerſal Deluge*, in his *Natural Hiſtory of the Earth*; which appear to me very reaſonable, and are theſe.

1. That theſe Marine Bodies, and the other Spoils of Freſh-water Fiſhes, were born forth of the Sea by the Univerſal Deluge, and on return of the Water back again from off the Earth, they were left behind at Land.

2. That during the time of the Deluge, whilſt the Water was out upon, and covered the Terreſtrial Globe, all the *Stone* and *Marble* of the Antediluvian Earth; all the *Metals* in it; all the Mineral Concretions; and in a Word, all Foſſils whatever that had before attained any Solidity, were *totally diſſolved*; their Conſtituent Corpuſcles were disjoined, and their Coheſion perfectly ceaſed; and that the ſaid Corpuſcles of thoſe ſolid Foſſils, together with the Corpuſcles of theſe which were not before ſolid, ſuch as Sand, Earth, and the like; as alſo all Animal Bodies and Parts of Animals Bones, Teeth, Shells; Vegetables and Parts of Vegetables, Trees, Shrubs, Herbs; and, to be ſhort, all Bodies whatſoever that were either upon the Earth, or that conſtituted the Maſs, if not quite down to the Abyſs, yet quite down to the greateſt Depths we ever dig; all theſe, he ſays, were aſſumed up promiſcuouſly into the Water, and ſuſtained in it, in ſuch manner, that the Water, and Bodies in it, together made up one common Maſs.

3. That at length all the Maſs that was thus born up in the Water, was again precipitated and ſubſided toward the Bottom: And that this Subſidence happened generally according to the Laws of Gravity: That Matter, Body, or Bodies which had the greateſt Quantity or Degree of Gravity, ſubſiding firſt in order, and falling loweſt; *that* which had the next, or a ſtill leſſer Degree of Gravity ſubſiding next after; and ſo in their ſeveral Courſes: *That* which had the leaſt Gravity ſinking not down till laſt of all, but ſettling at the Surface of the Sediment, and covering all the reſt: That the Matter ſubſiding thus, form'd the *Strata* of Stone, Earth, Marble, Coal, &c. of which *Strata* lying one upon another, the Terreſtrial Globe, or at leaſt as much of it as hath ever been diſplayed to Human view, doth mainly conſiſt.

4. That the *Strata* of Marble, Stone, and of all other ſolid Matter attained their Solidity, as ſoon as the Sand or other Matter, whereof they conſiſt, was arrived at the Bottom, and well ſettled there; and that all thoſe *Stratæ* which are ſolid at this Day, have been ſo ever ſince that time.

5. That theſe *Strata* lying thus one on another, were all originally parallel; and they were plain, even and regular, rendring conſequently the Surface of the Earth even and ſpherical; that they were contiguous, and not interrupted or broken as we find them now; and that the whole Maſs of the Water lay then upon them, above them all, and conſtituted a Fluid Sphere environing round all the Globe.

6. That after ſome time, by the Force of an Agent ſeated within the Earth, theſe *Strata* were broken on all ſides the Globe; that they were *diſlocated*, and their Situation varied, being elevated in ſome Places, and depreſſed in others; and from hence aroſe all the Mountains, Valleys, and other Inequalities of our preſent Earth's Surface; all the Caverns and Grotto's, all the Perpendicular and Horizontal Fiſſures; the Channel of the Sea, all Iſlands, &c. In one word, the whole Terraqueous Globe was put, by this Diſruption and Diſlocation of the *Strata*, into the Condition which we now behold it. *Nat. Hiſt. of the Earth.* Part 2.

And afterward, in *Part* the 3d. conſidering farther this Matter of the Univerſal Deluge, he concludes from his *Obſervations*;

1. That the *Deluge* of *Noah* was truly *Univerſal*, and laid the whole Earth under Water, covering all, even the higheſt Mountains, quite round the Globe.

2. That at the time of the *Deluge*, the Water of the Ocean was firſt brought out on the Earth, and that *it* was immediately ſucceeded by *that* of the Abyſs, which was alſo brought out on the Surface of the Globe.

3. That upon the Diſruption of the *Strata*, and the Elevation of ſome, and the Depreſſion of others of them, which followed after that Diſruption towards the End of the Deluge, this *Maſs* of *Water* fell back again into the depreſs'd and loweſt Parts of the Earth, into Lakes and other Cavities into the *Alveus* or Channel of the Ocean; and through the Fiſſures whereby *this* communicates with the Ocean in the Abyſs, which it filled till it came to an *Æquilibrium* with the Ocean.

4. That the *Deluge* commenced in the *Spring Seaſon*, the Water coming forth upon the Earth in the Month which we call *May*.

5. That the *Deluge* did not happen from an accidental Concourſe of Natural Cauſes, but that many things were then done, which never could poſſibly have been done without the Aſſiſtance of a *Supernatural Power:* That the ſaid *Power* acted in this Matter with *Deſign*, and with the higheſt *Wiſdom:* And that as the Syſtem of Nature was then, and is ſtill ſupported and eſtabliſhed, a *Deluge* neither did nor could happen naturally.

The Learned and Ingenious Mr. *Whiſton*, now Mathematical Profeſſor of the Univerſity of *Cambridge*, in his *New Theory of the Earth*, ſuppoſes, and indeed makes it very probable from ſeveral ſurpriſing Co-incidences (as the exact Correſpondence between the *Solar* and *Lunar* Year, ſuppoſing, as he doth, that the Earth moved in a Circular Orbit before the *Deluge:* That the Earth at the Time of the *Deluge* ſhould be in its Perihelion, which is indeed the natural Effect of a Comet's paſſing by at that time, and drawing it from a Circular to an Elliptical Orbit: And alſo, That the Moon was then in ſuch a Place of its Orbit, as to be equally attracted by the Earth when the Comet paſſed by; I ſay, he renders it very probable) that a Comet deſcending in the Plane of the Ecliptick towards it Perihelion, paſſed juſt before the Earth on the firſt Day of the *Deluge:* The Conſequences of which he thinks would be, That this Comet, when it came below the Moon, would raiſe a prodigious, vaſt and ſtrong Tide, both in the ſmall Seas, which, according to his Hypotheſis, were in the Antediluvian Earth (for he allows no great Ocean there, (as in ours) and alſo in the Abyſs, which was under the upper Cruſt of the Earth. This Tide he ſuppoſes would riſe and increaſe all the time of the approach of the Comet towards the Earth, and would be at its greateſt Height when the Comet

was at its leaſt Diſtance from it. By the Force of which Tide, and alſo by the Attraction of the Comet, he judges, that the Abyſs muſt put on an Elliptick, or rather exactly Oval Figure, whoſe Surface being much larger than the former Spherical one, the outward Cruſt of the Earth incumbent on the Abyſs, muſt needs accommodate it ſelf to that Figure, which yet it could not poſſibly do while it held ſolid and conjoined together; and therefore he concludes, that it muſt of neceſſity be extended, and at laſt broken by the violent Force of the ſaid Tide and Attraction, and conſequently have innumerable Gaps and Clefts made quite through it, out of which the included Water of the Abyſs muſt iſſue, and ſo help to occaſion the *Deluge*.

He ſuppoſes further, That this Comet in its Deſcent towards the Sun, paſſed ſo cloſe by the Body of the Earth, as to involve it in its Atmoſphere and Tail for a good while, and conſequently left a vaſt Quantity of Vapours both expanded and condenſed on its Surface; a great Part of which being very much rarify'd after their firſt Fall, would be ſoon drawn up into the Air again, and afterwards fall down on the Earth in vaſt and prodigiouſly violent Rains; which was the Cauſe of the *Forty Days* Rain mentioned by *Moſes* in his Hiſtory of the *Deluge*. But the other great Rain, which with this laſted for 150 Days, was cauſed (he ſaith) by the Earth's coming a ſecond time into the Tail of the Comet: And from this double coming of the Earth into, firſt, the Atmoſphere, and then the Tail of the Comet, he ſuppoſes half the Water of the *Deluge* to be derived, as the other half came from the Abyſs; whoſe Waters he ſuppoſes were continued to be brought out from the Preſſure of that Water which came from the Comet, which he thinks would preſs downwards with a mighty Force, and endeavour to ſink the outward Cruſt of the Earth down into the Abyſs, and this would force the Subterranean Water up through the Clefts and Fiſſures before made in the Cruſt by the Violence of the Tide abovementioned. And at laſt, to remove this vaſt Orb of Waters again, he ſuppoſes a mighty Wind to have ariſen, which dried up ſome, and forced the reſt down into the Abyſs through the Clefts or Fiſſures by which it came up in a good meaſure before; only that a good Quantity indeed retired into the *Alveus* of the great Ocean (now firſt made) and into leſſer Seas and *Lakes*, &c. From the Calculation of this Comet he concludes, That the *Deluge* began on the 17th Day of the Second Month from the Autumnal Equinox (or on the 27th Day of *November*, in the *Julian* Stile extended backward) in the 2365th Year of the *Julian* Period, and in the 2349th Year before the Chriſtian *Æra*. He aſſerts alſo, That the Waters of the *Deluge* were ſtill, calm and free from Commotions, Storms, Winds and Tempeſts of all ſorts, during the whole time the Ark was afloat upon them: That at the *Deluge* the Earth was firſt divided into two vaſt Continents almoſt oppoſite to one another, and ſeparated by a vaſt Ocean, as it is now; and alſo, that ſince the *Deluge*, there neither hath nor will be any great or general Changes in the State of the World, till a Period be put to the preſent Courſe of Nature. How he makes out theſe things, the Reader will find in his *New Theory of the Earth*, which is very well worth the careful Peruſal of every Mathematical and Philoſophical Reader.

DEMAINE, or *Demeſn*, *Dominicum*, is a *French* Word, otherwiſe written *Domaine*, and ſignifieth, as *Hottoman* ſaith, *Patrimonium Domini, in verbis feudalibus, verbo Dominicum*, where, by divers Authorities, he proveth thoſe Lands to be *Dominicum*, which a Man holdeth originally of himſelf, and thoſe to be *feodum* which he holdeth of a Superior Lord.

In *England* no common Perſon hath any *Demaines* ſimply underſtood, for all dependeth either mediately or immediately on the Crown; for when a Man in pleading would ſignify his Land to be his own, he ſaith, That he is or was ſeiz'd thereof in his *Demaine*, as of Fee, *Lit. lib.* 1. *C.* 1. whereby he meaneth, That although his Land be to him and his Heirs for ever, yet it is no true *Demaine*, but dependeth upon a Superior Lord, and he holdeth by Service, or Rent in lieu of Service, and by both Service and Rent.

This Word *Demaine* is diverſly taken; ſometimes more largely, as of Lands and Tenements held for Life, &c. and ſometimes more ſtrictly, as for ſuch only as are generally held in Fee. This Word is ſometimes uſed for a Diſtinction between thoſe Lands that the Lord of the Mannor hath in his own Hands, or in the Hands of his Leſſee, demiſed upon a Rent for Term of Years or Life, and ſuch other Lands appertaining to the ſaid Mannor, which belongeth to the Free or Copy-holders. And the reaſon why Copy-hold is accounted *Demaines*, is, becauſe they that be Tenants to it, are judged in Law to have no other Right, but at the Will of the Lord; ſo that it is reputed ſtill, after a ſort, to be in the Lord's Hands: And yet in common Speech that is ordinarily called *Demeans*, that is, neither Fee nor Copy. Note alſo, That *Demaine* is ometimes uſed in a more ſpecial Signification, and is oppoſite to *Frank-Fee*: For Example, Thoſe Lands which were in the Poſſeſſion of *Edward the Confeſſor*, are called *Ancient Demaine*, and others be called *Frank-Fee*. *Kitchin*, Fol. 98. And the Tenants which hold any of thoſe Lands, be called *Tenants in Ancient Demaine*, the other *Tenants in Frank-Fee*, and alſo Tenants of the Common Law; the Reaſon is, becauſe *Tenants in Ancient Demaine* cannot be ſued out of the Lord's Court.

DEMI-BASTION, is a kind of Fortification that hath only one *Face* and one *Flank*.

DEMI-CANNON *loweſt*, the Name of a great Gun; (the ordinary ones are about 6 Inches bore, 5400 lb. Weight; ſome 10, ſome 11 Foot long, and carry a Shot of 30 Pound Weight;) it carries point blank 156 Paces; its Charge of Powder is 14 Pound Weight. There are alſo two Sizes of Demi-Cannon above this, which are ſomething larger, as the

Demi-Cannon Ordinary, which is $6\frac{1}{6}$ Inches Bore, 12 Foot long, weighs 5600 Pounds; its Charge of Powder is 17 Pounds 8 Ounces, carries a Shot $6\frac{1}{2}$ Inches in Diameter, and whoſe Weight is 32 Pounds, and the Piece ſhoots point blank 162 Paces.

Demi-Cannon of the largeſt ſize, is $6\frac{6}{8}$ Inches Bore, 12 Foot long, of 6000 Pounds Weight; its Charge is 18 lb. of Powder, and the Piece ſhoots point blank 180 Paces.

DEMI-CULVERING, a Piece of Ordnance; the common ſort of them are $4\frac{1}{2}$ Bore, 2700 lb. Weight, 10 Foot long, carries a Shot of 10 Pounds 11 Ounces, is charged with 7 Pounds 4 Ounces of Powder, and ſhoots Point blank 175 Paces.

Demi-Culvering of the loweſt Size, is $4\frac{1}{4}$ Inches Bore, 10 Foot long, of 2000 lb. Weight; its Charge is 6 Pound 4 Ounces of Powder; it carries a Ball of 4 Inches Diameter, and of 9 Pound Weight, and its level range is 174 Paces.

Demi-Culvering of the Elder ſort is $4\frac{6}{8}$ Inches Bore, 10 Foot long, and $\frac{1}{3}$ of 3000 lb. Weight; its Charge of Powder is 8 lb. and 8 Ounces, the Ball is 4 Inches $\frac{1}{2}$ Diameter, weighs 12 lb. 11 Ounces, and the point blank Shot 178 Paces.

DEMI-

DEMI-DISTANCE of *Polygons*: See *Polygons*.

DEMI-DITON, a Note in Muſick, being the ſame with *Tierce Minor*: See *Monochord*.

DEMI-GORGE, in Fortification, is half the Gorge or Entrance into the Baſtion, not taken directly from Angle to Angle where the Baſtion joins to the Cortine, but from the Angle of the Flank to the Center of the Baſtion, or Angle the two Cortines would make, were they thus protracted to meet in the Baſtion.

DEMI-QUAVER, a Note in Muſick: See *Notes* and *Time*.

DEMISE, (in Law) is applied to an Eſtate either in Fee-ſimple, Fee-Tail, or for Term of Life, and ſo it is commonly taken in many Writs: The King's Death is in Law termed *the Demiſe of the King*.

DEMOCRACY, is a Form of Covernment where the ſupreme Power and Authority is lodg'd in the People, and they chuſe all Adminiſtrators and Officers.

DEMONSTRATION, is a Chain of Arguments depending on one another, and founded primarily on firſt and ſelf-evident Principles, or plain Propoſitions eſtabliſhed and proved from them, and at laſt ending in the invincible Proof of the thing to be demonſtrated, as the Concluſion.

DEMURRER, (in Common Law) ſignifies a kind of Pauſe upon a Point of Difficulty in any Action. In *Chancery* the Defendant *demurrs* to the Plaintiff's Bill, averring it to be defective in ſuch and ſuch a Point; and demands the Judgment of the Court thereupon, whether he ſhall be compell'd to make any further or other Anſwer thereunto, *&c.*

DENEB, the ſame with *Cauda Lucida* or *Lion's Tail*, a Star ſo called: Which ſee.

DENIZEN, (in Law) ſignifies an Alien that is enfranchiſed by the King's Charter, and in all reſpects almoſt to do as the King's Native Subjects do, *viz.* to purchaſe and poſſeſs Lands, and to be capable of any Office or Dignity; yet it is ſhort of Naturalization, becauſe a Stranger Naturalized may inherit Lands by Deſcent, which a Man made only a *Denizen* cannot.

DENOMINATIVES, in Logick, are ſuch Terms as take their *Original* and *Name* from others.

DENOMINATOR *of a Fraction*, is the Number below the Line, ſhewing the Nature and Quality of the Parts which any Integer is ſuppoſed to be divided into: Thus in $\frac{6}{8}$, 8 the Denominator ſhews you, that the Integer is ſuppoſed to be divided into 8 Parts or half Quarters; and the Numerator 6 ſhews, that you take 6 of ſuch Parts, *i. e.* three Quarters of the Whole.

DENOMINATOR *of any Proportion*, is the Quotient ariſing from the Diviſion of the *Antecedent* by the *Conſequent*: Thus, 6 is the Denominator of the Proportion that 30 hath to 5, becauſe 5) 30 (6. This is alſo called the *Exponent* of the *Proportion* or *Ratio*.

DENSE: that Body is ſaid to be *Denſe* or Thick, when it hath more of Matter, in proportion to the Space or Room it takes up, than other Bodies have; and the being under theſe Circumſtances is called the

DENSITY *of Bodies*, as that which produces it, is called *Condenſation*.

The Denſity of Water to Air is, as Sr. *Iſ. Newton* ſtates it, as 800, or 850 to 1, allowing the Mercury in the Baraſcope 30 Inches; though Mr. *Boyle* and ſome others make it as 1090 to 1; but I judge the former Proportion comes neareſt the Truth.

The Denſity of Quick-ſilver to Water is as $13\frac{1}{2}$ to 1; and when the Quick-ſilver is extraordinary good, as 24 to 1 nearly; and conſequently the Denſity of Quick-ſilver to Air is as 11617 to 1.

Sir *Iſaac Newton* aſſerts the Denſity of the Planets *Sol*, *Saturn*, *Jupiter*, and of our Earth, and the *Moon*, to be as 100, 60, 76, 387, and 700, and concludes the Sun to be a little denſer than *Jupiter*, and our Earth 7 times more denſe than the *Sun*.

DENTARPAGA: See *Forfex*.

DENTIDUCUM: See *Forfex*.

DENTIFRICE, is a Medicine for the whitening, ſcouring, and faſtning the Teeth, and for ſtrengthning the Gums.

DENTILS, in Architecture, is a Member of the *Ionick Cornice*, ſquare and cut out at convenient Diſtances, which gives it the Form of a Sett of Teeth, and the Original of its Name.

DENTITION, is the Time that Children breed Teeth, which is about the ſeventh Month, or later; and uſually the upper Teeth come firſt, though in ſome the under; and amongſt theſe the Fore-Teeth firſt. *Blanchard*.

DEOBSTRUENT *Medicines*, Remedies that open Obſtructions.

DEODAND, a thing devoted or conſecrated to God for the Pacification of His Wrath, in caſe of Miſadventure, whereby any Chriſtian Man cometh to a violent End, without the Fault of any Reaſonable Creature; as if a Horſe ſhould ſtrike his Keeper, and ſo kill him; in this Caſe the Horſe is to be a *Deodand*, that is, given to God, that is, to be ſold, and diſtributed to the Poor, for an Expiation of that dreadful Event, though effected by an unreaſonable Creature.

DEOPPILATIVE, the ſame with *Deobſtruent Medicines*: Which ſee.

DEPART, a certain Operation in Chymiſtry is called *the Depart*, becauſe the Particles of Silver are made by it to *depart* from Gold, when they were before melted together in the ſame Maſs, and could not be ſeparated any other way.

'Tis done by melting the united Metals together in a Crucible with a ſtrong Fire, and while the Matter is in Fuſion, caſting it into a Veſſel of cold Water, the Mixture will be divided into very ſmall Grains, which being collected again, and having *Aqua fortis* poured on them, the *Menſtruum* will diſſolve the Silver, but leave the Gold at the Bottom in a Powder; which, after the Solution of the Silver is gently poured off, muſt be waſhed to ſweeten it. This is intended for a kind of Purification of Gold; but all the Particles of the Silver will ſcarce be ſeparated from it even this way. The only way to purify Gold exactly, is by Antimony: Which ſee under *Purification*; if you would purſue this

Depart farther, and get your *Silver* out of the *Aqua fortis*; put then into an Earthen Pan a Plate of Copper, and on it pour 10 or 12 times as much Water as the Quantity of your impregnated *Aqua fortis*; into which put in the *Menſtruum* of *Aqua fortis*, and let the Mixture lie ſtill for ſome Hours, or till you find the Copper-Plate to be covered all about with the Powder or Precipitate of Silver, and that the Water begins to turn Blue; then filtrate the bluiſh Water, and this is that which is called *Aqua Secunda*. Dry the Powder of Silver, and melt it into an Ingot in a Crucible, with a little Salt Petre. If you ſteep a Plate of Iron ſome Hours in this *Aqua Secunda*, you will have another

Depart; for the *Menſtruum* will let go the Copper which it had diſſolved, and which made it look Blue, to prey upon the Iron, and you will have your Copper in Powder on the Iron-Plate: And if you filtrate this Diſſolution, you may get the Iron out of it

it, by laying in it a Piece of *Lapis Calaminaris*, the Iron will depart out and fall to the Bottom in a Powder, and the Stone will be diſſolved, or at leaſt as much of it as the *Menſtruum* can contain. If you again filtrate this Water, and then pour upon it drop by drop the *Liquor of fix'd Nitre*, the *Lapis Calaminaris* will be precipitated to the Bottom: And laſtly, if you filtrate this Water as before, and after having evaporated a Part of it, ſet the reſt in a cool Place, you will have Chryſtals of Salt Petre which will burn like the ordinary ſort. *Note*, That though the Silver, the Copper, and the Iron could not be gotten perfectly out of the *Menſtruum*, yet the Liquor of fix'd Nitre will precipitate all the *Lapis Calaminaris*, and the remaining Particles of the Silver, Copper and Iron.

DEPARTER, or *Departure* from a Plea or Matter, is where a Man pleads a Plea in bar of an Action, and being replyed thereunto, doth in his Rejoinder ſhew another Matter contrary to his firſt Plea, that is called *a Departure from his Bar:* It is applied alſo to a Plaintiff, who in his Replication ſhews new Matter from his Declaration. So if a Man plead a general Agreement in Bar, and in his Rejoinder alledge a ſpecial one, this ſhall be adjudged a *Departure* in pleading: So in Treſpaſs, if the Defendant will plead a Diſcent, and the Plaintiff replies, that after this the Defendant infeoffed him; and the Defendant eſſoins that this Feoffment was upon Condition, for the Breach whereof he entred; this is a *Departure*, for it is new Matter.

DEPARTURE *in deſpight of the Court*, is when a Tenant or Defendant appears to an Action, and hath a Day over in the ſame Term, or is called after, though he had no Day given him, ſo that it be in the ſame Term: If he do not appear, but make default, it is a *Departure in deſpight of the Court*, and therefore he ſhall be condemned.

DEPHLEGMATED, *i. e.* cleared from its Phlegm or Water, is a Term uſed by the Chymiſts to expreſs that any Spirit is pure and unmix'd with Water or Plegm, which to effect, they *rectify* it, as they call it, that is, diſtil it over again; and when 'tis fully deprived of all Water and Phlegm, or at leaſt as much of it as it can well be, they ſay ſuch a Spirit is well *dephlegmated*.

DEPILATORY, an external Medicine that takes away the Hair from any Part of the Body.

DEPOSITION, is the Teſtimony of a Witneſs ſet down in Writing by way of Anſwer to the Interrogatories exhibited in *Chancery*, where ſuch Witneſs is called a *Deponent*.

DEPOSITION, in the Senſe of the Grammarians, is the Termination of the Dimenſions of a Latin or Greek Verſe, ſo as to diſcover whether it be perfect, redundant or deficient; wherefore in this reſpect they reckon four kinds of Verſes; *Acatalectick*, where no Syllable is wanting at the End; *Catalectick*, where a Syllable is wanting at the End; *Brachycatalectick*, where a Foot is wanting at the End; and *Hypercatalectick*, where a Syllable or two are redundant, and this kind is called alſo *Hypermetros*.

DEPRESSION *of Equation*: See *Equation*, N° 3.

DEPRESSION *of the Pole*; ſo many Degrees as you ſail or travel from the *Pole* towards the *Zenith*, you are ſaid to *depreſs the Pole*, becauſe it becomes (reſpectively) as much lower or nearer to the *Horizon*.

DEPRESSOR *vel Deprimens Auricularum*, a Muſcle of the Ear, in Beaſts ſerving to depreſs or let fall the Ear.

DEPRESSOR *Labii Inferioris*: It's difficult to determine whether this be one only, or two Muſcles, it lying between the *Depreſſores Labiorum Communes*, poſſeſſes that Part of the lower Jaw called the *Chin*, and aſcending with a direct and tranſverſe order of the Fibres, is inſerted into the nether Lip, in depreſſing of which it turns it outwards.

DEPRESSOR *Labiorum*, is a Muſcle that ariſes Fleſhy from the lower Edge of the inferior Jaw Bone laterally, and aſcends directly to its *Interior* at the Angle of the Lips: This, with its Partner and the *Quadrati* acting, expreſs a ſorrowful Countenance, in drawing down the Corners of the Mouth and Cheeks.

DEPRESSOR *Oculi*, is a Muſcle of the Eye which ariſes from the profoundeſt Part of the *Orbit*, and paſſes directly to its Inſertion to the oppoſite Part of the Globe of the Eye.

DEPRIMENS, or *Humilis*, one of the ſtraight Muſcles which move the Globe of the Eye; its Uſe is to pull it downwards.

DEPRIVATION, is a bereaving or taking away; as when a Biſhop, Parſon, Vicar or Prebend is *deprived* or depoſed from his Preferment for any Matter in Fact or in Law; as if a Schiſmatick or meer Lay-man be preſented, admitted, inſtituted and inducted, this is good Cauſe of *Deprivation*.

DEPTH *of a Squadron* or *Battalion*, is the Number of *Men* that are in a File; which of a Squadron is three, and of a Battalion generally ſix; whence it comes that we ſay a Battalion is drawn up 5 *deep*, or 6 *deep*.

DEPURATION, is the cleanſing of any Body from its excrementitious Dregs, or more groſs Parts.

DE *quibus ſur diſſei*, is a Writ of Entry: See *Fitzh. Nat. Brev.* Fol. 191.

DERAIGNE, or *Dereigne*, (in Law) ſignifies the Proof of a thing which one denies to be done by himſelf, and the Adverſary affirms it, defeating and confounding the Aſſertion of his Adverſary, and ſhewing it to be without and againſt Reaſon or Probability.

DESCANT, in Muſick, ſignifies the Art of compoſing in ſeveral Parts, and is threefold, *viz. Plain*, *Figurate* and *Double*.

Plain Deſcant, is the Ground-work or Foundation of Muſical Compoſition, and conſiſts altogether in the ordinary placing of many Concords.

Figurate or *Florid Deſcant*, is that wherein Diſcords are concern'd, as well (though not ſo much) as Concords; and may well be termed the Ornament or Rhetorical Part of Muſick, in regard that in this are introduced all the Varieties of Points, Figures, Syncopes, Diverſities of Meaſures, and whatſoever elſe is capable of adorning the Compoſition.

Double Deſcant, is when the Parts are ſo contrived, that the *Treble* may be made the *Baſs*, and on the contrary, the *Baſs* the *Treble*.

DESCENSION *Oblique*: See *Oblique Deſcenſion*.

DESCENSION *Right*: See *Right Deſcenſion*.

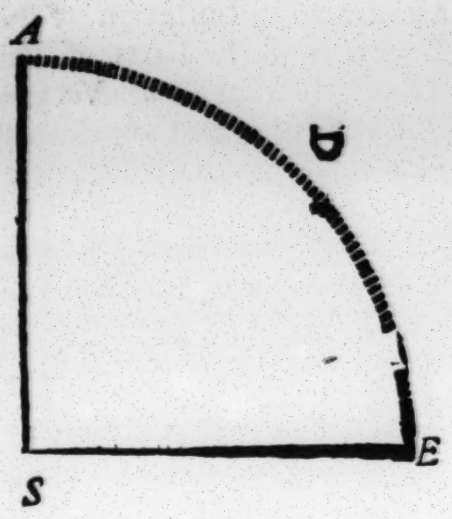
DESCENSORIUM, a Chymical Furnace, in which Subſtances are diſtill'd by Deſcent, or downwards.

DESCENT *in Law*: *Vid. Diſcent*.

DESCENTS, in Fortification, ſignify the Holes, Vaults, and hollow Places made by undermining the Ground, as the *Counterſcarp* or *Covert-way*; ſo that a DESCENT *into the Moat* or *Ditch*, is a deep digging into the Earth of the *Covert-way* in Form of a Trench, of which the upper Part is covered with *Madriers* or Clays againſt Fires, to ſecure the Paſſage into the *Moat*.

DE-

DESCENT *of heavy Bodies:* If a Body deſcend from *A* by its proper Gravity, it will come to the Center *S* in the ſame time as another ſuch like Body by its Revolution ſhall deſcribe the Quadrant *A D E. Princ. Phyſ. Math. Lib.* 1. *Prop.* 38. *Cor.* 1.



Wherefore abſtracting from the Reſiſtance of the *Medium*, all Bodies muſt needs deſcend equally ſwift, and come to the Center from the ſame Height at the ſame time, as in Fact is found by Experiment true.

An heavy Body let fall from any Height near the Surface of our Earth, deſcends in a Second of Time $16\frac{11}{24}$ Feet *Engliſh*, or 197 Inches and $\frac{1}{2}$.

Propoſition I.

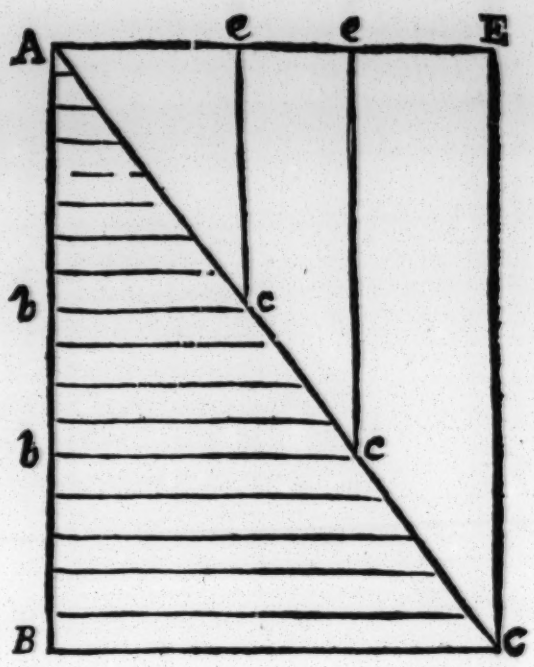
The Velocities of deſcending heavy Bodies are proportionate to the Times from the Beginning of their Falls. This follows (ſaith the Learned Capt. *Halley*, *Philoſ. Tranſ. N.* 179.) becauſe the Action of Gravity being continual, in every Space of Time the following Body receives a new Impulſe, equal to what it had before in the ſame Space of Time received from the firſt Power; *v. gr.* in the firſt Second of Time a Body hath acquired a Velocity, which in that Time would carry it a certain Diſtance; ſuppoſe 32 Foot, 2 Inches, and there were no new Force, it would continue to deſcend at that rate with *an equable Motion:* But in the next Second of Time, the ſame Power of *Gravity* continually acting thereon, ſuperadds a new *Velocity* equal to the Former, ſo that at the End of two Seconds, the *Velocity* is double to what it was at the End of the Firſt; and after the ſame manner may it be proved to be triple at the End of the third Second, and ſo on; wherefore the *Velocities of falling Bodies* are proportionate to the times of their *Falls*. *Q. E. D.*

Propoſition II.

The Spaces deſcribed by the Fall of a Body, are as the Squares of the Times from the Beginning of the Fall.

Demonſtration.

Let *A B* repreſent the *Time* of the *Fall* of a *Body*, *B C*, perpendicular to *A B* the *Velocity* acquired at the End of the *Fall*, and draw the Line *A C*; then divide the Line *A B* repreſenting the *Time*, into as many equal Parts as you pleaſe, as *b b b b*, &c. and from theſe Points draw the Lines *b c*, *b c*, &c. parallel to *B C*; 'tis manifeſt, that the ſeveral Lines *b c* repreſent the ſeveral *Velocities* of the falling Body, in ſuch Parts of the *Time* as *A b* is of *A B:* It is evident likewiſe, that the *Area A B C* is the Sum of all the Lines *b c* taken together, which according to the Method of *Indiviſibles*, are infinitely many; ſo that the *Area A B C* repreſents the Sum of all the *Velocities*, between none and *B C* ſuppoſed infinitely many; which Sum is the Space deſcended in the Time repreſented by *A B*. And by



the ſame Reaſon the *Area's A b c* will repreſent the Spaces deſcended in the Times *A b*; ſo that the Spaces deſcended in the Times *A B*, *A b*, are as the *Area*'s of the *Triangles A B C*, *A b c*; which, by the 20th of the 6th of *Euclid*, are as the Squares of their *Homologous Sides A B*, *A b*, that is to ſay, the *Times*; wherefore the Deſcents of falling Bodies are as the *Squares* of the Times of their *Fall*. *Q. E. D.*

Propoſition III.

The Velocity which a deſcending Body acquires in any Space of Time, is double to that wherewith it would have moved the Space deſcended by an equable Motion in the ſame time.

Demonſtration.

Draw *E C* parallel to *A B*, and *A B* parallel to *B C*, and compleat the *Parallelogram A B C E*; it is evident that the *Area* thereof may repreſent the Space, a *Body* moved equally with the *Velocity B C* would deſcribe in the Time *A B*; and the *Triangle A B C* repreſents the *Space* deſcribed by the Fall of a Body in the ſame time *A B* (by the foregoing *Propoſition.*) Now the *Triangle A B C* is half the *Parallelogram A B C E*, and conſequently the Space deſcribed by the *Fall*, is half what would have been deſcribed by an *equal Motion* with the *Velocity B C* in the ſame time; wherefore the *Velocity B C* at the End of the *Fall*, is double to that *Velocity* which, in the Time *A B*, would have deſcribed the *Space fallen*, repreſented by the *Triangle A B C* with an *equable Motion*. *Q. E. D.*

Propoſition IV.

All Bodies, on or near the Surface of the Earth, in their Fall deſcend ſo, as at the End of the firſt Second of Time they have deſcribed 16 *Feet, one Inch*, London *Meaſure, and acquired the Velocity of* 32 *Feet*, 2 *Inches in a Second.*

This is made out from the 25th *Prop.* of the 2d *Part* of Mr. *Hugenius de Horologio Oſcillatorio*; wherein he demonſtrates the time of the leaſt *Vibrations* of a *Pendulum*, to be to the Time of the *Fall* of a *Body* from the Height of half the length of the *Pendulum*,

dulum, as the *Circumference* of a *Circle* to its *Diameter*; whence, as a *Corollary*, it follows, That as the *Squares* of the *Diameter* to the *Square* of the *Circumference*, so half the Length of the *Pendulum* vibrating Seconds, to the *Space* described by the *Fall* of a *Body* in a Second of *Time*; and the Length of a *Pendulum* vibrating *Seconds* being found, 39, 125, or $\frac{1}{8}$ Inches, the *Descent* in a *Second* will be found by the aforesaid *Analogy* 16 Foot and one Inch; and by the last *Prop.* the *Velocity* will be double thereto; and near to this it hath been found by several *Experiments*, which, by reason of the *Swiftness* of the *Fall*, cannot so exactly determine its *Quantity*.

From these Four *Propositions* all *Questions* concerning the *Perpendicular Descent of Bodies* are easily solved; and either *Time*, *Height*, or *Velocity* being assigned, one may readily find the other two.

From them likewise is the Doctrine of *Projects* deducible, assuming the two following *Axioms*, *viz.*

1. That a *Body* set a moving, will move on continually in a *Right Line* with an *equable Motion*, unless some other Force or Impediment intervene, whereby it is accelerated, or retarded, or deflected.

2. That a *Body* being agitated by two *Motions* at a time, does by their *compounded Forces* pass through the same *Points* as it would do, were the two *Motions divided* and acted *successively*.

The Learned Mathematician Mr. *Keil*, in his Examination of Dr. *Thomas Burnet's Theory of the Earth*, P. 124. proves, That the Direction of heavy Bodies is not towards the Center of the Earth any where but at the Equator, or at the Poles: However they will be all perpendicular to their Horizons, and so there can be no Error in levelling of Lines, and in finding the Risings and Fallings of the Ground. And from hence (as he shews, P. 128.) 'tis plain, the Surface of the Earth cannot be exactly Spherical, but the Earth's Equatorial Diameter to its Polar is as 692 to 689.

DESCRIBENT, a Term in Geometry, expressing some Line or Surface which by its Motion produces a Plain Figure or a Solid: See *Dirigent*.

DESICCATION, is an Evaporation of superfluous Moisture by Heat.

DESICCATIVE *Medicines*, are the same with *Drying ones*.

DESIRE, is an Uneasiness in the Mind upon the absence of any Thing whose present Enjoyment carries the *Idea* of Delight with it; and is greater or less as that Uneasiness is more or less vehement.

DE SON *Tort Demesne*, are Words of Form in an Action of Trespass, used by way of reply to the Plea of the Defendant, when the Defendant says, He did what he did by the Command of his Master; the Plaintiff replies, That the Defendant did it *De Son Tort Demesne*, *viz.* of his own Wrong, &c.

DESPAIR, is the Thought of the Unattainableness of any Good, which works differently in Mens Minds, sometimes producing Uneasiness or Pain, sometimes Rest and Indolency.

DESPOTICK, is the same as absolutely Supreme, as when a Prince has gain'd such an Absolute and *Despotick* Power, that he will not be regulated by the Laws of his Country, but will govern only by his sole Will and Pleasure.

DESPUMATION, is a Term in Pharmacy, and signifies the clearing and cleansing of any Liquor, by letting it boil so as to take off the Scum.

DESSEIN, (in *French*) signifies two things in Painting, either in general, the *Design* or Thought that the Painter had about any great Piece, whether there be drawn only the *Out-lines* (or *Contours*; or whether he hath proceeded farther to put in the Shadows or the Colours; and if there appear much Masterly Skill or Judgment in the Thought or Design, we say the Design was Great and Noble, &c.

It also signifies the just Measures, the Proportions and external Forms which those Objects ought to have that are drawn in Imitation of Nature; and in this Sense 'tis one of the Parts of Painting, and may be called a *just Imitation of Nature*.

DESTILLATION, is an Extraction of the moist or unctuous Parts which are rarified into Vapour or Smoke, as it were, by the Force of Fire.

Destillation is performed *per Vesicam*, *i.e.* in a *Cucurbite* (before describ'd) by a *Retort*, by *Deliquium*, by *Filtre*, by *Descent*, &c. and that either in *Balneo Mariæ*, *Sand*, *Vapours*, *Dung*, the *Sun*, a *Reverberatory*, &c.

DET, or *Debt*, is a Writ that lies where any Sum of Money is due to a Man by reason of Account, Bargain, Contract, or Obligation, or other Specialty to be paid at a certain Day, which is not paid, then he shall have this Writ; but Action of *Debt* will not lie for Money due to a Lord by his Tenant for any Rent-Service, but he must distrain for it: So for Rent-charge or Rent-seck, which any Man hath for Life in Tail or in Fee, he shall not have any Action of *Debt* as long as the Rent continues, but his Executors may have an Action of *Debt* for the Arrearages due in the Lives of their Testator.

DETACHMENT, a Military Term, signifying a certain Number of Soldiers taken out of a greater Body, on purpose to be employed in the Undertaking of some particular Enterprise; it is to form a kind of flying Camp, to relieve a Party already engaged in Battel, to join a separate Army, to assist at the Siege of a Place, to enter into some Garrison, &c.

DETENTS, in a Clock, are those Stops which, by being lifted up or let fall down, do lock and unlock the Clock in striking.

DETENT-*Wheel*, or *Hoop-Wheel*, in a Clock, is that which has a *Hoop* almost round it, wherein there is a Vacancy, at which the Clock locks.

DETERGENT: See *Abstergent*.

DETERMINED *Problem*, in Geometry, is that which hath but one, or but one certain Number of Solutions. This Problem hath but one only Solution, *viz. To describe an Isosceles Triangle on a given Line, whose Angles at the Base shall be double to that at the Vertex:* But this following hath two Solutions; *To find an Isosceles Triangle, whose Area and Perimeter are given.*

A determined Problem may be either Simple or Linear, Plane, Solid or Surfolid: Which see.

DETERRATION, is a Removal of the Earth, Sand, &c. from the Mountains and higher Grounds, down into the Valleys and lower Parts: This is occasioned by Rain, which wash the Earthy Matter down by degrees; but this cannot be very considerable, or much raise the Surface of the Earth, as some have imagined, because a good Part of it is sunk into the Clefts and Caverns of the Rocks and Mountains, a great Quantity is born down into Rivers, and thence into the Sea, and the richer and finer Part helps to compose the Bodies of Plants and Vegetables.

DETERSIVE *Medicines*, are such as are used to cleanse the Body from sluggish, viscous and glutinous Humours.

DETINUE, is a Writ that lieth against him, who having Goods or Chattels delivered him to keep, refuseth to deliver them again; and he taketh his Action of *Detinue* that intendeth to recover the thing delivered

delivered, and not the Damages ſuſtained by the *Detinue*.

DETONATION, is a Chymical Word, expreſſing the thundring Noiſe that is often made by a Mixture being enkindled in the containing Veſſel; for the volatile Parts do fly out with great Velocity and Impetuoſity: 'Tis the ſame with *Fulmination*.

DETRUSOR-URINÆ, is a Muſcle which is by ſome reckoned the firſt proper Membrane of the Bladder, lying under that which is derived from the *Peritoneum*; its Carnous Fibres embracing the whole Bladder like a Hand (as *Spigelius* repreſents it) compreſſes it in the Evacuation of the Urine.

DEVASTAVERUNT *bona teſtatoris*, is a Writ lying againſt Executors for paying Legacies and Debts without Speciality, before the Debts upon the ſaid Specialities be due, to the Prejudice of Creditors.

DEVENERUNT, is a Writ directed to the Eſcheator, when any of the King's Tenants holding *in Capite* dies, and when his Son and Heir within Age, and in the King's Cuſtody dies, then ſhall this Writ go forth, commanding the Eſcheator, that by the Oaths of Twelve good and lawful Men, he enquire what Lands or Tenements, by the Death of the Tenant, come to the King.

DEVISE, or *Diviſe*, (in Common Law) is when a Man in his Will bequeaths his Lands or Goods to another after his Deceaſe; and he to whom the Lands or Goods are bequeath'd, is called the *Deviſe*.

DEVOURING, if any Fiſhes are born in an Eſcutcheon in a feeding Poſture, the Herald's Term for it is Devouring, becauſe Fiſh ſwallow all their Meat whole.

DEUTEROPATHIA, is a Diſeaſe that proceeds from another Diſeaſe; for Example, as the Head-Ach from the Diſtemper of another Part, the Morbifick Matter being tranſlated thither from its former Repoſitories. *Blanchard.*

DEW, is compoſed of Steams of the Terreſtrial Globe, which, for a while, ſwim to and fro in the Air, but at laſt convene into Drops, and then fall down again to the Earth.

DEW *of Vitriol*, ſo ſome Chymiſts will call a kind of *Phlegm* which is drawn from Vitriol in *Balneo Mariæ*, or with a gentle Heat.

DEXTER *Side* or *Point*, is the *Right* Side or Point in an Eſcutcheon. *Vid. Eſcutcheon.*

DIABETES, ſo *Galen* calls it, and *Agineta Dipſacus*, from the great Thirſt that attends it: and as others will have it, from a certain ſort of Serpent called *Dipſacus*, found eſpecially in *Libya*, which poyſons with its Bite, and brings an unquenchable Thirſt upon the Perſon affected. The Diſeaſe is too great a Fuſion of the Blood, whereupon the *Serum* paſſes the Reins, and is voided in great Quantities by the Paſſages of the Urine. *Blanchard.*

DIABROSIS, is a Solution of the *Continuum* by Corroſion of the Parts. *Blanchard.*

DIACLYSMA, is a waſhing of the Mouth to cleanſe it, or to ſtrengthen the Teeth or Gums. *Blanchard.*

DIACOPRÆGIA, a Medicine of Goat's Dung, and uſed againſt Tumours in the Spleen and Glandules behind the Ears, called *Parotides*. *Blanchard.*

DIACOUSTICKS, or *Diaphonicks*, is the Conſideration of the Properties of refracted Sound, as it paſſes through different Mediums.

DIACRISIS, is a Diſtinction and Dijudication of Diſeaſes and Symptoms. *Blanchard.*

DIADOCHE, is a ſucceeding by a *Criſis*. *Blanchard.*

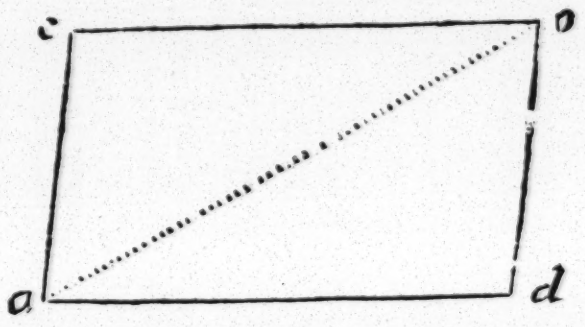
DIADROME, the ſame with the *Vibration*, or Motion, or Swing of a Pendulum.

DIÆRESIS, in Anatomy, is the eating out, or conſuming of the Veſſels of an Animal Body, when, from ſome cutting corroding Cauſe, ſome Ways and Paſſages are made which naturally ought not to have been; or when ſome which really are, yet are dilated more than ordinary, ſo that the Humours which ought to have been contained in the Veſſels, run out. *Blanchard.*

DIÆRESIS in *Grammar*, is the Diviſion of one Syllable into two, as in this Verſe of *Tibullus*, *Stamina non ulli diſſolüenda Deo*, for *Diſſolvenda*. This DIÆRESIS is uſually noted by two Points placed over a Letter, to ſhew that it is founded by it ſelf, and not joined with any other, ſo as to make a Diphthong; as *Æra* by the Points over the *e*, is diſtinguiſhed from *Æra*. 'Tis alſo a kind of *Metaplaſm* or Addition to a Word, by dividing one Syllable into two, as *Aulaï*, by a *Diæreſis*, is of three Syllables, inſtead of *Aulæ*.

DIÆTETICA, is a Part of Phyſick that preſcribes the Uſe and Knowledge of the *ſix non-natural Things*, as the Phyſicians ſpeak.

DIAGONAL, in Geometry, is a Line drawn acroſs from Angle to Angle in any Figure, and is by

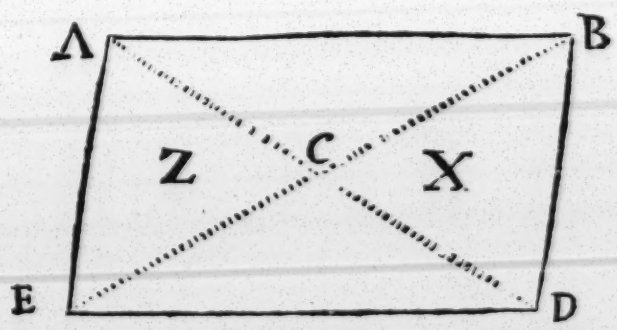


ſome called the *Diameter*; as in this Figure, *a b* is called a *Diagonal*

Propoſitions.

1. Every *Diagonal* divides a Parallelogram into 2 equal Parts; for the 2 △'s, *a c b* and *a b d* have the Sides *c b* = *a d*, *a c* = *d b* (becauſe oppoſite ones of the Figure;) and the Angle *c a b* = to the alternate one *a d b*, wherefore they are equal to each other. *Q. E. D.*

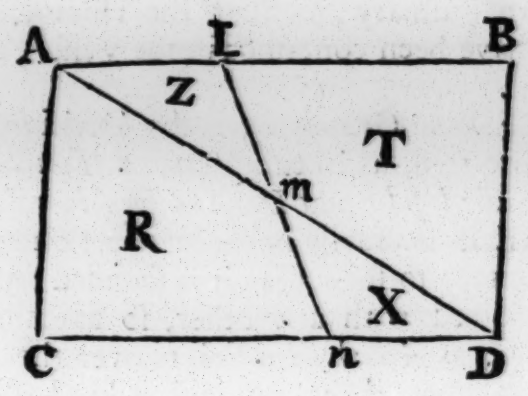
2. Two *Diagonals* *A D* and *B E* being drawn in any Parallelogram, do biſſect each other: I ſay *A C* = *C D*, and *B C* = *C E*; for in the Triangles *Z* and *X*, the Vertical Angles at *C* are equal, and



the alternate ones *E AD* and *ADB* are alſo equal, and the Side *AE* = *BD*; therefore all the Sides of *Z* are equal to thoſe of *X*, and conſequently *AC* = *CD*, and *EC* = *CB*. Q. E. D.

3. A Line (as *L N*) paſſing thro' the middle Point (*m*) of the *Diagonal* of a Parallelogram (*AD*) divides the Figure into two equal Parts: I ſay *Z* + *R* = *T* + *X*; for *Z* + *T* = *R* + *X* (becauſe of the

Diagonal) and the Triangle Z = Triangle X, as having the vertical Angles at M, and the alternate ones DAB and ADC, and alſo the Side AM and MD, all reſpectively equal to each other; therefore the remaining Trapezium R, when the



Triangle Z is taken away, muſt be equal to T when X is taken away; but if R be equal to T, and $Z = X$, then $Z + R$ muſt be equal to $X + T$, and each will be equal to half the Parallelogram. *Q. E. D.*

DIAGONAL *Scale*: See *Scale*.

DIAGNOSTICKS, a Term in Medicine, are the preſent Signs whereby to judge of a Diſeaſe, or a Knowledge whereby Men underſtand the preſent Condition of a Diſtemper; and they make it threefold, either a right Judgment of the *Part affected*, of the Diſeaſe it ſelf, or of its *Cauſe*.

DIAGRAM, is a Scheme for the Deſignation or Demonſtration of any Figure.

DIAGRYDIUM, or *Diacrydium*, Scamony prepared by boiling it in a hollowed Quince; ſome prepare it with Juice of Quince, and others with Juice of Lemons, or of pale Roſes.

DIAL, the firſt *Sun-Dial* that was ſet up in *Rome*, was by *Papyrius Curſor*, about the Year of the City 447, (and before that there is no mention, ſaith *Pliny*, of any Account of Time but of the Sun ſetting and riſing:) This Dial was ſet up in the Temple of *Quirinus*, but it went not right. About 30 Years after this, *M. Valerius Meſſala* (ſays *Varro*) being Conſul, brought out of *Sicily*, from the taking of *Catana*, another *Dial*, which he ſet up on a Pillar near the *Roſtrum*; but for want of its being made for that particular Latitude, it could not go true. Nevertheleſs they made uſe of it 11 Years, and then *Martius Philippus*, who was Cenſor with *L. Paulus*, ſet up another that was more exact. The *Greeks* alſo were a long Time without *Clocks* and *Sun-Dials*. Some attribute the Invention of *Sun-Dials* to *Anaximenes Mileſius*, and ſome to *Thales*. There are many Kinds of *Dials* mentioned by *Vitruvius*, as, one invented by *Beroſus* the *Chaldean*, which was on a reclining Plane, parallel almoſt to the Equinoctial; on this was an half Circle, and thence 'twas called *Hemicyclus*.

Ariſtarchus Samius found out the *Hemiſphere Dial*, and there were ſome *Spherical* ones, with a Needle for a *Gnomon*. The *Diſcus* of *Ariſtarchus* was an *Horizontal Dial*, with its Limb raiſed up all round to prevent the Shadow from extending it ſelf too far off.

DIAL-PLAINS, are plain Superficies upon which the Hour-Lines are drawn in any Latitude, and may be diſtinguiſhed into *Parallel*, *Perpendicular* and *Oblique*, according to their Poſition with reſpect to the *Horizon* of the Place where they are made.

Parallel Plains or *Dials* are ſuch as lie level with the *Horizon*, and on that account termed *Horizontal Dials*.

Perpendicular Plains are ſuch as ſtand erect to the *Horizon*, and ſuch are all thoſe that are ſet againſt an upright Wall or Building; which are of two Sorts, *viz.* either *Direct* or *Declining*; and theſe are often called *Mural Dials*.

Erect, *Direct South*, *Weſt*, *North*, *Eaſt Plains*, are thoſe Walls or Plains which face any one of the four *Cardinal Points of the Horizon*, and the *Dials* made upon ſuch a *Plain* are called *Erect*, *Direct South*, *Weſt*, *North*, *Eaſt Dials*.

Erect { *South*, *North*, } *Plains declining Eaſt* or *Weſt*, are thoſe *Plains* which lie open to any Two of the *Cardinal Points*, as to the { *South*, *North*, } and *Eaſt*, or to the { *South*, *North*, } and *Weſt*.

Oblique Plains, *reclining* from the *Zenith*, or *inclining* to the *Horizon*, are alſo of two ſorts, *viz.* either *direct Reclining*, or *Declining* and *Reclining*.

Direct South, *Weſt*, *North* or *Eaſt Recliners*, are thoſe *reclining Plains* which lie open to any one of the *Cardinal Points* of the *Horizon*.

Reclining { *South*, *North*, } *Plains declining Eaſt* or *Weſt*, are thoſe *Plains* which face any Two of the *Cardinal Points* { *South*, *North* } and *Eaſt*, or to the { *South*, *North*, } and *Weſt*.

DIALECT, is the peculiar Manner of *Idiom*, Spelling and Pronunciation of any Language in particular Places of the Nation: Thus among the *Greeks*, the *Ionick* and *Dorick* Way of Speaking and Writing was different from the *Athenian*, which therefore are called the Dialects of the *Greek* Language; and ſo it is in all Countries.

DIALECTICAL *Arguments*, in Logick, are ſuch as are barely probable, but do not convince or determine the Mind to either Side of the Queſtion; tho' ſome will have *Dialecticks* to be the ſame as the Art of true Reaſoning in general, and to be as comprehenſive as univerſal Logick.

DIALEIMMA, the ſame with *Apyrexia*.

DIALLING-GLOBE, is an Inſtrument made of *Braſs* or *Wood*, with a Plane fitted to the *Horizon*; and an Index particularly contrived to draw all Sorts of *Dials*, and to give a clear Demonſtration of that *Art*.

DIALLING-SPHERE, is an Inſtrument made of *Braſs*, with ſeveral Semi-circles ſliding over one another on a moving *Horizon*, to demonſtrate the Nature of the Doctrine of Spherical Triangles, and to give the true *Idea* of drawing Dials on all Manner of Planes: See more in *Dial*.

DIAMETER, is a Line that paſſes through the Middle of any Figure from one Corner to another; and this ſhould rather be called the *Diagonal*.

DIAMETER of a Circle, is a Right Line which paſſes through the Center of a Circle, and is terminated at each End by the Circumference dividing the Circle into two equal Parts.

DIAMETER of a *Conick Section*, is a Right Line drawn through the Middle of the Figure, and biſſecting all the *Ordinates*; and if it biſſect them at Right Angles, 'tis called the *Axis of the Section*, and often the *Ax*.

DIAMETER *Conjugate*, in the *Ellipſis*, is the ſhorteſt *Axis* or *Diameter*.

DIAME-

DIAMETER *Conjugate*, in the *Hyperbola*, is a Line drawn parallel to the *Ordinates*, and through the Center or middle Point of the Tranſverſe Axis, and is always a middle Proportional between the *Latus Rectum*, and the *Latus Tranſverſum*.

DIAMETRICALLY *Oppoſite*, is when two things are oppoſed to one another right acroſs, or directly contrary, as one End of a *Diameter* is to another.

DIANA'S *Tree*; diſſolve an Ounce of *Silver* in 3 Ounces of Spirit of Nitre, then pour the Diſſolution into a Matraſs, in which before you had put 18 or 20 Ounces of Water, and two Ounces of *Quick-ſilver*: The Glaſs muſt be filled up to the Neck; and all muſt lie ſtill on a round of Straw in ſome cool Place for 40 Days together, during which time the Tree will begin to ſpread forth its Branches, and will have little Balls at the End which will repreſent Fruit.

Another like a Firr Tree may be thus made; diſſolve an Ounce of Coppel *Silver* in 3 Ounces of *Aqua fortis*; ſet the Glaſs in Sand, and evaporate about half the Moiſture, after which add to the Remainder 3 Ounces of good diſtilled Vinegar; let it be a little hot, and keep it ſtirring; then put the Matraſs into a little cool Place for about a Month, and then the Tree will riſe up to the very Top of the Liquor.

To recover the *Silver* again in both theſe Experiments: In the *Former* take the whole Matter and ſhake it together, and then boil it for about ½ an Hour in an Earthen Veſſel; then let it cool till it's juſt no more than luke-warm, and pour upon it gently a Quart of Water, in which you had before diſſolved 2 Ounces of Salt; a white Precipitate will fall down, which gather and dry. Put it into a Retort in a Sand Furnace, fitting to it a Receiver filled with Water, and beginning with a ſmall Fire at firſt, increaſe it till the Retort is red hot. The Quick-ſilver will diſtil drop by drop into the Receiver; continue the Fire till no more will come; you will find the Mercury in the Bottom of the Receiver, which waſh and dry with a Linnen Cloth and Crumbs of Bread. The *Silver* will remain in the Retort, which may be recovered into pure *Silver*, by melting the Matter in a Crucible with a little *Salt Petre*.

In the latter Experiment, to get the *Silver* again, you need only pour ſalt Water upon the whole ſhaked together, which will precipitate a white Powder, and that Powder melted in a Crucible with a little *Borax* or *Salt-Petre*, will run into fine *Silver*. Becauſe this way of making *Diana's Tree* is very tedious, Mr. *Homberg* hath given us, in the *Memoirs Mathem. & de Phyſique*, *A. D.* 1692. *P.* 146. the following Method of making this curious Experiment in leſs than a Quarter of an Hour's Time.

Take four Drams of Filings of fine *Silver*, with which make an Amalgam, without heat, with two Drams of *Quick-ſilver*; then diſſolve this *Amalgam* in 4 Ounces of *Aqua Fortis*: Pour this Solution into 12 *Paris* Points of common Water (which is about 3 Gallons *Engliſh*;) ſtir it about a while to mingle it well together, and then keep it in a Glaſs Veſſel well ſtopp'd.

When you would make the Experiment, take about an Ounce of it and put it in a ſmall Viol, wherein put alſo about the Quantity of a ſmall Peaſe of the ordinary *Amalgama* of Gold or Silver, which ſhould be as ſoft as Butter, and ſet the Viol at reſt for about two or three Minutes; preſently after which you will ſee ſeveral ſmall Threads or Filaments ariſing perpendicularly from the little Bulb of the newly put in *Amalgama*, and which will ſenſibly grow, and thruſt out on the Sides ſmall Branches in the Form of a Tree. The Bulb or Ball of the *Amalgama* will grow hard, and be like a Pellet of white Earth, but the little Tree will be of the Colour of bright *Silver*.

Only obſerve, That the Water which ſerves once for this Experiment, will not ſerve a ſecond time.

Mr. *Homberg* ſaith, you may vary the Form of this Metalline Tree almoſt as you pleaſe: The ſtronger you make the firſt deſcribed Water, the thicker will the little Tree be in Branches, and the ſooner formed; but if that be weak, the Branches will be ſparing, ſlender, and ſlow in growing: And afterwards he ſhews how ſeveral other kinds of Trees may be formed alſo by Chryſtallization and by Digeſtion.

DIAPASMA, according to *Pliny*, is a dry Medicine made up of dry Powders, to be ſprinkled upon ſomething, as either upon Cloaths to perfume them, or upon Ulcers or Wounds ſeveral ways, or upon Drink to make it more delicious. *Blanchard.*

DIAPASON, a Greek Word, ſignifying a Chord including all Tones: 'tis the ſame with what we call an *Eighth* or an *Octave*, becauſe there are but ſeven Tones or Notes, and then the *Eighth* is the ſame again with the firſt. *Ariſtot.* ſays, it was not called *Dioctо*, as it ſhould have been, becauſe the ancient Harp, which had all the Tones then known, had but 7 Strings, the Terms whereof are as 2 to 1.

DIAPEDESIS, is an Eruption of the Blood by reaſon of the Thinneſs of the Veſſels. *Blanchard.*

DIAPENTE, an Interval of *Muſick*, whoſe Terms are as 3 to 2, it being the ſecond of the Concords, and makes an *Octave* with the *Diateſſaron*; it is otherwiſe called a *perfect Fifth*.

DIAPER, in Heraldry, ſignifies a Bordure fretted all over with ſome ſuch things as Bordures uſed to be charged with, all appearing between the Frets; a bearing which hath been uſed in ſome *French* and *Belgick* Coats of Arms.

DIAPHANEITY, is the Property of ſuch a Body as is *Diaphanous*, which is one that is tranſparent like Glaſs, the Humours of the *Eyes*, the *Tunica Cornea*, &c. And ſuch a Body hath its Pores ſo ranged and diſpoſed, that the Beams of Light can paſs freely through them every way.

DIAPHORESIS, Sweating, is a Perſpiration of all manner of *Effluvia* through the inviſible Pores of the Body.

DIAPHORETICKS: See *Sudorificks*.

DIAPHRAGMATICK-ARTERY, is by ſome ſaid to iſſue from the Trunk of the *Aorta*, and thence to go to the *Diaphragma*.

DIAPHRAGM, by ſome called *Septum Tranſverſum* and *Diſeptum*: The *Midriff*, is a Muſcle compoſed of two others, which divide the Middle from the Lower Cavity; the Firſt and Superior Muſcle ariſes from the *Sternum*, and the Ends of the laſt Ribs on each ſide. Its Fibres from this Semicircular Origination, tend towards their Center, and terminate in a *Tendon* or *Aponeuroſis*, which hath always been taken for the Nervous Part of the *Diaphragm*. The Second and Inferior Muſcle comes from the *Vertebræ* of the Loins by two Productions, of which that on the Right Hand comes from the Firſt, Second and Third *Vertebræ*. That on the Left Side is ſomething ſhorter, and both theſe Productions,

ctions join and make the Lower Part of the *Midriff*, which joins its Tendon with the Tendon of the Other, ſo as that they make but one Membrane, or rather Partition.

The *Diaphragm* is covered with a Membrane from the *Pleura* on its Upper ſide, and by the *Peritoneum* on its Lower; it is pierced in the Middle to make a Paſſage for the *Vena Cava*, and in its Lower part, for the *Oeſophagus*, and for the Nerves which go to the Upper Orifice of the Stomach. And again, between the Production of the Inferior Muſcle, paſſes the *Aorta*, the *Ductus Thoracicus*, and the *Vena Azygos*.

The *Diaphragm* receives Veins and Arteries called *Phrenicæ* from the *Cava* and *Aorta*, and ſometimes on its Lower Part two Branches from the *Vena Adipoſa*, and two Arteries from the *Lumbares*. It hath two Nerves which come from the third *Vertebræ* of the Neck, which paſs through the Cavity of the *Thorax*, and are diſperſed in the Muſcles of the *Diaphragm*.

In its Natural Situation the *Diaphragm* is Convex on the Upper ſide towards the Breaſt, and Concave on its Lower one towards the Belly: Therefore when its Fibres Swell and Contract, it muſt become plain on each ſide, and conſequently the Cavity of the Breaſt is enlarged to give Liberty to the Lungs to receive the Air in Inſpiration; and at the ſame time the Stomach and Guts are preſt for the Diſtribution of the Chyle. But it diminiſhes the Cavity of the Breaſt when it reſumes its Natural Situation, and preſſes the Lungs for the Expulſion of the Air in Expiration.

DIAPHRATONTES, are the Membranes called the *Pleura*, which cover the Inſide of the *Thorax*, and leave a kind of Partition in the Middle, called *Mediaſtinum*. *Blanchard*.

DIAPHTHORA, is a Corruption of any Part of the Body.

DIAPLASIS, is the Setting of a Limb which was out of Joint.

DIAPLASMA, is an Ointment, or Fomentation.

DIAPNOE, the ſame with *Diaphoreſis*.

DIAPYEMA, the ſame with *Empyema*.

DIAPYETICA, are Medicines which ripen and concoct Purulent Matter.

DIARIA *Febris*, the ſame with *Ephemera*.

DIARRHOEA, is a Looſeneſs in the Belly which ejects ſeveral Bilious, Pituitous, and other Feculent Excrements.

DIARTHROSIS, is a good Conſtitution of the Bones, whereby they are apt to move eaſily and ſtrongly; ſuch as is in the Arm, Hand, Thigh, Foot, &c.

DIASTOLE, is the Dilatation or Expanſion of the Heart, when the Blood flows into it, from the place where it is as it were accended, the Lungs.

DIASTOLE is alſo an *Accent* in Grammar, which ſhews that thoſe Words or Sentences to which it is adjoined, are to be ſeparated, and is marked thus (,) 'Tis alſo the making long a Syllable which is naturally ſhort.

DIASTYLE, is a ſort of Edifice, where the Pillars ſtand at ſuch a diſtance one from another, that three Diameters of their Thickneſs are allow'd for *Intercolumniation*.

DIATESSARON, a Word uſed in Muſick, ſignifying an Interval compoſed of one greater *Tone*, one leſſer, and one greater *Semi-Tone*; its Proportion being as 4 to 3. In Muſical Compoſition 'tis called a *Perfect Fourth*.

DIATHESIS, is the Natural or Præternatural Diſpoſition of the Body, whereby we are inclined to perform all Natural Actions ill or well. *Blanchard*.

DIATONICK, a Term which ſignifies the Ordinary ſort of Muſick which proceeds by different Tones, either in aſcending or deſcending; it contains only the two greater and leſſer Tones, and the greater Semi-Tone.

DICHOPHYIA, is a Fault in the Hair, when it parts and disjoins too much. *Blanchard*.

DICHORÆUS, is the Foot of a Latin Verſe conſiſting of four Syllables, of which the firſt is long, the next ſhort, the Third long, and the Laſt ſhort. 'Tis compounded of two *Choræus*, as *Comprobare*.

DICROTUS, is a Pulſe that beats twice.

DIDYMI, are Twins.

DIEM *clauſit extremum*, is a Writ that lieth for the Heir of him that holdeth Land of the King, either by Knight-Service or Soccage, and dieth, be he under or at full Age, directed to the Eſcheator of the County, to enquire of what Eſtate the Party died ſeized, and who is next Heir to him, and of what Value the Land is.

DIES CRITICI: See *Critici Dies*.

DIES-DATUS, a Term in Law, ſignifying a *Reſpite* given to the Tenant or Defendant by the Court.

DIESIS, in Muſick, is the Diviſion of a Tone below a Semi-tone, or an Interval compoſed of a leſſer or imperfect Semi-tone; ſo that when Semi-tones are placed where there ought to be Tones, or when a Tone is ſet where there ſhould be only a Semi-tone, this is called *Dieſis*.

Enharmonical Dieſis, is the Difference between the Greater and the Leſſer Semi-Tone.

Theſe *Dieſes* are the leaſt ſenſible Diviſions of a Tone, and are mark'd on the Score in Form of St. *Andrew*'s Croſs.

DIEU SON ACT, are Words uſed in our Law, and it is a Maxim, That the *Act* of God ſhall prejudice no Man: and therefore if a Houſe be beaten down by Tempeſt, or other *Act* of God, the Leſſee for Life or Years ſhall not only be quit in an Action of Waſte brought againſt him, but hath by the Law a ſpecial Intereſt to take Timber to build the Houſe again, if he will, for his Habitation. So when the Condition of an Obligation conſiſts in two Parts, in the Disjunctive, and both are poſſible at the Time of the Obligation made, and afterwards one of them becomes impoſſible by the *Act* of God, the Obligor is not bound to perform the other part, for the Condition ſhall be taken beneficially for him.

DIFFERENCE, in Logick, ſignifies an Eſſential Attribute belonging to any *Species* that is not found in the *Genus*, and is the *Univerſal Idea* of that *Species*; thus Body and Spirit are two *Species* of Subſtance, which do contain in their *Ideas* ſomething more than is in that of Subſtance; in Body we firſt find Impenetrability and Extenſion; in a Spirit a Power of Thinking and Reaſoning; ſo that the *Difference* of Body is impenetrable Extenſion, and the *Difference* of a Spirit is Cogitation.

DIFFERENCE, in Mathematicks, is the Remainder when one Number or Quantity is ſubſtracted from another.

DIFFERENCE *of Aſcenſion*: See *Aſcenſional Difference*.

DIFFERENCE *of Longitudes*, of two places on the Earth, is an Arch of the Equator, comprehended between the *Meridians* of thoſe two places.

DIFFERENCES in a Coat of Arms; So the Heralds call ſuch things as diſtinguiſh one Family from another, or Perſons of the ſame Family from each other. They are by *Guillim* accounted either *Ancient*

cient or *Modern*: The *Ancient* ones are the *Bordures* of all Kinds; the *Modern* are the *File* or *Labe*, *Creſcent*, *Mullet*, *Martlet*, &c.

DIFFORM, is a Word uſed in Oppoſition to *Uniform*, and ſignifies that there is no manner of Regularity in the Form or Appearance of a thing. The *Botaniſts* uſe it as a Diſtinction of the Flowers of Plants. See *Flower*.

DIFFUSION, is uſually taken to ſignify the diſperſing of the ſubtile *Effluvia* of Bodies into a kind of Atmoſphere all around them; thus the Light diffuſed by the Rays of the Sun, iſſuing all round from that amazing Body of Fire, and thus are the Magnetical Particles diffuſed every where round about our Earth in Parts adjacent to it.

DIGASTRICUS or *Biventer*, is a double Bellied Muſcle (whence its Name) which ariſes from the Proceſs called *Mammiformis* or *Maſtoides*, whence deſcending it becomes Tendinous, paſſing through the *Stylohyoideus*, and an Annular Ligament faſtned to the *Os Hyoides*; from which Bone ſome Tendinous Fibres do ariſe, and join with its ſecond fleſhy Belly, aſcending from thence to its Inſertion at the Middle of the Inferior Part of the Lower Jaw. The Middle Tendon of this Muſcle, and its Partner, paſſing through Two Annular Ligaments, fix'd to the *Os Hyoides*, as Ropes through a double Pulley, is a wonderful Contrivance of the Author of Nature to render them capable of pulling the Lower Jaw down, which had their Progreſs been direct from their Originations, that could not have been performed. Nor are there any Proceſſes, whether of the *Vertebræ* of the Neck, or the neighbouring Parts, that could give an Origination to thoſe Muſcles below their Inſertion, as in ſome *Quadrupeds*; wherefore the Divine Architect of Human Bodies has placed this double Pulley below their Terminations, whereby they perform their deſigned Office. Hence *Deglutition* is hindred when theſe Muſcles are in Action, they then preventing the Aſcent of the Tongue and *Larynx*: neither can we at that Time draw the lower Jaw down, becauſe the *Center of Direction* is pulled upwards; wherefore we are obliged on that Occaſion to keep the Jaws cloſe together. But in Dogs and other Voracious Animals, who have theſe Muſcles ariſing from the Tranſverſe Proceſſes of the firſt *Vertebræ* of the Neck, theſe Actions are not dependant; whence it is they devour their Aliment ſo quick.

DIGEST or *Pandects*; the 1ſt Volume or Tome of the Civil Law is called *Digeſts*, or *Pandects*: *Digeſts*, becauſe the Author hath put, or digeſted all things, every Book and Title in its proper and natural Place and Order; and *Pandects* from πᾶν and δέχομαι, as containing and comprehending in it ſelf all that ever *Juſtinian* drew or collected out of 150000 Verſes of the old Books of the Law.

This *Digeſt* was collected from the Works of 27 Venerable and Eminent Old Lawyers, whereof ſeveral were before Chriſt, and the Others flouriſh'd in the Time of the Emperors, even unto the Time of *Maximinus*, as we find from *Spartianus* and *Lampridius* in that Emperor's Life. The *Tome* of the *Digeſts* is divided into 7 Parts, and they again into 50 Books. To this *Tome* Sir *Thomas Ridley* adds the *Inſtitutions* or *Inſtitutes*; which ſee under that Word.

DIGESTER, a Veſſel ſo called by its Inventor Mr. *Papin*, and is a kind of *Balneum Mariæ Clauſum*.

DIGESTIO *Chymica*, a *Chymical Digeſtion*, is when things are digeſted by an Artificial Heat, juſt as they are naturally in the Stomach, which is when ſome Matter is put over a gentle Heat, to infuſe it in ſome proper *Menſtruum* or Liquor fit to diſſolve it, that ſo it may, as near as can be, be like the Effect of a Natural Heat.

DIGESTION, the Concoction of the Aliments, or the Diſſolution of them, by which they are turned into Chyle.

Mr. *Charles Leigh*, then of *Brazen-Noſe College* in *Oxon*, has a Diſcourſe concerning *Digeſtion*, publiſhed in *Phil. Tranſ. N.* 162. wherein he ſuppoſes that there is neceſſary to Digeſtion in the Stomachs of Animals, 1. *A Liquid Menſtruum*, which by its peculiar Faculty operates upon their Meat, and helps to diſſolve it. 2. A gentle Heat in the Stomach, which he thinks it receives from the Liver, and therein falls in with the Opinion of Dr. *Gliſſon*. 3. 'Tis neceſſary that the Stomach have a *Natural Situation*. 4. That the *Omentum* be aſſiſting; for it hath been found by Anatomy, that where the *Omentum* hath been purified in an Human Body, it was always accompanied with a bad Digeſtion and loſs of Appetite; and 'tis alſo obſervable, that thoſe Creatures which have no *Omentum*, as Hares and Conies, &c. do help their Concoction by doubling their hinder Legs, and reſting their Bellies upon them. 4. 'Tis neceſſary that the Stomach ſhould have a *Tunica Villoſa*, which both helps to divide the Meat into ſmall Parcels, and alſo keeps the *Tunica Carnoſa* from being too much diſtended, which would by degrees weaken and injure its Tone. 5. 'Tis neceſſary that the Guts ſhould lie in a winding Poſition, and be of a good length; for otherwiſe the Meat digeſted in the Stomach would paſs away too faſt.

The firſt of theſe, the *Liquid Menſtruum* or *Natural Ferment* of the Stomach, he thinks conſiſts of theſe Ingredients; 1. The *Saliva* or Spittle. 2. The Juice contained in the Stomachical Glands. And 3. The Nitro-aerial Spirit of the Nerves.

DIGESTIVE *Medicines*, are either *Internal* or *External*.

The *Internal* are uſually preſcribed to prepare the Body by Purgation, which they do by making the Humours fluid, attenuating and drawing viſcous or tough Subſtances, tempering ſuch as are ſharp, diluting Salts, blunting, concentrating, and imbibing Acids, &c.

External Digeſtives, are ſuch as ripen a Tumor, or generate good and laudable Matter in a Wound.

DIGIT, in Aſtronomy, is the Twelfth Part of the Diameter of the Sun or Moon; 'tis uſed to expreſs the Quantity of an Eclipſe.

DIGITATUM *Folium*, among the Botaniſts is the Term for the Leaf of the Plant, which either is compoſed of many ſimple Leaves ſet together upon one Foot-ſtalk, as in Cinque-foil, Vetches, &c. or elſe when there are many deep Gaſhes or Cuts in the Leaf, as in thoſe of Straw-Berries, Hops, &c.

DIGITORUM *Tenſor*: See *Extenſor Digitorum Communis*.

DIGITS, or *Monades*, a Term in Arithmetick, ſignifying any *Integer* under Ten, as, 1, 2, 3, 4, 5, 6, 7, 8, 9.

DIJAMBUS, is the Foot of a *Latin* Verſe of four Syllables, and compounded of two *Iambicks*, ſo that the firſt and laſt are ſhort, and the two middle long, as *Severitas*.

DILATATION, among the Anatomiſts, is when any Paſſages or Receptacles in the Body are too much ſtretched or diſtended; and in general, it ſignifies a thing's taking up more Space than it did before.

DILATORIUM, is a Chirurgeon's Inſtrument wherewith the Mouth is dilated or opened: It is called

called likewiſe *Speculum Oris*, becauſe by it one may ſee into the Mouth.

DILATORES *Alarum Naſi*, are ſmall thin Muſcles, having a double Order of Fibres decuſſating each other, not unlike the *Muſculi Intercoſtales*; they pull up the *Alæ*, and dilate the Noſtrils.

DILEMMA, is an Argument compounded uſually of four or more Propoſitions, and ſo diſpoſed, that own or grant which you will of them, yet ſtill the Argument ſhall preſs you, and hem you in with Difficulties not readily to be ſolved or ſurmounted, eſpecially if the *Dilemma* be juſt; in order to which, *the Diviſion and Enumeration of the Parts muſt be adequate and entire*; *your Antagoniſt muſt be truly preſſed and affected with one or more of the Propoſitions*; and the *Arguer* himſelf free from a Poſſibility of having the *Dilemma* returned upon him.

DILUTE, is a Word frequently uſed by the Writers of Chymiſtry and Pharmacy, and ſignifies the Diſſolution of the Parts of a dry Body in a moiſt or liquid one; for when the Body is ſo diſſolved, they ſay 'tis *diluted*.

DIMENSION, in Geometry, is either Length, Breadth or Thickneſs: Thus, a Line has, they ſay, one *Dimenſion*, *viz.* Length; a Surface two, *viz.* Length and Breadth; and a Body or Solid hath all three *Dimenſions*. 'Tis uſed alſo with Regard to the Powers of any Root in an Equation, which are called the *Dimenſions of that Root*; as in a Biquadratick Equation, the higheſt Power hath 4 *Dimenſions*, or its Index is 4.

DIMETIENT, the ſame with *Diameter*.

DIMINISHED *Angle*, a Term in Fortification. See *Angle*.

DIMINUTIO: See *Litotes*.

DIMINUTION, in Muſick, is nothing elſe but the diminiſhing or abating ſomewhat of the full Value or Quantity of any *Note*.

DINUS, according to ſome, is the Name of a Diſeaſe called uſually the *Vertigo*.

DIOPTER, is the ſame with the *Index* or *Alhidada* of an *Aſtrolabe*, or the like *Inſtrument*.

DIOPTRA, is an Inſtrument uſed by Chirurgeons, whereby one may ſee into the *Matrix*; otherwiſe called *Dilatatorium*, wherewith the Womb is dilated and enlarged in the Extraction of a dead *Fœtus* out of it, or in the inſpecting any Ulcers that are in it: 'Tis alſo called the *Speculum Matricis*.

DIOPTRICKS, is a Part of *Opticks* treating of the different Refractions of the Light paſſing through different *Mediums*, as the Air, Water, Glaſſes, &c.

DIORTHOSIS, a Chirurgical Operation, by which crooked or diſtorted Members are made even, and reſtored to their Primitive and regular Shape.

DIOTA, the Chymiſt's Term for a circulating or double Veſſel.

DIPLASIASMUS, is a Reduplication of Diſeaſes; alſo two Muſcles of the Arm, which ſerve to turn it about. *Blanchard.*

DIPLOE, is the lower thin Plate or Shell of the Skull; alſo a double Veſſel uſually with Chymiſts.

DIPLOMA, the ſame with *Diploe*; ſometimes it is taken for a complicated or folded Cloth.

DIPPING *Needle*, is an *Engliſh* Diſcovery (Dr. *Wallis* thinks by Mr. *Blagrave*, or ſome other Greſhamite, *Phil. Tranſ.* 276.) of a Property in the *Magnetick Needle*; that beſides its Polarity or Verticity, which is its Direction towards the *North* in a Horizontal Poſition, it hath alſo a Direction of Altitude above the Horizon; and that it will (if duly poized about an Horizontal Axis) always point to a determinate Degree of Altitude or Elevation above the Horizon in this or that Place reſpectively.

DIPSACUS, according to ſome, is the ſame with *Diabetes*.

DIPTERON, in Architecture, is a Name which the Ancients attributed to thoſe Temples which were encompaſſed with a double Row of Pillars, making two Portico's, which they called *Wings*; but we commonly call them *Iſles*, from the *French* Word *Ailes* of the ſame Signification.

DIPTOTES, are ſuch Nouns in Grammar as have but two Caſes, as *Suppetiæ*, *Suppetias*, &c.

DIRECT; in Aſtronomy, a *Planet* is ſaid to be *direct*, when by its proper Motion it goes forward in the *Zodiack* according to the Succeſſion of the Signs, or rather when it appears ſo to do, the Obſerver's Eye being placed on our Earth.

DIRECT, *Erect*, *Eaſt* or *Weſt Dials*, are thoſe whoſe Planes lie directly open to the *Eaſt* or *Weſt* Points of the Heavens, or parallel to the Meridian of the Place.

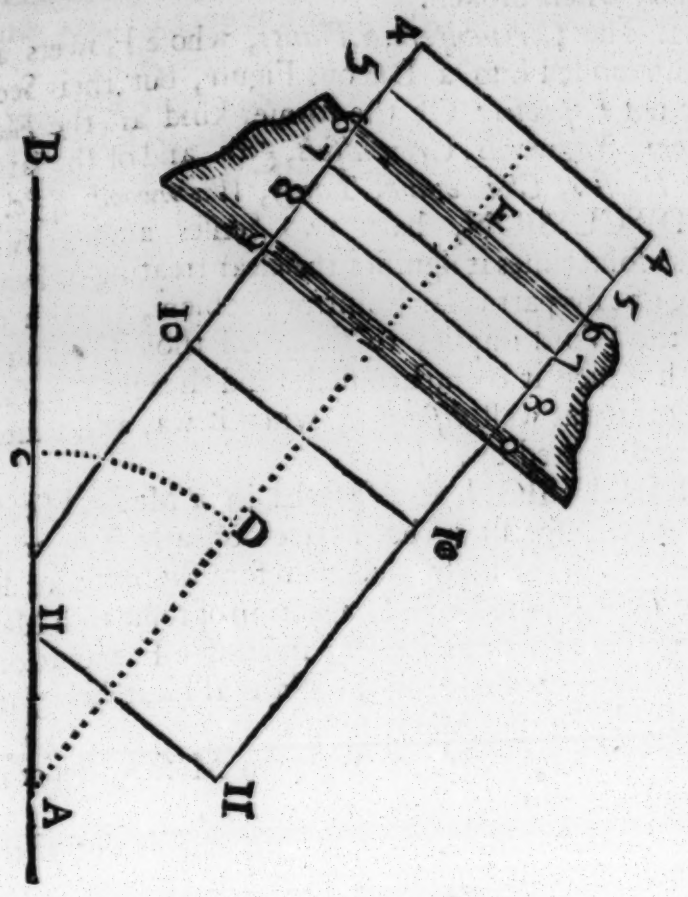
To draw this Dial, the Style's Height may be found according to the Bigneſs of the Plane, and the Diſtance of the Hour Lines from each other, by the Direction given under *Polar Dials*, making of them a Table, as in the following one, for the *Lat.* 51. *Deg.* 32. *Min.*

Hours.	*Angles at Pole.*		*Tangent.*		*Hours.*
Eaſt.	*D.*	*M.*	*Inch*	*P.*	*Weſt.*
4	30	00	5	77	8
5	15	00	2	68	7
6	*Subſtyle.*		00	00	6
7	15	00	2	68	5
8	30	00	5	77	4
9	45	00	10	00	3
10	60	00	17	32	2
11	75	00	37	32	1
12	*Infinite.*		*Infinite.*		

Then to deſcribe the Dial, draw the *Horizontal Line* A B; and with 60 *Deg.* from your Chords deſcribe the prick'd Arch *C D*, whereon ſet the Co-Latitude of the Place from *C* to *D*. From *A*, through *D*, draw *A D E*, repreſenting the Equator of the Dial; then chuſe a Point in this Line to be the Hour of 6, as at *E*. Draw 6 *e* 6 at Right Angles with the Equator; and from *E* ſet off the ſeveral Tangents as you find them in the Table, and thoſe ſhall be the ſeveral Points for the Hours, and through each Point draw the Hour Lines parallel to the Equator 6 *e* 6.

The *Style* may be a ſtraight Pin equal in Height to the Right Line 6, 9. in either Dial, or which is better and more uſual, a Rod or Ledge of Iron ſupported by two Legs, and ſet upon the Line 6, 6, and of the ſame Height 6, 9 as the Pin.

A Direct, Erect, East Dial, Lat. 51 *Deg.* 32 *Min.*



The *West Dial* is made after the same manner, only set and numbred a contrary way.

DIRECT, *Erect, South or North Dials:* See *Prime Verticals.*

DIRECT, *Erect Planes:* See *Dial Planes.*

DIRECT { *Inclining* / *Reclining* } *Plains:* See *Dial Planes.*

DIRECT *South* or *North* { *Inclining* / *Reclining* } *Dials*, are those whose *Planes* { *Incline* to the / *Recline* from the } { *Horizon* / *Zenith* } and lie directly open to the *South* or *North.*

These *Dials* are described after the same manner with *Direct South Dials*, only observing this Rule in placing the *Style.*

In *South Incliners*, the Difference of the *Angle of Inclination*, and the *Height of the Pole*, is the *Height of the Style* above the *Plane.*

If the *Pole's Height* be { greater / lesser } than the *Angle of Inclination*, then the { *North* / *South* } *Pole* is elevated, and the Center is { below. / above.

In *Direct North Incliners*, the Sum of the *Angles of Inclination* and *Elevation of the Pole*, is the *Height of the Style* above the *Plane.*

Note, That *Reclining Dials* are to be made after the same Manner; for *South Incliners* are *North Recliners*, and *North Recliners* the same with *South Incliners*, the one being the Back-side of the other.

DIRECT *Ray*, in *Opticks*, is the Ray which is carried from a Point of the visible Object directly to the Eye through one and the same *Medium.*

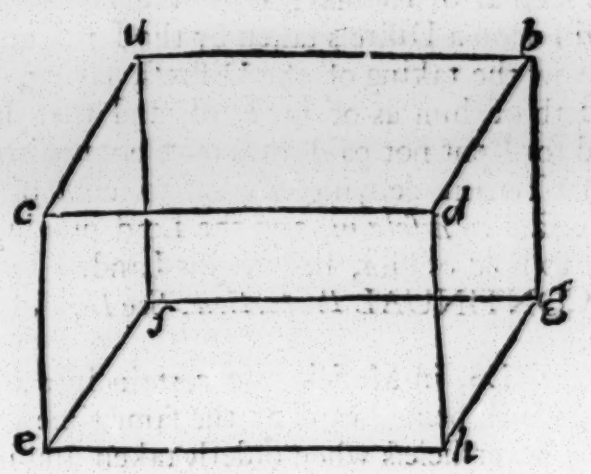
DIRECT *Sphere:* See *Right Sphere.*

DIRECTION, a Term in Mechanicks, wherein, by the *Line of Direction*, they always mean the Line of Motion that any Body observes, according to the Force impressed upon it, and which is determined or *directed* to move such a way.

DIRECTRIX of the *Conchoid:* See *Conchoid.*

DIRIGENT, a Term in Geometry, expressing the Line of Motion, along which the *Describent Line* or Surface is carried in the *Genesis* of any Plane or Solid Figure.

Thus, If the Line *a b* move along the Line *a c*, so that the Point *a* do always keep in the Line *a c*, a Parallelogram, as *a b c d*, will be form'd, of which the Side *a b* is the *Describent*, and the Line *a c* the *Dirigent:* So also if the Surface *a b c d* be suppo-



sed to be carried along the Line *c e*, in a Position always parallel to it self in its first Situation, the Solid *a d f h* will be formed where the Surface *a d* is the *Describent*, and the Line *c e* is the *Dirigent.*

DISABILITY, in Law, is taken notice of four several ways; *viz*, by the Act of the Ancestor; by the Act of the Party; by the Act of Law; and by the Act of God.

1. *Disability* by the Act of the Ancestor, is if a Man be attainted of Treason or Felony; by this Attainder his Blood is corrupted, and thereby himself and his Children are *disabled* to inherit.

2. *Disability* by the Act of the Party himself, as if one Man make a Feoffment to another that then is Sole, upon Condition that he shall enfeof a Third before *M.* and when such Feoffment is made, the Feoffee takes a Wife; he hath by that *disabled* himself to perform the Condition according to the Trust in him reposed, and therefore the Feoffer may enter and out him. Also if a Man be excommunicated, he cannot, during that Time, sue any Action, but shall be thereby *disabled*; and so in other Cases.

3. *Disability*, in Act of Law, is properly when a Man, by the sole Act of Law, is *disabled*, and so is an Alien born; and therefore if a Man born out of the King's Ligeance will sue an Action, the Tenant or Defendant may say that he was born in such a Country out of the King's Ligeance, and demand Judgment if he shall be answered; for the Law is our Birthright, to which an Alien is a Stranger, and therefore *disabled* to take any Benefit thereby.

4. *Disability* by the Act of God, as to be *Non compos mentis*, or *Non sanæ memoriæ*, which so *disables* him, that in all Cases where he gives or passes any thing, or Estate out of him, after his Death it may be disannulled and avoided.

DISCENT, in commom Law, signifies an Order or Means whereby Lands or Tenements are derived unto any Man from his Ancestors, as to make his *Discent* from his Ancestors, and is to shew how and by what Degrees the Lands in Question came to him from his Ancestors. And this *Discent* is either *Lineal* or *Collateral*; *Lineal Discent* is convey'd downwards in a right Line from the Grandfather to the Father, and from the Father to the Son, and from the Son to the Nephew, &c. *Collateral Discent* is springing out of the Sid of the whole Blood, as Grandfather, Father's Brother, &c.

DISCENS *sive Disciformis Cometa*, (according to some) is a *Comet* resembling the Shape of a round Dish or Platter; and the Chief of this kind is called a *Solar Comet*, from the likeness of its Rays to those of

of the *Sun*; and otherwiſe *Roſa* and *Chryſeus*, from its bright Silver Colour mix'd with a Golden or Amber Colour: Thoſe of this ſort, which are not abſolutely circular, but reſemble the Figure of a Shield, are thence termed *Clypeiformes*.

DISCLAIMER, in Law, is a Plea containing an expreſs Denial or Refuſal; as if the Tenant ſue a Replevin upon a Diſtreſs taken by the Lord, and the Lord avow the taking of the Diſtreſs, ſaying, That he holdeth of him as of his Lord, and that he diſtrained for Rent not paid, or Service not performed; then the Tenant denying himſelf to hold of ſuch Lord, is ſaid to *diſclaim*, and the Lord proving the Tenant to hold of him, he loſes his Land.

DISCONTINUAL *Proportion*: See *Diſcrete Proportion*.

DISCORDS, in Muſick, are certain Intervals of Sounds, which being heard at the ſame time offend the Ear; nevertheleſs when orderly taken and intermix'd with Concords, they make the beſt Muſick. Theſe *Diſcords* are the Second, Fourth and Seventh, with their Octaves; that is to ſay, all Intervals, except thoſe few which preciſely terminate the *Concords*, are *Diſcords*.

DISCOURSE, in a Logical Senſe, is that rational Action of our Mind by which we form or infer any new Judgment from others before made; or whereby we can infer or conclude one thing from another.

DISCRETE or *Disjunct Proportion*, is when the *Ratio* between 2 Pairs of Numbers or Quantity is the ſame, but there is not the ſame Proportion between all the four Numbers: Thus, if theſe Numbers 6 : 8 :: 3 : 4, are conſidered, the *Ratio* between the firſt Pair 6 and 8 is the ſame as that between 3 and 4, and therefore theſe Numbers are proportional; but 'tis only diſcreetly or disjunctly, for 6 is not to 8, as 8 to 3; that is, the Proportion is broken off between 8 and 3, and is not continued all along, as it is in theſe following, which are called *Continual Proportionals*, *viz.* 3 : 6 :: 12 : 24.

DISCRETE *Quantity*, is ſuch as is not continued and joined together, as *Number*, whoſe Parts being diſtinct Units, cannot be united into one *Continuum*; for in a *Continuum* there are no actual determinate Parts before Diviſion, but they are potentially Infinite; wherefore it is uſually and truly ſaid, *That continued Quantity is diviſible in Infinitum*.

DISCRETIVE *Propoſitions*, are thoſe where various Judgments are made and denoted by the Particles (*but*, *notwithſtanding*) or Words of the like Nature either expreſs'd or underſtood: Thus, *Fortune may deprive me of my Wealth, but not of my Virtue: They who croſs the Sea, change only their Country, but not their Diſpoſition*, are called *Diſcrete Propoſitions*.

DISCUS, among the *Romans*, was a round Quoit of Metal or Stone about a Foot in Diameter, which, in ancient Exerciſes, they threw in the Air to ſhew their Strength: Alſo they gave the ſame Name to a round Shield conſecrated to the Memory of ſome famous Hero, and hung up in the Temples of their Gods as a Trophy for ſome great Action. From the Figure of either of which, but rather from the former, comes the Word ſo much in uſe among Aſtronomers, *viz.* the *Disk* of the Sun or Moon; by which they mean the Round of the Planet's Body as it appears to us.

DISCUS, is uſed by the Botaniſts to denote the middle, plain and flat Part of ſome Flowers, ſuch as *Caltha*, *Flos Solis*, &c. becauſe 'tis in Figure like the ancient *Diſcus*: And they reckon two kinds of Plants with a *Diſcous Flower*;

1. Such as have the Flower compounded, and the Seed pappous, but the Leaves and Stalks are not Milky when broken.

2. The *Corymbiferous Plants*, whoſe Flowers are compounded into a Diſcous Figure, but their Seeds are not *Pappous*: Of the former kind are the *Fleabanes*, *Ragweeds*, *Groundſels*, &c. and of the latter are *Daiſies*, *Chamemile*, *Tanſy*, *Wormwood*, &c.

DISCUSSION, hath two Senſes among Writers; ſometimes it ſignifies the clear treating or handling of any particular Point or Problem, ſo as thereby the Word implies to *ſhake* off thoſe Difficulties with which it is embarraſſed; and thus we ſay, ſuch a Point was well *diſcuſſed*, when it was well treated of and cleared up. But

DISCUSSION is alſo uſed in a Medical Senſe, for the diſperſing the Matter of any Tumor or Swelling in the Body, and therefore the Surgeons define *Diſcuſſion* to be an Evacuation of ſome thin Matter gathered in any Part by inſenſible Evaporation; and this is procured by the Natural Heat being increaſed by proper Medicines.

DISDIAPASON, a Term in Muſick, denoting a double Eighth or Fifteenth.

DISEMBOGUE, when a Ship paſſeth out of the Mouth of ſome Gulph, they call it *Diſemboguing*: They ſay alſo of a *River*, that at ſuch a Place, or after it hath run ſo many Leagues, it *diſembogues* it ſelf into the Sea.

DISJUNCT *Proportion*, the ſame with *Diſcrete*: Which ſee.

DISJUNCTIVE *Propoſitions*, are thoſe wherein the Disjunctive, Conjunctive (*or*) is found; as, *either the Sun moves about the Earth, or the Earth about the Sun*; *Men are guided either by Intereſt or Fear*.

DISLOCATION, the ſame with *Luxation* or putting a Limb or any Bone of the Body out of Joint.

DISMES *Decimæ* are Tythes, and ſignify the Tenth Part of all the Fruits of the Earth, or tame and profitable Beaſts of it, or of Mens Labour.

DISMOUNT, in the common Military Uſe, is to unhorſe, as to diſmount the Cavalry; but they call it alſo *diſmounting of Cannon*, when they are thrown off the Carriages, and are broken, or any Horſe rendred unfit for Service.

DISPART, a Term in Gunnery, ſignifying the ſetting a Mark on the Muzzle-Ring of a Piece of Ordnance, or thereabouts, ſo that a Sight-Line taken upon the Top of the Baſe Ring againſt the Touch-hole, by the Mark ſet on or near the Muzzle, may be parallel to the Axis of the Concave Cylinder. The common Way of doing which, is, to take the two Diameters of the Baſe Ring, and of the Place where the *Diſpart* is to ſtand, and divide the difference between them into two equal Parts, one of which will be the Length of the *Diſpart*, which is ſet on the Gun with Wax or Pitch, or faſtened there with a Piece of *Twine* or *Marlin*: But an Inſtrument may be made to do it to all poſſible Nicety.

DISPENSATORY, is a Book uſed by *Apothecaries*, wherein all Medicines, at leaſt the moſt uſual, are contained and preſcribed, that they may be prepared in the Shops all the Year round.

DISPLAYED, the Term in Heraldry for an Fagle in an erect Poſture, and her Wings ſpread abroad.

DISPONDÆUS, is the Foot of a Latin Verſe conſiſting of four Syllables, and thoſe all long, as *Concludentes*, ſo that this is a Compoſition of two *Sponde's*.

DISPOSITION: See *Method.* In Architecture they call the juſt placing of all the ſeveral Parts of an Edifice, according to their proper Order, *Diſpoſition.*

DISQUISITION, an Enquiry into the Nature, Kinds and Circumſtances of any Problem, Queſtion or Topick, in order to gain a right Notion, and to diſcourſe clearly of it.

DISSEISIN, in Law, ſignifies an unlawful diſpoſſeſſing a Man of his Land, Tenement, or other immovable or incorporeal Right.

DISSEISIN *upon Diſſeiſin,* is where the *Diſſeiſor* is *diſſeiſſed* by another.

DISSEMINATE *Vacuum:* See *Vacuum.*

DISSIMILAR *Leaves,* are the two firſt Leaves of any Plant at its firſt ſhooting out of the Ground; and are ſo called becauſe they uſually are of different Form from the common Leaves of the grown Plant. Theſe Dr. *Grew* obſerves to be nothing but the very Lobes of the Seed expanded and thus advanced. Their Uſe is for the Protection of the *Plume,* which being young and tender, is thus guarded on each Side, and alſo hath ſome Rain or Dew gradually conveyed down to it by this Means.

DISSIMILAR *Parts,* in Anatomy, (by ſome called *Compound* and *Organical*) are ſuch as can be divided into various Parts different from one another; as the Hand is into Veins, Muſcles, Bones, &c. whoſe Portions are neither of the ſame Nature nor Denomination.

DISSOLVING *Medicines:* See *Diſcuſſion.*

DISSOLUTION, is when Electuaries and Powders are mingled and diſſolved in Water or a Decoction. *Blanchard.*

DISSONANCE, in Muſick, is a diſagreeable Interval between two Sounds, which, being continued together, offend the Ear.

DISTANCE, in Navigation, is the Number of Degrees, or Leagues, &c. that a Ship has ſailed from any given Point.

DISTANCE *of the Baſtions,* in Fortification, is the Side of the *Exterior Polygon.*

DISTEMPER, a Term in Painting for the working up of Colours with ſomething elſe beſides bare Water or Oil; for if the Colours are prepared with the former of theſe, that kind of Painting is called *Limning*; and if with Oil, 'tis called *Painting in Oil,* and ſimply *Painting*; but if the Colours are mix'd with Siſe, Whites of Eggs, or any ſuch proper glutinous or unctuous Subſtance, and not with Oil, they then ſay 'tis done in *Diſtemper,* as the admirable *Cartons* are at *Hampton Court.*

DISTENTION, is when Parts are puffed up, dilated or relaxed by any thing; as the Guts by Wind raiſed from Effervescencies within them, whence Oppreſſions and Pains frequently proceed. *Blanchard.*

DISTILLATION, is drawing off ſome of the Principles of a Mixture, as the Oil, Spirit, Water, &c. in proper Veſſels, by the help of a Fire; and is twofold.

1. *Per Aſcenſum,* when the Matter to be diſtilled above the Fire.

2. *Per Deſcenſum,* when the Matter to be diſtilled is below the Fire, and ſo the Vapour not being able (by the Contrivance of the Veſſel) to riſe upward, is forced to precipitate and to diſtil down to the Bottom of the Veſſel.

Oil of Cloves, if you would have it White, is beſt made this Way.

Diſtillation of Vegetables or Minerals is very different, according to the Nature of the Body to be diſtilled. Acid Spirits are drawn in a ſtrong Re-

tort, and with very great Fires, and uſually in a Reverberatory Furnace. Ponderous Woods are diſtilled in a Retort after the ſame manner, and with near the ſame Degree of Heat, ſuch as *Guajacum, Box,* &c. and in theſe firſt comes a little Phlegm, and then the Fire increaſing, the Spirits fly out in white Clouds; when they ceaſe to come, the Matter in the Receiver is filtrated through a Tunnel lined with Cap-Paper; the Spirit will paſs, but leave the Black Fetid Oil in the Tunnel, which afterwards may be rectify'd (if it be worth while) by making it up into Pellets with Sand, and then diſtilling it over again in a naked Fire, there will come over a clear Oil. The Spirit alſo may be rectify'd by diſtilling it over again in a Glaſs Alembick: Put Fire to the black Coals remaining in the Retort, and they will ſoon kindle and turn to Aſhes; which Aſhes may be calcined a while in a Potter's Furnace, and then a *Lixivium* being made of them with Water, and the Water filtrated and evaporated, the fix'd Salt of the Wood will remain at the Bottom; and thus all the five Principles may be drawn from *Amber, Ponderous Woods,* &c.

Plants that are Odoriferous are to be diſtilled *per Veſicam,* but firſt let a ſtrong Decoction of the ſame Plant be poured hot upon the Plant it ſelf bruiſed and put into the Body, and there let the Matter digeſt two Days, the Veſſel being cloſe ſtop'd: Then fit all things for Diſtillation, and with a Fire of the ſecond Degree draw off about half the Water you poured on the Plant; this will be a very good Water, and taſte and ſmell ſtrongly of the Plant.

Preſs through a Cloth ſtrongly what remains in the Body, filtrate and evaporate in a gentle Heat till the Matter be of the Conſiſtence of thick Honey. This is the *Extract* of the Plant; but the Extracts of Odoriferous Plants are not ſo good as thoſe of Vegetables which are not ſo, becauſe abundance of the finer Volatile Parts evaporate with the Moiſture.

Dry what remained in the Cloth after Expreſſion, and then burn it (with more of the Plant dried, if you will:) Make a *Lixivium* of the Aſhes, and then filtrate and evaporate to drineſs, and the fix'd Salt of the Plant will remain at the Bottom. And thus may Balm, Wormwood, Sage, Hyſſop, &c. be diſtill'd, and their Waters, Oils and Extracts made, and their fix'd Salts gain'd.

To diſtil Plants that are not Odoriferous, 'tis beſt to proceed thus; pound the Plant, and then fill two Thirds of the *Veſica* or *Alembick* with it, and after that pour on a good quantity of the expreſſed Juice of the ſame Plant, ſo that the bruiſed Matter may float in the Juice, and not ſtick to the Bottom or Sides of the Veſſel: Then fit on the Head, and draw off about half as much Water as you uſed Juice; this will be a very good diſtill'd Water of that Plant. Preſs through a Cloth what remains in the Still, and let the Juice ſettle; then filtrate it, and after that, in a ſmall Heat, evaporate about two Thirds of the Liquor in a Glaſs or Earthen Veſſel; then remove the Veſſel into a Cellar, or ſome ſuch cool place, and the *Eſſential Salt* will ſhoot out into Chryſtals; which gather, and keep in a Viol well ſtop'd; or you may make the *Extract fixed Salt* of it as above directed, as of an Odoriferous Plant.

To diſtill a Spirit from any Plant like that of Scurvy-Graſs, they proceed thus: The Plant is pounded to a Pulp in a Marble Mortar, and then put into an Earthen Veſſel ſo as to fill it but half full; after which the expreſſed Juice of the ſame Plant is pour-

ed upon it till it be about 6 Inches above the Matter: After this they mix with it all about a Pint of *Yeſt* or *Barm*, and then ſtopping the Veſſel, they ſet it to ferment, either in the warm Sun, or in Horſe Dung, for three or four Days, or more if it be cold Weather: As ſoon as you perceive that it hath done fermenting, and that its Surface begins to ſink or ſubſide, put the Matter ſpeedily into a Cucurbite or *Veſica*, and luting on the Head, ſet the Veſſel in a *Balneum Vaporis*, and diſtil, with a gentle Fire, about two Pints of the Liquor, which will be very Spirituous; and if you rectify again, and draw off half of it, it will be a very fine Spirit. What remains in the Body may be diſtill'd farther, and a Water will run off, that is as good or better than any diſtill'd Water of that Plant drawn the common way.

After this Manner alſo the *Ardent* or *Inflammable* Spirit of Roſes, &c. may be drawn.

DISTINCT *Baſe*, in Opticks, is that preciſe Diſtance from the Pole of a Convex Glaſs, in which Objects, beheld through it, appear *diſtinct* and well defined; ſo that 'tis the ſame with what is otherwiſe called the *Focus*. The *Diſtinct Baſe* is cauſed by the Collection of the Rays proceeding from a ſingle Point in the Object, into a ſingle Point in the Repreſentation; and therefore Concave Glaſſes, which do not unite, but ſcatter, and diſſipate the Rays, can have no real *Diſtinct Baſe*.

DISTINCT *Viſion*: See *Viſion*.

DISTORTION, is when the Parts of an Animal Body are ill placed or ill figured.

DISTRESS, in Law, ſignifies a Compulſion in certain real Actions, whereby to bring a Man to appear in Court, or to pay a Debt of Duty denied; the Effect thereof, moſt commonly, is to drive the Party diſtrained to replevy the *Diſtreſs*, and ſo to take his Action of Treſpaſs againſt the Diſtrainer, or elſe to compound with him for the Debt or Duty for which the *Diſtreſs* was made. There are ſeveral things not *diſtrainable*; for a *Diſtreſs* muſt be of a thing whereof a valuable Property is in ſome Body, and therefore Dogs, Bucks, Coneys, and the like, that be *feræ naturæ*, cannot be diſtrained. 2. Although it be of a valuable Property, as a Horſe, (yet when a Man or Woman is riding on him) or an Ax (in a Man's Hand cutting of Wood) and the like, are for that time privileged, and cannot be diſtrained. 3. Valuable things ſhall not be diſtrained for Rent, for Benefit and Maintenance on Trades, which, by conſequence, are for the Commonwealth, and are by Authority of the Law there; as a Horſe in the Smith's Shop; Materials in the Weaver's Shop for making Cloth; Cloth or Garments in the Taylor's Shop, Sacks of Corn or Meal in a Mill, nor in a Market, nor any thing diſtrained for *Damage-feaſant*, for it is in *Cuſtodia Legis*. 4. Nothing ſhall be diſtrained for Rent, that cannot be rendred again in as good a Plight as it was at the time of the *Diſtreſs* taken; as Sheaves or Shocks of Corn cannot be diſtrain'd for Rent, but for *Damage-feaſant* they may. 5. Beaſts belonging to the Plough ſhall not be diſtrain'd, but Goods may. 6. Furnaces, Cauldrons, or the like, fix'd to the Freehold, or the Doors or Windows of a Houſe, or the like, cannot be diſtrained. When a *Diſtreſs* that hath Life in it, is taken, it muſt be brought into the common Pound, or kept in an open Place, where the Owner may give it Food.

Diſtreſs is taken to be either *Real* or *Perſonal*: *Diſtreſs Real* is made upon immoveable Goods, as the *Grand-Cape* and *Petit-Cape*, by which the Land it ſelf is ſeized. *Diſtreſs Perſonal*, is made by taking a Man's moveable Goods, and detaining them for Security of his Appearance to the Suit. *Diſtreſs* is alſo either *Finite* or *Infinite*; *Finite* is that which is limited by Law, how often it ſhall be made to bring the Party to Trial of the Action: *Diſtreſs Infinite*, is with Limitation until the Party come, as againſt a Jury that refuſeth to appear *Super certificatione Aſſiſæ*, where the Proceſs is a *Venire facias*, *habeas corpora*, and *Diſtreſs Infinite*, &c.

DISTRIBUTIO *Chyli*, the Chyle is diſtributed when, after a due Fermentation in the Ventricle and the Guts, it ſoaks into and through the Glandulous Tunick of the Inteſtines; and paſſing through the Lacteal Veins, and its proper Channel along the Side of the Thorax, at laſt falls into the Subclavian Vein, that it may circulate with the Blood, and receive its Colour. *Blanchard*.

DISTRICHIASIS, is a double Row of Hair on the Eye-lids.

DISTRINGAS, is a Writ directed to the Sheriff or any other Officer, commanding him to diſtrain one for Debt to the King, &c. or for his Appearance at a Day.

DISSYLLABLE, is a Word conſiſting only of two Syllables, as *Vertue*.

DITONE, a double Tone, or the greater Third, is an Interval in Muſick which comprehends two Tones; the Proportion of the Tones that make the *Ditones*, is as 4 to 5, and that of the *Semi-ditones* as 5 to 6.

DIVERGENCE *Point*: See *Vertical Focus*.

DIVERGENT, or *Diverging Rays*, in *Opticks*, are thoſe *Rays* which going from a Point of the viſible Object, are diſperſed, and continually depart one from another, according as they are removed from the Object.

DIVIDEND, in Arithmetick, is the Number propoſed to be divided into certain equal Parts.

DIVIDUAL, is that part of the *Dividend* diſtinguiſhed by a Point, in working by the Rule of *Diviſion* in Arithmetick.

DIVINATORIA *Virgula*: See *Virgula Divinatoria*.

DIVISIBILITY, is that Diſpoſition of a Body, whereby it is conceived to have Parts, into which it may actually or mentally be divided.

All Quantity is infinitely, or rather indefinitely diviſible: for ſhould it be otherwiſe, it would be diviſible into Parts that are not *Quantæ*, which cannot be, for no accidental Change can deſtroy the eſſential Properties of a Being: Yet this infinite *Diviſibility* can never actually be effected, becauſe when you have divided a Line, or any other Quantity, into any number of Parts, every one of theſe Parts is further diviſible into as many Parts as the whole was, and ſo on, as is many ways demonſtrable in Geometry; wherefore there can be no ſuch thing as a determinate Number of actual Parts in any continued Quantity; which is farther alſo demonſtrable from the Conſideration of incommenſurable Quantities; as *that the Diagonal of a Square is incommenſurable with its Side*, as *Euclid* proves, *Lib.* 10. *Prop.* 117. And that the Parts in any Line are Infinite or Indefinite, will plainly appear by the following *Diagram*.

Let the Line *a b* be conceived to be drawn parallel to *d e* at the perpendicular Diſtance *c d*, which ſuppoſe to be half an Inch: 'Tis plain, the Line *d e* being capable of being infinitely produc'd, there may be taken in it as many Points, *o*, 1, 2, *e*, as you pleaſe; and from *a* to each of them can a Right Line be drawn, as in the Figure, which will divide the Line *c d*, though but of $\frac{1}{2}$ an Inch in Length, into as many Parts as you take in the low-

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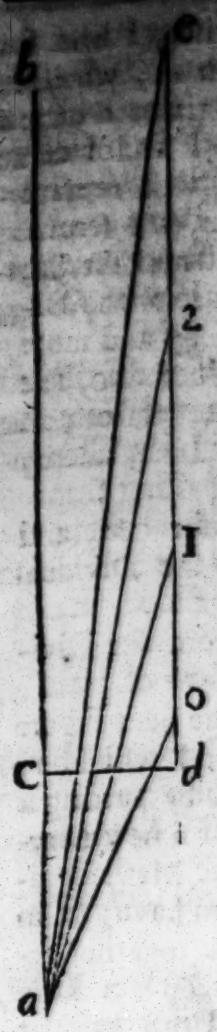


er Parallel *d e*. And though the Diviſions in the Line *c d* do ſtill leſſen upwards, yet they can never become nothing, becauſe no Line drawn from *a* to any Part of *d e*, though never ſo remote, can poſſibly ever coincide with the upper Parallel *a b*.

See alſo the Learned Mr. *Keil*'s 4th *Philoſophical Lecture*, read in the Univerſity of *Oxon*, and lately publiſh'd.

And that the Parts of Solid Bodies are almoſt infinitely ſmall, and that they are capable of being divided wonderful minutely, the Honourable Mr. *Boyle* ſhews by theſe Inſtances.

1. A Piece of Silver Wire was drawn ſo ſmall, that the Weight of but a Grain would reach to 27 Foot or 324 Inches in Length; and ſince an *Engliſh* Inch can eaſily be divided into 200 equal Parts, one Grain of this Wire may be divided into 64800 Parts; and ſince this Diviſion relates only to the Surface of the Wire, its Solidity may eaſily be conceived to conſiſt of many Millions of ſuch Parts.

2. One of the Oval Caſes of Silk-Worms was drawn out into a Length that much exceeded 300 Yards, and yet weighed but two Grains and a half; ſo that each Cylindrical Grain of that Silk, was at leaſt 120 Yards in Length.

3. A Grain of Leaf Gold was extended into an Area of above 50 Inches; and then ſuppoſing the Area reduced to a Square, and its Sides divided after the Manner above-mention'd, *i. e.* ſo that there be 200 Diviſions in an Inch: If parallel Lines be ſuppoſed to be drawn through thoſe ſubtile Diviſions, the Area will be divided into no leſs than two Millions of little Squares.

4. If you ſuppoſe the Silver Wire mentioned above, to be gilt with Gold (and allow for the Gilding 8 Grains of Gold to an Ounce of Silver, which yet is more than is commonly uſed) you will find an Ounce of Gold may cover as much Wire as will reach to 155½ Miles in Length.

5. By diſſolving one Grain of Crude Copper in a good Proportion of Spirit of *Sal Armoniack*, a deep Blue Colour was produced, and after this a good Quantity of diſtill'd Water was put to it to dilute it, yet ſo as that the Blue Colour did ſtill remain viſible; and on the comparing the Weight of the Liquor with the Grain of Copper firſt diſſolved, it was found, that one Grain was capable of imparting a ſenſible Colour to above 513620 times its Bulk of Liquor.

DIVISION, in general, ſignifies the diſtributing or parting of any Whole into its proper Parts, and is only a Compendium of *Subſtraction*; for the *Diviſor* is ſo many Times contain'd in the *Dividend*, as there are *Units* in the *Quotient*; ſo that ſubſtracting continually the *Diviſor* from the *Dividend*, and accounting an Unit for each Time, the Sum of thoſe Units is the *Quotient*.

In *Diviſion* the Number or Quantity to be divided, is called the *Dividend*; that by which you divide, the *Diviſor*; and the number of Times that the *Dividend* contains the *Diviſor*, is called the *Quotient* or *Quota*, and ſometimes the *Parabola*; the Reaſon of which ſee under that Word.

In all Diviſion, as one is to the Diviſor; ſo is the Quotient to the Dividend; wherefore though in whole Numbers the Quotient muſt always be *leſs* than the Dividend, yet in Fractions it muſt always be *greater*.

Thus, let 36 be divided by 4, the Quotient is 9, leſs than 36, becauſe, ſince 1 : 4 :: 9 : 36; 1 being leſs than 4, 9 muſt be alſo leſs than 36: But if $\frac{4}{5}$ were to be divided by $\frac{3}{4}$ the Quotient $\frac{16}{10}$ will be much bigger than the Dividend $\frac{4}{5}$, becauſe as 1 :: $\frac{3}{4}$ :: $\frac{16}{10}$: $\frac{4}{5}$, (*i. e.*) as one is to the Diviſor :: ſo is the Quotient to the Dividend; but 1 is greater than $\frac{3}{4}$ or $\frac{1}{2}$, wherefore $\frac{16}{10}$ muſt alſo be greater than $\frac{2}{5}$.

DIVISION in *Species* or *Algebra*, is, in general, the reducing the Dividend and Diviſor to the Form of a Fraction, which Fraction is the Quotient: Thus, if *a b* were to be divided by *c d*, it muſt be placed thus, $\frac{a\,b}{c\,d}$, and that Fraction is the Quotient; though ſome chuſe to write it thus, $c\,d)\,a\,b$, or $ab \div cd$, which laſt Mark $\div$ is the common Character for *Diviſion*.

For the performing the Work of Diviſion *Algebraically, obſerve theſe* Rules.

1*ſt Rule*, When the Dividend is equal to the Diviſor, the Quotient is Unity, and muſt be placed in the Quotient, becauſe every Thing contains it ſelf once.

2*d Rule*, When the Quotient is expreſs'd Fraction ways (as in *Simple Diviſion*) if the ſame Letters are found equally repeated in every Member of the Numerator and Denominator, caſt away thoſe Letters, and the Remainder is the Quotient: Thus, $\frac{a\,b}{b}$ (a, and $\frac{a\,b\,c}{a\,b}$ (c, &c.

3*d Rule*, When there are any Co-efficients, divide them as in common Arithmetick, and to the Quotients annex the Quantities expreſs'd by Letters: Thus, $\frac{360\ a\,b}{24\ b}$ ($= 15\,a$.

4*th Rule*, The general Way of *Diviſion* of Compound Quantities, is like the ordinary Way in common Arithmetick, reſpect being had to the Rules of Algebraick *Addition*, *Subduction*, and *Multiplication*; as alſo, that like Signs give +, and unlike — in the Quotient, taking care to divide every Part of the Dividend by its correſponding Diviſor (*i. e.* that whoſe Letters ſhew it of the ſame Kind with the other) to prevent a Fraction which would otherwiſe ariſe:

Thus $a + b)\ a\,a + a\,b - c\,a - c\,b\ (a - c.$

$a\,a + a\,b$

$0 \qquad 0 - c\,a - c\,b$

$- c\,a - c\,b$

0

That the ſame Reaſon for like Signs giving a poſitive, and unlike a negative Quotient, muſt hold in *Diviſion* as well as in *Multiplication*, is clear from conſidering the Nature of *Diviſion* (which is only reſolving the thing into its Parts) therefore, ſince every Dividend is nothing elſe but the Product of the Diviſor and Quotient multiplied by each other,

the Quotient muſt conſiſt of ſuch Signs which could produce the Dividend; therefore if the Dividend be divided by a Quantity that hath a ſimilar Sign with it, the Quotient muſt be poſitive; if by a Quantity having a diſſimilar Sign, it muſt be Negative.

It may be a General Rule in Compound Diviſion in Algebra, always to place ſuch a Letter in the Quotient, as will, when multiplied into the Diviſor, produce the Dividend, for that is always a Rectangle under the Diviſor and the Quotient.

An Example of Compound Diviſion in Algebra.

$zz-16)\ z^5-8z^3-124\,zz-64\,(z^3+8z+4$

z^5-16z^3

$8z^3-124\,zz$

$8z^3-128\,zz$

$4\,zz-64$

$4\,zz-64$

0

DIVISION *in whole Numbers* is thus perform'd.

1. To divide by one Figure is very eaſy, as ſuppoſe 6759 were to be divided amongſt 3 Men, how much is each Man's Share? Set the Numbers down as you ſee here; 3) 6759 (2253.

And then ſay, 3 is contained in 6 (the firſt Figure towards the Left-hand of the Dividend) twice; wherefore I place 2 in the Quotient; then I go on to the next Figure, and ſay, 3 is found in 7 twice, and there is one over: I place 2 in the Quotient again; and I imagine the one that was over to ſtand before the next Figure 5, which will make it 15: Then I enquire how oft I can have the Diviſor 3 in 15, and finding it juſt 5 times, I place 5 in the Quotient. Then I go to the laſt Figure, and aſk how often I can have 3 in 9, which I find to be 3 times I write 3 in the Quotient; and ſo the Operation is over, 2253 being the true Quotient, or the number of Pounds that each Man muſt have.

2. When you are to divide a Number by a Diviſor that conſiſts of 2, 3, or more Places, the Operation is more tedious and difficult (it being indeed the hardeſt Leſſon in Arithmetick) but yet it may, with a little Practice, be readily perform'd thus; ſuppoſe 940488 Crowns were to be divided among a Ship's Company conſiſting of 263 Men, what is each Man's Share.

1. Set down the Numbers as you ſee; then firſt diſtinguiſh by a Point a Part of the Dividend, which ſhall be greater than, or at leaſt equal to the Diviſor, which is called the *Dividual*, and is firſt to be divided: Then ſeek how often you can have 263 in 940, which, becauſe it is uſually the hardeſt Taſk to find exactly, obſerve carefully this Rule: Firſt ſay, I can have 2, the firſt Figure of the Diviſor, 4 times in 9, the firſt of the Dividual, and there will remain 1, which 1 I imagine to ſtand before 4, the ſecond Figure of the Dividual, which will therefore be 14; but then conſidering 6, the Figure of the Diviſor, I find I cannot have as I ought, 6 four times in 14; wherefore I conclude I cannot have 263 four times in 940: I try next then what will 3 do; and I find I can have 2 three times, and that there will remain 3, which 3 I imagine to ſtand before 4, the ſecond Figure of the Dividual, and then it will make it 34; trying therefore with 6, the ſecond Figure of the Diviſor, I find I can have that 3 times in 34, and more than enough will remain to be placed before 0, the laſt Figure of the Dividual; I therefore place 3 in the Quotient juſt after the crooked Line, and by that Figure which is the

263) 940488 (3576
789
1514
1315
1998
1841
1578
1578
0

2*d* Operation, I multiply the Diviſor 263, and write the Product 789 *orderly* under the Dividual 940. Then,

3*dly*, I ſubſtract the Product 789 from the Dividual, and there remains 151.

4*thly*, To which I bring down 4, the next Figure to the Right Hand of the *Dividual*, and which, to ſhew that I have done with, I mark, by putting a Point under it; ſo I have now 1514 for a new *Dividual*. Then do I enquire again, by the Method given in the firſt Article, how often I can have 263 in 1514, and comparing thoſe Numbers together according to that General Rule, and which a little Practice will make very eaſy, I find I can have it but 5 times; wherefore I put 5 in the Quotient, and by that multiply my Diviſor, and ſubſcribe the Product 1315 *orderly* under the laſt *Dividual*. Then I ſubſtract it alſo from thence, and find a Remainder of 199; to which Remainder I bring down the next Figure 8 from the Dividend (having alſo pointed it there) and then I have 1998 for a new Dividual; with which, as before, comparing my Diviſor 263, I find that I can have it but 7 times; wherefore placing 7 in the Quotient, by that I multiply the Diviſor 263, and ſubſcribing the Product orderly under the Dividual 1998, ſubſtracting it alſo from thence; and to the Remainder, which is 157, bringing down 8, the laſt Figure of the Dividend, I have 1578 for a new Dividual; with which, comparing as before, the Diviſor 263, I find, on trial, that I can have it juſt 6 times in it; ſo I write 6 in the Quotient; by that Figure 6 multiply the Diviſor, ſubſcribe the Product 1578 under the Dividual, and making Subſtraction, find no Remainder; wherefore I conclude the *Diviſion* is ended, and that 3576 is the true Quotient, or Number of Crowns each Man is to have for his Share.

And this Example, if carefully heeded, will be ſufficient to teach any one the Way of dividing by more Figures than one; the ſeveral Operations of which Method are briefly ſumm'd up in this *Latin* Verſe,

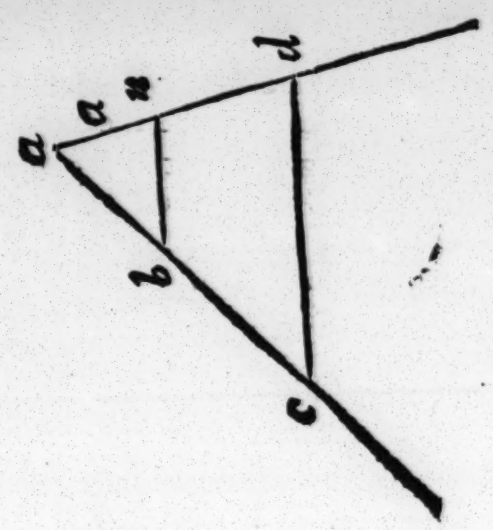
Dic quot, multiplica, ſubduc, transferq; ſecundum.

The only true Proof of *Diviſion* is by *Multiplication*, for the Product of the Quotient and Diviſor muſt always be equal to the Dividend: Thus, 3576 multiplied by 263, produces 940488, becauſe what is deſtroyed by *Diviſion*, is reſtored by *Multiplication*.

DIVISION *Geometrical*, or *Diviſion in Lines*, is called *Application*; the Deſign of which, when it is exerciſed about the Conſtruction of plain Problems, is only this, *viz.* a Rectangle being given, as alſo a Right Line, to find another Right Line, ſo that the Rectangle contained under it, and the Right Line given, ſhall be equal to the Rectangle firſt given; which *Effection* or *Conſtruction* is called the *Application* of a given Rectangle to a Right Line given; and

and the Right Line arising by such *Application* is called the *Parabola*, or *Geometrical Quotient*, and may be found out by the *Rule of Three*, by making, As the Line given: Is to one Side of the Rectangle :: So is the other Side: To the Line sought.

Not unlike to which is *D. Cartes*'s Way of working *Division* in Lines by Scale and Compass: Thus, suppose $a\,c$ (=6) were to be divided by $a\,d = 3$, make any Angle at pleasure, and therein set off first $a\,d$ (= 3) the Divisor, and then on the same Leg $a\,u$ = to Unity: Then on the other Leg of the Angle set $a\,c$ (= 6) the Dividend, and join $d\,c$, and to it, through u, draw $u\,b \parallel$ to $d\,c$, which shall cut off $a\,b$ the Quotient sought; for, as $a\,d : a\,u :: a\,c : a\,b$; that is, As the Divisor: Is to Unity: So is the Dividend: To the Quotient; on which depends the Reason of all *Division*.



DIVISION *in Decimal Fractions*: See *Decimal Fractions*.

DIVISION *in Vulgar Fractions*: See *Fractions*.

DIVISION *of Logarithms*: See *Logarithms*, N°. 7.

DIVISION *by Logarithms*: See *Logarithms*, N°. 9.

DIVISION *of Proportion*: See *Proportion*, N°. 9.

DIVISOR, in Arithmetick, is the dividing Number, shewing how many Parts the *Dividend* is to be divided into.

DIVORCE, or *Devorce*, is, in the Common Law, a Separation of two Persons actually married together, and therefore is the Solution of the *Vinculum Matrimonii*, and is not only *à Mensa, sed etiam à Thoro*; and therefore a Woman thus divorced, received all again that she brought with her. This is only upon a Nullity of the Marriage, upon some Essential Impediment, as Consanguinity or Affinity within the prohibited Degrees, Pre-contract, Impotency, or such like; of which there are 14 usually summ'd up in these Verses by the Divines and Civilians;

Error, Conditio, Votum, Cognatio, Crimen,
Cultus, Disparitas, Vis, Ordo, Ligamen, Honestas,
Si sis Affinis; si forte coire nequibis;
Si Parochi & duplicis desit præsentia Testis,
Raptûrâ si sit mulier, &c.

DIURESIS, is a Secretion of the Urine by the Reins, which is done after this Manner; There are little Glandules placed near the Emulgent Arteries, wherewith the *Serum* is separated from the Blood, and is conveyed by little Channels (of which the Substance of the Reins does principally consist) to the *Caruncula Papillares*, thence to the *Pelvis*, thence to the *Ureters*, thence to the Bladders, and so out of Doors. *Blanchard.*

DIURETICKS, are those Medicines which by parting, dissolving, and fusing the Blood, do precipitate the *Serum* by the Reins into the Bladder. *Blan.*

DIURNAL *Motion of a Planet*, is so many Degrees and Minutes, *&c.* as any Planet moves in 24 Hours; also the Motion of the *Earth* about its Axis (in the *Copernican System*) is called its *Diurnal Motion*, which causes the Vicissitudes of Days and Nights.

DIURNAL *Arch*, is the *Arch* or number of Degrees that the Sun, Moon or Stars describe between their Rising and Setting.

DIUTURNITY, is the long Continuance or Duration of any Being.

DIZZYNESS: See *Vertigo*.

DOCK, is a Pit, great Pond or Creek by the Side of an Harbour, made convenient to work in, in order to build or repair Ships, and is of two sorts.

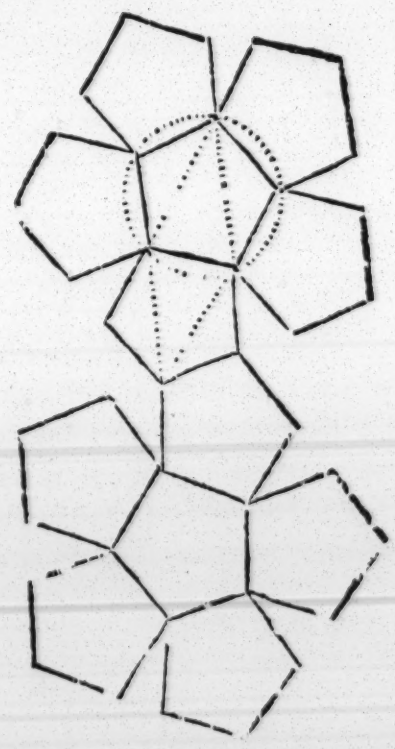
1. A *Dry Dock*, where the Water is kept out of the *Dock* by great Flood-Gates, till the Ship is built or repaired; but after that, can easily be let in to Float and Launch her.

2. A *Wet Dock*, is any Place in the Ouze out of the Tide's way, where a Ship may be haled in, and so *dock her self*, or sink her self a Place to lie in.

DODECADACTYLUM, is the first of the small Guts, beginning from the *Pylorous* of the Stomach, and ending where the Gut *Jejunum* begins: It is so called as if it were the Length of the twelve Fingers, which yet is never observed in any Men amongst us; perhaps the Ancients mistook, from inspecting the Guts of some Brutes: 'Tis most usually called *Duodenum*. *Blanchard.*

DODECAEDRON: See *Regular Bodies*. This Solid consists of twelve Quinquangular *Pyramids*, whose Vertexes or Tops meet in the Center of a Sphere that is conceived to circumscribe this Solid, and consequently have their Bases and Altitudes equal; wherefore, having found the Solidity of one of those Pyramids, and multiplied it by the number of Bases, (*viz.* 12.) you have the Solidity of this *Dodecaedron*.

The following Figure being drawn on Pastboard, cut half through, and then folded up, will represent a *Dodecaedron*.



Its Solidity is found by multiplying the Base into $\frac{1}{3}$ of its Distance from the Center 12 times: And to find this Distance, take the Distance of two parallel Faces, the Half is the Height.

DODECAGON, a regular Polygon consisting of twelve equal Sides and Angles: In Fortification 'tis a Place with twelve Bastions. DODE-

DODECATEMORY: The twelve Signs of the *Zodiack*, *Aries*, *Taurus*, &c. are ſo called, becauſe each of them is the twelfth Part of the *Zodiack*.

DOGMATICK MEDICINE, is a Rational Practice of Phyſick; *Hippocrates* was its firſt Author, and after him *Galen*; therefore thoſe Phyſicians are called *Dogmatical*, who, upon the Principles, as they pretend, of the School Philoſophy, reject all Medicinal Vertues that they think not reducible to manifeſt Qualities; but *Galen* hath long ago obſerved very well of ſuch Men, that they muſt either deny plain Matter of Fact, or aſſign but very poor Reaſons and Cauſes of many Effects they pretend to explain.

DOME, ſo the CHYMISTS call the arched Cover to their Reverberatory Furnace: See the Figure of it under that Word, or in *Furnace*.

DOME, in Architecture, is a round, vaulted or arched Roof of a Church, or any ſuch great Building.

DOMINICAL LETTER, one of the firſt ſeven Letters of the Alphabet, wherewith the Sundays are mark'd throughout the Year in the *Almanack*.

To find the Dominical Letter.

Divide the Year, its 4th, and 4 by 7. what's left ſubſtract from 7, the Letters given. *A* 1, *B* 2, *C* 3, *D* 4, *E* 5, *F* 6, *G* 7.

Example.

In the Year	1701
The 4th Part, omitting Fractions, is	425
To both which add the number	4
The Sum is	2130

Which Sum divided by 7, leaves 2 remaining, and 2 from 7 leaves 5, which ſhews the Dominical Letter for the Year 1701, is the Fifth in the Order of the Alphabet, that is, *E*.

DOMINICUM, *Demain*, or *Demeſne*, are Lands not rented to Tenants, but held in *Demeſne*, or in the Lord's own Uſe and Occupation.

DOMO REPARANDA, is a Writ for one againſt his Neighbour, by the Fall of whoſe Houſe he feareth Hurt to his own.

DONJON, in Fortification, is generally taken for a large Tower or Redoubt of a Fortreſs, where the Garriſon may Retreat in caſe of Neceſſity, and Capitulate with greater Advantage.

DORICK *Order of Architecture*, was invented by the *Dorians* a People of *Greece*, whence the Name. If its Columns are Simple and Plain without *Pilaſters*, *Palladio* ſaith they ought to be 7 Modules and one Half, or 8 Modules high. The Intercolumniations are to be little leſs than 3 Diameters of the Column: And this Manner of Building is by *Vitruvius* called *Diaſtyle*.

But if the Columns have *Pilaſters*, their Height, reckoning Baſe and Chapiter, muſt be 17 Modules and $\frac{1}{3}$; and by the by, though the Module in all the other Pillars be a Diameter divided into 60 equal Parts, yet in this Order the *Module* is to be accounted but as the Semi-diameter, and is therefore of 30 ſuch Parts, according to *Palladio*.

This Pillar hath no proper Baſe, which is the Reaſon that moſtly in the Ancient Buildings you ſee them without any Baſe at all, as in *Marcellus* his Temple at *Rome*, &c.

But when the Attick Baſe is given it, it much augments its Beauty, and then the Height of the Baſe is to be $\frac{1}{2}$ the Diameter of the Column.

The Capital's Height alſo ought to be half the Diameter of the Pillar at the Baſe, and the Architecture the ſame Height. The *Freeſe* is a *Module* and $\frac{1}{2}$ Height, and the *Cornice* is a *Module* and $\frac{1}{3}$. The *Triglyph* is one *Module*, and its *Capital* the 6th Part of one; the *Metops* or Space between *Triglyph* and *Triglyph*, is in Length the ſame with the Height of the *Triglyph*.

This Order being deſigned to repreſent Solidity to us, ought not to be uſed but in great and maſſy Buildings, as the Outſide of Churches and publick Places.

The Entablature here is more Maſſy and Tall than in the other Order, becauſe the Strength of the Column is ſo much greater, it being uſually $\frac{1}{4}$ of the Column. The *Cornice* muſt be without any Foilage or Trimming, and if you allow *Modillions*, they muſt be Square and Plain.

The Freeſe here hath a regular Ornament, which are the *Triglyphs*; the *Metops* or Space between which ſhould be exactly Square.

The Architrave of this Pillar hath alſo a peculiar Ornament, which are certain Pendulous Drops under the *Triglyphs*, which yet ſeem as it were to be faſtened to it.

DORMANT, is the Herald's Term for the Poſture of a Lion born *ſleeping*, in any Coat of Arms.

DORSI LONGISSIMUS, is a Muſcle which ariſes in Common with the *Sacrolumbalis* from the Spine of the *Os Ilium*, and the ſuperior Part of the *Sacrum*, and all the Spines of the *Vertebræ* of the Loins, Externally Tendinous, Internally Fleſhy: In its Aſcent it is inſerted to the Tranſverſe Proceſſes of the *Vertebræ* of the Loins, and as it marches over the laſt Rib this great Muſcle divides it ſelf into Two, the Outermoſt of which is the *Sacrolumbalis*, but the Innermoſt next to the Spine is the *Longiſſimus Dorſi*, which aſcends with a partly Fleſhy and partly Tendinous Outſide, and Fibres paſſing ſomewhat obliquely outward; part of which Tendinous Fibres ariſe diſtinct from the inferior Spines of the *Vertebræ* of the *Thorax* and Superior of the Loins, from which ariſe ſome Fleſhy Fibres aſcending obliquely inwards, and are inſerted to the fifth, ſixth, and ſeventh Spine of the *Thorax*, as expreſt by *Bidloo*, and called *Semi-Spinalis*. The other larger Part of this Muſcle aſcending on the *Thorax*, divides its ſelf into many diſtinct Fleſhy Portions, not much unlike a Palm Branch, which are inſerted in a twofold Manner to the Tranſverſe Proceſs of each *Vertebra* of the *Thorax* and Tubercle of each Rib, as alſo to the tranſverſe Proceſſes of the *Vertebræ* of the Neck.

When this and its Partner acts, they are not only ſerviceable in keeping the Trunk of the Body erect, and bending it backwards, but they are alſo uſeful in Progreſſion, as it may be obſerved when either Leg is moved forwards, this Muſcle on the ſame Side is in Action, which ſeemeth to be advantageous in rendring the *Os Ilium* at that time ſtable, ſo that the Thigh may be the more commodiouſly elevated, in regard it is ſo moved by a Muſcle ariſing from the *Vertebra* above the *Os Ilium*, namely the *Pſoas*.

DORSIPAROUS and *Dorſiferous Plants*, are ſuch as are of the *Capillary* kinds without Stalks, and bearing their Seeds on the Backſides of their Leaves: Theſe are called by ſome Botaniſts *Epiphylloſperma*, and by others *Hypophylloſperma*: See *Capillary Plants*.

DORSUM, or *Tergum*, the Back, is the hinder Part of the *Thorax*; but the *Dorſum* of the Hand or Foot is their Outſide. *Blanchard.*

DOSE, is a ſet Quantity of Phyſick, being uſually as much as is given at once.

DOTE ASSIGNANDA, is a Writ that lies for a Widow, where it is found by Office that the King's Tenant was ſeized of Tenements in *Fee* or *Fee-Tail* at the Day of his Death, *&c.* and that he holdeth of the King in chief, *&c.* for in this Caſe the Widow cometh into the *Chancery*, and there maketh Oath that ſhe will not marry without the King's Leave, and hereupon ſhe ſhall have this Writ to the Eſcheator.

And this ſort of Widow is called the *King's Widow.*

DOTE *unde nihil habet*, is a Writ of Dower that lieth for the Widow againſt the Tenant which bought Land of her Huſband in his Life-time, whereof he was ſeized ſolely in Fee-Simple or Fee-Tail, in ſuch ſort as the Iſſue of them both might have inherited it.

DOUBLE-DESCANT: See *Deſcant.*

DOUBLE *Horizontal Dial*, invented by Mr. *Oughtred*, and made of *Braſs* with a double *Gnomon*, one to ſhew the Hour on the Outward Circle, the other to ſhew the ſame Hour in the *Stereographick* Projection (drawn on the Plate.) This not only finds the *Meridian*, Hour, *&c.* but ſhews the Sun's Place, Riſing and Setting, Declination, Amplitude, Altitude, and Azimuth, Diurnal Arch, and many uſeful Propoſitions; and may be very well applied to the making of *Dials.*

DOUBLE or *Flank'd Tenaille*: See *Tenaille.*

DOUBLE-PLEA, in Law, is that wherein the Defendant alledgeth for himſelf two ſeveral *Matters* in Bar of the Action, whereof either is ſufficient to effect his Deſire in debarring the Plaintiff. And this is not to be admitted in the common Law, wherefore it is well to be obſerved when a *Plea* is *double*, and when not, for if a Man alledge ſeveral Matters, the one nothing depending on the other, the *Plea* is accounted *Double*; if they be mutually depending one on another, then it is accounted but ſingle.

DOUBLE-VESSEL, in Chymiſtry, is when the Neck of one *Bolt-head* or *Matraſs* is put and well luted into the Neck of another; and this is uſed for the *Circulation* of Spirits, in order to their being exalted and refined as high as can be: See *Matraſs.* Of this there are ſeveral Figures; 'tis ſometimes called a *Pellican*, and alſo *Diota.*

DOUBLING, in a Military Senſe, is to put two Ranks or Files of Soldiers into one, ſo that when the Word of Command is *Double your Ranks*, then the 2d, 4th and 6th Ranks are to march up into the firſt third and fifth, ſo that of 6 Ranks they make but 3, leaving double the Interval there was between them before, which is not ſo when they double the half Files, becauſe then 3 Ranks ſtand together, and the 3 others come up to double them; that is, the 1, 2 and 3 are doubled by the 4, 5 and 6th, or on the contrary. *Double your Files* is for each other to march to that next to it on the Right or Left, according to the Word of Command, and then the 6 Ranks are turned into 12, the Men ſtanding 12 deep, the Diſtance between the Files being now double of what it was before.

DOUCINE, in Architecture, is an Ornament of the higheſt Part of the *Cornice*, or a Moulding cut in Form of a Wave, half Convex and half Concave.

DOWER, in Common Law, ſignifies that which the Wife bringeth to her Huſband in Marriage, called by ſome *Maritagium*; but it is taken moſt commonly for that which ſhe hath of her Huſband after the Marriage is determined, if ſhe out-live him, and this is the third Part of all the Lands of which the Huſband was in his Life-time actually ſeized, in an Eſtate of Fee-Simple or Fee-Tail.

DRABLER, a ſmall Sail in a Ship, the ſame to a Bonnet (which ſee) that a Bonnet is to a Courſe, and is only uſed when the Courſe and Bonnet are too ſhoal to Cloath the Maſt.

DRACO, a Conſtellation in the Northern Hemiſphere conſiſting of 33 Stars.

DRACO VOLANS, with the Meteorologiſts, is a Fat, Heterogeneous, Earthy Meteor, appearing long and ſinous, ſomething in the Shape of a flying Dragon; and this Shape they will have to ariſe from the latter Part of the Matter of this Meteor, being fired with greater Impetuoſity than what comes firſt out of the Cloud; and they ſuppoſe the broken Parts of the Cloud, and the Sulphureous Matter which adheres to them, forms the apparent Wings of this imaginary Dragon.

DRACUNCULUS, is an Ulcer which eats thro' even a Nerve it ſelf. *Blanchard.*

DRAGON'S *Head* and *Tail*, or the Nodes of the Moon, in Aſtronomy, are two Points where the Orbit of the Moon, which makes with it Angles of 5 degr. cuts the Orbit of the Sun at the *Ecliptick*, the one of them tends Northwards, the Moon being there to have *North* Latitude, and the other Southwards, where ſhe commences *South.* This her Deviation from the *Ecliptick* ſeems, according to ſome Men's Fancy, to make a Figure like to that of a *Dragon*, whoſe Belly is where he has the greateſt Latitude, and the Interſections repreſent the *Head* and *Tail*; from which Reſemblance 'tis ſo called.

But *Note*, Theſe Points abide not always in one Place, but have a Motion of their own in the *Zodiack*, and *Retrograde* almoſt 3 Minutes a Day, and compleat their Circle in about 19 Years; ſo that the Moon can be but twice in the *Ecliptick* during her Menſtrual Period, but at all other times will have *Latitude* as they call it.

DRAPERY, ſignifies, in Painting or Sculpture, the Cloathing of any Human Figures, and when the Folds of Garments hang eaſy and natural, and yet appear ſtrong, we ſay the Drapery is very good.

DRASTICK *Remedies*, are thoſe that operate quickly and effectually.

DRAUGHT *Compaſſes*, are *Compaſſes* with ſeveral moveable Points to draw fine *Draughts* of *Charts*, *Maps*, *Architecture*, *Fortification*, *Dialling*, &c.

DRAW, a Ship is ſaid to draw ſo much Water, according to the Number of Feet ſhe ſinks into it: Thus, if fifteen Foot from the Bottom of her be under Water, or if ſhe ſink into the Water fifteen Foot perpendicular, ſhe is ſaid to draw Fifteen Foot Water: According as ſhe draws more or leſs Water, ſhe is ſaid to be of more or leſs *Draught.*

DRAW-BRIDGE, is a *Bridge* made after the Manner of a Floor, to be drawn up or let down (as Occaſion ſerves) before the Gate of a Town or Caſtle.

DRAWING *Medicines*: See *Epiſpatick.*

DRIFT-SAIL, in a Ship, is a Sail uſed under Water; it's veered out right a-head upon the Sea in a Storm, having Sheets faſtned to it as other Sails have, its Uſe being to keep the Ship's Head right upon the Sea: It's alſo uſeful to hinder a Ship's driving with a Cur-

a Current, and ſo generally uſed by Fiſhermen, eſpecially in the North Seas.

DRIP, in Architecture: See *Larmier*.

DRIVE, a Ship is ſaid to *Drive*, when an Anchor being let fall, it will not hold her faſt, but that ſhe ſails away with the Tide or Wind; the beſt way to help which is to veer out more Cable (for the more Cable ſhe has out, the ſurer and ſafer ſhe rides) or elſe to let fall more Anchors.

Alſo when a Ship is *a Hull* or *a Trye*, we ſay ſhe *Drives to Leeward*, or in with the Shoar, according to the Way ſhe makes.

DROPS, in Architecture, the ſame with *Guttæ*, which ſee.

DROPSY: See *Hydrops*.

DRY; Bodies are called *Dry*, when the Pores intercepted between their more ſtable Parts, are not filled with any viſible Liquor.

DRY *Moat*: See *Moat*.

DUCES TECUM, is a Writ commanding one to appear at a Day in the *Chancery*, and to bring with him ſome Evidence, or other thing, that the Court would view. There is another kind of *Duces tecum* directed to the Sheriff, upon return that he cannot bring his Priſoner without danger of Death, he being *adeo Languidus*; then the Court grants a *Habeas Corpus* in the Nature of a *Duces tecum licet Languidus*.

DUCKUP, a Word uſed at Sea by the Steerſman, or he that is at Helm, when either Main-ſail, Fore-ſail, or Sprit-ſail hinder his Sight ſo, that he cannot ſee to ſteer by a Land Mark or the like, for then his Word is *Duckup* the Clew Lines of thoſe Sails: And as to the Sprit-Sail, when a Shot is to be made by a Chaſe Piece, and the Clew of that Sail hinders the Sight, they ſay, *Duckup* the Clew Lines of the Sprit-Sail; that is, hale the Sail out of the Way.

DUCTILITY, is an eaſy yielding Extenſion and Spreading of the Parts of any Metal under the Hammer, *&c.* and this is moſt remarkably the Property of Gold, whoſe *Ductility* is ſo great, as to be really wonderful; for Mr. *Rohault* tells us, That *Gold Beaters* of one Ounce of Gold, make 2790 ſquare *Leaves* of *Gold*, each containing two Inches and ten *Lines*; and by deducting the Waſtes that are cut off (which amounts to near one half of it) the Surface of every *Leaf* of *Gold* will be found to contain 1156 ſquare *Lines*; ſo that all of them joined together Side by Side, will make a *Surface* of 3155880 ſquare *Lines*. And if the third Part be added to this, as a Conſideration for the Loſs in the making, 'twill follow, that *Gold-Beaters*, out of one Ounce of *Gold*, beat 4270840 ſquare *Lines*.

DUCTUS ADIPOSI: See *Sacculi Adipoſi*.

DUCTUS ALIMENTALIS, ſo our moſt accurate Anatomiſt Dr. *Tyſon* calls the *Gula*, Stomach and Inteſtines, all which make but one continued Canal or Duct: And this *Ductus* he very truly makes the proper Characteriſtick of an *Animal*, or, as the Schools would expreſs it, the *Proprium Quarto Modo*, for all *Animals* have this Duct, and none but *Animals*.

DUCTUS BILARIUS. } See *Porus Bilari-*
DUCTUS HEPATICUS, } *us*; this and the *Ductus Syſticus* together make the *Ductus Communis Choledocus*, which goes obliquely to the lower End of the *Duodenum*, or Beginning of the *Jejunum*, and after it hath pierced the firſt Coat, it runs near two Fingers Breadth between the Coat before it opens into the Cavity of the Inteſtine, which oblike Inſertion ſerves inſtead of a Valve to hinder the return of the *Bile* into it again.

DUCTUS CHYLIFERUS, is a Veſſel, in the lower Part whereof, called the *Receptaculum Chyli*, all the *Lacteal* Veins, and many Lymphæducts, are terminated. It ariſes about the Kidney on the Left Side, and aſcending along the *Thorax* near the great *Artery*, ends at the *Subclavian* Vein on the Left Side. It is furniſhed with ſeveral Valves, that the Matter which aſcends by it may not fall down again betwixt the fourth and ſixth *Vertebræ*: It is variouſly forked or divided. It's Uſe is to convey the Chyle and *Lympha* from the lower Parts to the Heart. This Duct is alſo ſometimes called the *Ductus Communis Lympharum*, becauſe the Lymphatick Veſſels diſcharge themſelves into it, and very uſually *Ductus Thoracius*.

DUCTUS CYSTICUS, is a Pipe going from the Neck of the Gall Bladder to that Part where the *Porus Bilarius* joins it; 'Tis of the Bigneſs of a Gooſe Quill; it goes not in a ſtraight Line, but as it were depreſt by the Liver; ſeveral ſmall Bilary Ducts open into it, and its inner Membrane hath many Wrinkles, which retard the Motion of the Bile.

DUCTUS PANCREATICUS, is a little Channel which ariſes from the *Pancreas* or Sweet-bread, running all along the Middle of it, and is inſerted into the *Duodenum*, near, or not far off, the Paſſage which conveys the *Bile*: It carries a Juice, which it diſcharges into the *Duodenum*, to ferment and volatilize the Meat from the Acid Ferment of the Stomach and the Mixture of the Gall. The Learned Dr. *Graaf* got a Juice out of it that was ſomething acid; though others doubt of it, and of many Diſeaſes which *Silvius* attributes to the Effervеſcency of this acid pancreatick Juice with the Gall in the *Duodenum*. However there is ſometimes an acid Juice found in it, and often a ſalt and auſtere, but frequently an inſipid Liquor. This Canal was firſt found by *Virtſungus*, and is frequently from him called the *Ductus Virtſungianus*.

DUCTUS RORIFERUS, (ſo the Noble *Bilſius* calls it) the ſame with *Ductus Chyliferus*.

DUCTUS SALIVARES, or *Salivarij*, are Paſſages which proceeding from the *Maxillary Glandules* or *Parotides*, go as far as the Jaws and Sides of the Tongue, where they emit the Juice we call Spittle, which conduces to the better chewing and ſwallowing of ſolid Meat, and much to its Fermentation too. *Steno* was the firſt who diſcovered the *Ductus Salivaris exterior*, as he tells us in his Book *De Muſculis*.

DUCTUS THORACIUS: See *Ductus Chyliferus*.

DUCTUS UMBILICALIS: See *Funiculus*.

DUCTUS URINARIUS: See *Ureters*.

DUELLISTS, ſo Mr. *Boyle* calls the two Principles of thoſe Chymical Philoſophers, who will needs explicate all the *Phænomena* of Nature from the Doctrine of *Alkali* and *Acid*, and the ſuppoſed *Hoſtility* that there is between them, ſo that whenever they meet, they do as it were engage and fight a *Phyſical Duel*.

DULCIFIED *Spirit of Sal Armoniack*: See in *Volatile Spirit of Sal Armoniack*.

DULCIFY, when equal Parts of Spirit of Wine, and any acid Menſtruum, ſuch as Spirit of Salt, *Nitre*, *Vitriol*, *&c.* are digeſted together for 3 or 4 Day's Time, the Chymiſts call it *Dulcifying* the Acid Spirit; and after that 'tis called *Spiritus Salis*, *Nitri*, *Vitrioli Dulcis*, *&c.*

DUM *fuit infra ætatem*, is a Writ which lies for him that before he came to his full Age, made a Feoffment of his Land in Fee, or for Term of Life, or

in Tail, to recover them again from him to whom he conveyed them.

DUM *non fuit compos mentis*, is a Writ that lieth againſt the Alience or Leſſee, for him that not being of ſound Memory, did alien any Land or Tenements in Fee-Simple, or for Term of Life, Fee-Tail, or for Years.

DUODENUM, is the firſt of the Inteſtines or Guts, and is about 12 Finger's Breadth long; 'tis continued to the *Pylorus*, from which turning downwards, it runs under the Stomach immediately above the *Vertebræ* towards the Left Side, and ends at the Firſt of the Windings under the *Colon:* At its lower End there are two Pipes or Canals which open into its Cavity, one from the Liver and Gall Bladder, called the *Ductus choledochus communis*, the other from the *Pancreas*, called the *Ductus Pancreaticus*. This Inteſtine differs from the *Jejunum* and *Ileum*, in that its Paſſage is ſtraighter, and its Coats are thicker.

DUPLICATE PROPORTION, or *Ratio*, muſt be well diſtinguiſhed from *Double:* In a Series of *Geometrical Proportionals*, the Firſt Term to the Third is ſaid to be in a *Duplicate Ratio* of the Firſt to the Second, or as its *Square* is to the Square of the Second: Thus in 2, 4, 8, 16, the *Ratio* of 2 to 8 is *Duplicate* of that of 2 to 4, or as the Square of 2 to the Square of 4; wherefore *Duplicate Ratio* is the Proportion of *Squares*, as *Triplicate* is of *Cubes*, &c. and the *Ratio* of 2 to 8 is ſaid to be compounded of that of 2 to 4, and of 4 to 8.

DUPLICATION, is the doubling of any thing, or multiplying of it by 2; alſo the folding of any thing back again on its ſelf.

DURABLE FORTIFICATION: See *Fortification.*

DURA MATER: See *Mater Dura.*

DURATION, is the *Idea* which we have of the Continuation of the Exiſtence of any thing, and is the ſame thing with Time, when this is mathematically and abſolutely conſidered; but the vulgar Time is the Meaſure of this *Duration* taken from the Motion of the Heavenly Bodies, &c.

Mr. *Lock* defines *Duration* to be the *Idea* which we have of periſhing Diſtance, of which no two Parts exiſt together.

DURESSE, a Term in Law, ſignifying a Plea uſed by way of Exception by him, that being caſt into Priſon at a Man's Suit, or otherwiſe by Beating or Threats hardly uſed, doth unwillingly ſeal unto him a Bond during his Reſtraint; for the Law holdeth ſuch Specialty void, but rather ſuppoſeth it to be by Conſtraint, and *Dureſſe* pleaded ſhall avoid the Action.

DYALLING, is the Art of deſcribing Hour-lines truly on any given Plane, ſo as thereby to ſhew the Hour of the Day when the Sun ſhines.

It is founded on this Suppoſition, That the whole Earth is but a Point in compariſon of the *Magnus Orbis*, or the Sphere of the Sun's Motion round it (or of it round the Sun;) and therefore the Hour Lines drawn on any Plane, are in Effect the ſame with thoſe right Lines produced by the mutual Interſection of a great Circle of the Sphere, parallel to the Plane of the *Dyal*, and to the Planes of the ſeveral Hour Circles.

For the *Plane* of every *Dyal* is parallel to ſome greater Circle of the Sphere, which is as far from the Plane of the *Dyal*, as is the Point aſſigned for the Apex or Point of the Style.

The Situation therefore of the Plane is the firſt thing to be conſidered, and this, properly ſpeaking, is only in reſpect of the *Horizon* or the *Meridian.*

In Reference to the *Horizon*, if a Plane lie exactly *parallel* to it, it is called properly an *Horizontal Plane*, and the *Dyal* drawn on it an *Horizontal Dyal.*

If the Plane be *perpendicular* to the *Horizon*, as all thoſe of Walls are ſuppoſed to be, the *Dyal* deſcribed on it is called an *Erect mural Dyal:* If the Plane be *oblique* to the *Horizon*, it either hangs over towards you, making an acute Angle with it, and then 'tis called an *inclining Plane*, or elſe it falls off backward from it, making an obtuſe Angle with it, and then 'tis called a *Reclining Plane*; and if it recline back equal to the Complement of the Latitude of the Place, it lies in the Plane of the Equinoctial, and is called therefore an *Equinoctial Dyal.*

In reſpect of the *Meridian*, a Plane is either *Direct* or *Declining.* The Plane of a *Dyal* is *Direct*, when it reſpects one of the 4 *Cardinal* Points *Directly*, or when 'tis either *parallel to the Meridian*, as are all direct *Eaſt* or *Weſt Dyals* (which therefore are properly called *Meridional*) or *perpendicular* to it, as are all *Direct*, *Erect North* and *South Dyals*, which, becauſe they lie in the Plane of the *Prime Vertical Circle*, are rightly called *Vertical Dyals* by moſt Authors.

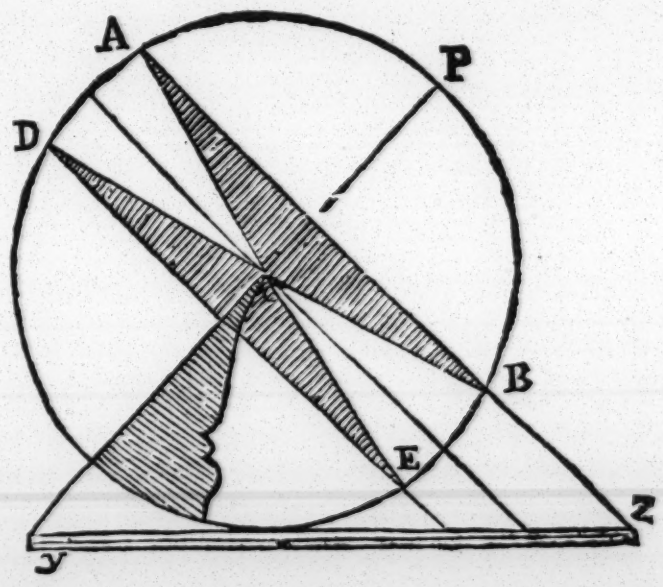
The Plane of a *Dyal* is *Declining*, when it is not directly oppoſite to any of the four Cardinal Points, but declines or deviates ſome way from the *Meridian* or the *Prime Vertical Circle.*

The Fundamental Scheme for *Dyalling*, is the Projection of the Sphere on the Plane of any particular *Horizon*, which you will find how to make under the Word *Projection.*

To find upon any *Dyal* whether the *Parallels* of the Sun's Courſes, &c. will be *Parabola's*, *Hyperbola's*, *Ellipſes* or *Circles:*

The Stile of a *Dyal* being look'd upon as the Earth's Axis, therefore upon any Point thereof (as *c*) which being deſigned for the Point to trace the Parallel by, project the Sphere.

Then the Sun being in any of the Parallels of Declination, for Inſtance, as *A B* the *Tropick* of *Cancer*, will caſt the Shadow of the Point *c* (the Earth's Center) in a ſtraight Line, ſo that when the Sun hath performed one Diurnal Revolution, the Shadow of the Point doth trace a Conical Surface *DCE*, whoſe Vertex is *C*, and is ſimilar to the Cone *A B C:* Now the Lines *CD*, *CE*, *CA*, *CB* of theſe Cones, may be conceived to be infinitely extended.



1. Then, whatever Plane is parallel to the Baſe of the Cone *D E* or *AB*, the Shadow of the Point *c* will deſcribe upon that Plane a Circle.

2. If any Plane cut either of these Cones parallel to either of the Sides, the Shadow of the Point C will describe upon that Plane a *Parabola*.

3. If a Plane cut the Cone, and likewise one of its Sides produced beyond the Vertex, the Shadow of the Point *c* will describe upon that Plane an *Hyperbola*.

As here the Plane *A B* cuts the Cone *D C E*, and also the Side *D C* produced to *z*, therefore the Parallels upon that Plane are *Hyperbola*'s.

4. If a Plane cuts both Sides of the Cone under the Vertex, the Shadow of the Point *C* will describe upon that Plane an *Ellipsis*.

DYE, in Architecture, is the Middle of the Pedestal, or that Part which lies between the Base and the Cornice; being so named, because it is frequently made in the form of a *Cube* or *Dye*, and is also called *Dado* by the *Italians*.

DYPTERON, or a *Dypterick* Figure or Order of Pillars in Architecture, is where the Temple, Edifice, &c. is environed round with a two-fold Range of Pillars in the Form of a double Portico. This *Vitruvius* tells us, *Ch.* 1. *Book* 3. was the Figure of the wonderful Temple of *Diana* at *Ephesus*, which was above 200 Years in Building, all *Asia* contributing to its Expence: These Columns were all of Marble, and 70 Feet high.

DYSESTHESIA, is a Difficulty of, or Fault in Sensation. *Blanchard.*

DYSCRACY or *Intemperature*, is when some Humour or Quality over-abounds in the Body. *Blanchard.*

DYSENTERY, is a Looseness accompanied with Gripings in the Belly, wherein Bloody and Purulent Excrements, and sometimes Membranous Pieces of the Intestines too are excerned, always, or very frequently, attended with a continual Fever and a Drought. *Blanchard.*

DYSEPULOTICA, are great Ulcers beyond Cure. *Blanchard.*

DYSOREXIA, a want of Appetite, proceeding from an ill Disposition or diminished Action of the Stomach. *Blanchard.*

DYSPATHY, is an Impatient Temper, or a Languishing under some grievous Disease or Trouble of Mind. *Blanchard.*

DYSPEPSIA, is a Difficulty of Digestion, or Fermentation in the Stomach and Guts. *Blanchard.*

DYSPHONIA, is a Difficulty of Speech from an ill Disposition of the Organs. *Blanchard.*

DYSPNOEA, is a Difficulty of Breathing, wherein the Breath is drawn often and thick, occasioned by the Stuffing of the Lungs. *Blanchard.*

DYSTHERAPEUTA, are Diseases of difficult Cure. *Blanchard.*

DYSTHRIACHISIS, is a continual Defluxion of Tears from the pricking of Hairs in the Eye-lids, which grow under the Natural Hairs. *Blanchard.*

DYSTICHIA, is a double row of Hair on the Eye-lids. *Blanchard.*

DYSTOCIA, is a Difficulty of bringing forth; or a preternatural Birth; as when the *Fœtus* comes forth obliquely, transverse, or with its Feet foremost, or when the Passages are straitned by Inflammation or otherwise, or when the *Fœtus* is very large, weak, fat, or dead. *Blanchard.*

DYSTRICHIASIS, is when the Hairs grow inverse. *Blanchard.*

DYSURIA, is a Difficulty of Urine, proceeding from an ill Disposition of the Organs, or from an Obstruction of them by the Stone, Gravel, or Viscous Clammy Humours, accompanied with an Heat of the Urine. *Blanchard.*

EAR. This curious Instrument of Hearing, is divided into the *External* and *Internal Ear*. The

EAR *External*, is composed of a Cartilage covered with a Skin very delicate, under which you meet with another Nervous Tegument, that immediately embraces the whole Cartilage; which, after some few Folds, terminates in that part of the Ear which is called the *Concha*, for its Resemblance to the Entrance of a small Shell: Besides these, it hath two Muscles;

The First is made up of certain Carneous Fibres, fixt to that part of the *Pericranium* that covers the Musculous *Crotaphytes*, and descends in a straight Line to insert it self at the upper part of the second Folding of the Ear.

The Second likewise consists of five or six Carneous Fibres, that take their Rise from the Upper and foremost part of the *Apophyses Mastoides*, and descending obliquely for about an Inch, terminate at the Middle of the *Concha*.

Arteries it hath from the *Carotides*, one Branch of which passeth behind, and the other before; and the Distribution of these is attended by Veins from the *External Jugular*.

The Hole of the Ear, is a Tube reaching from the *Concha* to the *Tympanum*, and consists partly of a Cartilage, and partly of a Bone, the Skin that covers it is furnished with an infinite Number of Glandules of a yellowish Colour, each of which hath its Tube opening into the Cavity of the Ear, and sending forth that yellow glewy Substance, which is commonly found there: At the End of this Passage is seated the Membrane, called the *Tympanum*, or *Drum*, being almost round, dry, thin, and transparent, and is inchased in a Channel cut in the Bone at the End of the Tube.

After this Membrane succeeds a Cavity called the *Barrel*, from the likeness it has to the *Barrel* of a *Drum*, being on the Sides encompassed by the Bone, closed before by that Membrane, and behind by the Surface of the *Os Petrosum*. This Barrel contains in it two *Channels*, two *Apertures*, four *Bones*, three *Muscles*, and one *Branch* of the *Nerve*.

The Channel that goes from the Ear to the Palate, is called the *Aqueduct*.

The Apertures, or Windows, are situated in the Superficies of the *Os Petrosum*, opposite to the *Tympanum*; the highest is the Oval-Window, in the Bottom of which is a small Edge whereon the Basis of the *Incus* rests; the other, which is called the Round Window, has a small Channel, in which is set a very fine, dry, and diaphanous Membrane, like that of the *Tympanum*.

The

The first of the Bones is called *Malleus*, whose Length is about $\frac{4}{12}$ of an Inch, the Diameter of its Breadth is one Third of its Length.

The Second is the *Incus*, the longest of whose Legs is joined to the *Stapes* by the Mediation of the fourth Bone.

Of the three Muscles which are contained in this Cavity, Two belong to the *Malleus*, the Third to the *Stapes*. Lastly, The Branch of the Nerve which passes behind the *Tympanum*, has been taken by some for the Tendon of the Muscle of the *Malleus*, and is a Branch of the fifth Pair.

The two Windows open into a Cavity, which is hewn in the *Os Petrosum*, called the *Labyrinth*, divided likewise into three Parts, *viz.* the *Entry of the Labyrinth*, the three *Semi-circular Canals*, and the *Concha*.

The Entry of the Labyrinth is situated behind the Oval Window, and hath Nine Apertures, *viz.* the Oval one, and the Right one, the first of which leads into the upper Part of the *Concha*; five belong to the Semi-circular Canals, and the two last transmit two Branches of the softer Portions of the *Auditory Nerve*, &c.

The *External Ear* collects the Sounds, and augments the Impression by the various Reflections the Voice undergoes in its Passage thro' the Folds of it.

The Use of the Muscles is thought to contract or dilate the *Concha*, as the Tremblings of the Air are strong or weak.

In the *Internal Ear* the *Tympanum* is stretched and made slack again by the Muscles of the *Malleus*; in the Tension of it both Muscles act, but in the Relaxation, only the External, whose Action it is to reduce it from a Concave to a Plain, as is manifest from the Insertion of the Muscles; the Determination of which Action proceeds from the various Dispositions and Appulse of the Objects, as a sharp Note is caused by a Body, whose Parts are so disposed, as to be capable of very quick Vibrations, which they as suddenly impress on the Air: On the contrary, the flat Note proceeds from the slower Strokes of a Body, with Parts that can only be so agitated; to which Differences the *Tympanum* readily complies, and does, as it were, put on their particular Character; this is delivered thence to the *Malleus*, and so forward, till at last the same Fluctuation is caused in the *Os Petrosum*, and in the *Labyrinth*.

The Aquæduct serves chiefly for the Ingress and Egress of Air to and from the Cavity, into which it opens.

From the Communication of the harder Portion of the Auditory Nerve, with the Branches of the Fifth Pair, which are distributed to the Organs of the Voice, proceeds that Sympathy between Speaking and Hearing. From the Communication of other Nerves follow the Motions of the Body, and even of the Spirits, which often accompany the Sounds we hear; as in the Effects of *Musick*, &c.

EARING, aboard a Ship, is that Part of the Bolt-Rope (or Rope wherein the Sail is sewed) which at the four Corners of the Sail is left open in the Form of a Ring: The two uppermost of which four Earings are put over the Yard-Arms to fasten the Sail to the Yard; and into the lower Earings the Tacks and Sheets are seized, or, as they call it, are there *bent unto the Clew*.

EARTH: The Surface of the whole Earth Mr. *Keil*, in his Examination of Dr. *Burnet's Theory*, makes to be 170981012 *Italian* Miles, and the *Italian* Mile is little less than the *English* one.

The Ambit of the Earth (or the Circumference of a Great Circle of it) according to the *French* Measures, is 123249600 *Paris* Feet, or $24649\frac{46}{50}$ *English* Miles.

The Mean Semi-diameter of the Earth is 19615800 *Paris* Feet, or 3933 Miles (of 5000 Feet to a Mile;) But the Earth is higher at the Equator than at the Poles by 82500 Feet or 17 Miles.

So that the Radius of the Earth may be taken in a round Number as 200000000 Feet.

The Solid Content of the Globe of the whole Earth is 30000 000000 000000 000000 Cubick Feet. . . . .

According to Mr. *Cassini*, the Earth's greatest Distance from the Sun is 22374, mean Distance 22000, and least Distance 8022 Semi-diameters of the Earth.

On Supposition that the Sun's Parallax be 32 Seconds, which is a Mean between 40 Seconds and 24 Seconds, the Earth's mean Distance from the Sun will be 54000000 of Miles. Mr. *Whiston*.

Sir *Is. Newton* takes the Earth's Diameter, seen from the Sun, to be 24 Seconds, and consequently the Sun's Parallax to be 12 Seconds; which agrees with our Accurate Astronomer Mr. *Flamstead*, and *Horrox*'s Observations; and then the Distance from the Earth to the Sun will be much greater.

The Figure of our Earth is most probably that of an *Oblate Spheroid*, swelling out towards the Equatorial Parts, and flatted or contracted towards the Poles; so that the Diameter of it at the Equator, is longer than the Axis by about 34 Miles, according to Sir *Is. Newton*; for the Polar Diameter or Axis: Is to the Equatorial one :: As 689: To 692.

If the Earth were ever in a Fluid State, its Revolution round its Axis must necessarily make it put on such a Figure; because near the Equatorial Parts must needs be the greatest Centrifugal Force, and consequently there the Fluid would rise and swell most.

And that it should be so now, seems necessary to keep the Sea in the Equinoctial Regions from overflowing the Earth thereabouts.

Experiments also made on Pendulums, which require different Lengths to swing Seconds here, and at the Equator, prove the same thing.

And if what Mr. *Cassini* says, in *Philosophical Transactions*, *Numb.* 278. is certain from Experience, *viz.* that the Degrees of one and the same Meridian on the Earth, increase about $\frac{1}{853}$ Part as you go Southward, or are longer towards the Equator in any Proportion, then the Earth must needs be of such a Figure; as indeed is that of *Jupiter*, as appears from Observation.

The Learned Dr. *Gregory*, in his *Astronomia Geometrica & Physica*, *Prop.* 52. *Lib.* 3. shews a Method to determine the Figure of the Earth exactly, and to find the Ratio of the Axis of it to its Equatorial Diameter: And demonstrates, That the Earth must be of the Figure now mentioned, *viz.* an *Oblate Spheroid*.

He shews also, That the Prolate Spheroidical Figure of the Earth, is the Reason both of the Recession of the Equinoctial Points; and also, That the Earth's Axis doth twice every Year change its Inclination to the Ecliptick, and as often return back again to its former Position. *Astron. Pag.* 77. *Lib.* 1. *Prop.* 64.

The Earth's mean Revolution, in respect of the fix'd Stars, is 23 Hours, 56 Minutes.

Captain *Halley*, in his Obſervation of *Mercury* in the Sun at St. *Helena*, 1677. tells us, That the Annual Motion of the Earth is ſo exceeding ſwift, as far to exceed that of a Bullet ſhot out of a Cannon, and to be after the Rate of 3 *Engliſh* Miles and an half in a Second, which is 210 Miles in a Minute, and 12600 Miles in an Hour.

The Axis of the Earth is inclined to that of the Ecliptick, in an Angle of 66 Degrees 30 Minutes.

And tho' in one Annual Revolution, its Axis appears to keep exactly parallel to it ſelf; yet in many Years this Poſition becomes ſenſibly changed. *Greg. Aſtron.*

The Earth doth not deſcribe an Orbit round the Sun properly by her own Center, but by the *Common Center of Gravity of the Earth and the Moon.* And this is the Reaſon of the Inequality of the Earth's Motion. *Greg. Aſtron.*

The Earth's Horizontal Parallax to an Eye at the Sun's Surface, will be ſixteen Minutes, the half of the Sun's apparent Diameter.

Our moſt Accurate Aſtronomer Mr. *Flamſtead*, found the Diſtance of the Pole-Star from the Pole, to be greater about the Summer Solſtice than at the Winter, by about 40 or 45 Seconds; and this he ſaith, he confirmed by repeated Obſervations, made for above ſeven Years ſucceſſively, as he acquaints Dr. *Wallis* in a *Latin* Letter to him in the Year 1698, which Letter is publiſhed in the Third Volume of Dr. *Wallis*'s Latin Works: And ſince that he hath told me, That he finds a ſenſible Annual Parallax in others of the fixed Stars, as well as that; and from thence he concludes (I think very juſtly) that the Earth muſt move Annually round the Sun.

As to the Reaſon of the Paralleliſm of the Earth's Axis in all Parts of its Annual Orbit, ſee the Word *Paralleliſm.*

That the Earth is nearer to the Sun in *December*, than it is in *June*; and conſequently, that its Perihelion is in the Month of *December*, is plain,

Firſt, Becauſe the Sun's apparent Diameter is then greater than at *Midſummer.*

And alſo, Becauſe the Earth moves much ſwifter then, by one 25th Part, than at *Midſummer.*

And from hence it is, that there are about eight Days more in the Summer Half-Year, from *March* to *September*, than in the Winter, from *September* to *March.*

Mr. *Whiſton*, in his *Lemmata*, proves very eaſily, That the Annual Motion belongs to the Earth about the Sun, not to the Sun about the Earth.

For when from the *Moon's Orbit*, and the *Planet's Orbits*, and *Periodical Times*, 'tis certain, That the Law of Gravitation towards the Earth and towards the Sun is the ſame; and by conſequence, all the *Periodical Times* of *Bodies* revolving about each of them, are in the ſame Proportion to one another, compared with their ſeveral Diſtances from each of them; on which *Hypotheſis* this Proportion ſuits the *Phænomena* of Nature: the ſame muſt be the true one, and to be fully acquieſc'd in.

Now 'tis known, That on the *Hypotheſis* of the *Earth*'s Annual Motion, her *Periodical Time* exactly ſuits, and is ſo between that of *Mars* and *Venus*, as the Proportion obſerved through the whole *Syſtem*; but one the other *Hypotheſis* 'tis enormouſly different: For when the Moon undoubtedly, and on this *Hypotheſis*, the Sun alſo revolves about our Earth; and when the Diſtance of the Sun is to that of the Moon, as about 10000 to 46; and the *Moon*'s Periodical Time leſs than 28 Days; the Periodical Time of the Sun is by the *Rule of Three* diſcoverable thus;

As the Cube of the *Moon*'s Diſtance, 46 equal to 97336: To (the Cube of the *Sun*'s Diſtance 10000 equal to 1000000000000, or almoſt as 1 to 10000000) :: So muſt the Square of the *Moon*'s Periodical Time, 28 Days equal to 784: Be to the Square of the *Sun*'s Periodical Time, 7840000000, whoſe Square Root 88204, are Days alſo, equal to 242 Years.

So that on the *Hypotheſis* of the *Sun*'s Revolution about the Earth, its Periodical Time muſt undoubtedly be 242 Years, which all Experience atteſts to be but a ſingle one: So that the Controverſy between the *Ptolemaick* and *Pythagorean Syſtems* of the World, is to a Demonſtration determined, and the *Earth*'s Annual Motion for ever unqueſtionably eſtabliſhed.

N. B. This Computation is upon a Suppoſition, that the Sun's Horizontal Parallax is 32 Seconds, which Mr. *Whiſton* takes as a middle Rate: But if you ſuppoſe it to be but 10 Seconds, which agrees much better with the Obſervations of our greateſt Aſtronomers, Mr. *Flamſtead* and Mr. *Caſſini*, who both make the Sun to be diſtant from us 11000 Semi-diameters of our Earth; then the Sun's Motion thro' the *Magnus Orbis*, will be found not to be performed in leſs than 597,3 Years, as any one may eaſily find by Calculation, as above.

He tells us alſo, *Lemma* 56. That if our Earth once revolved about the Sun in a Circular Orbit, whoſe Semi-diameter were equal to the Earth's Original Diſtance from the Sun, 6 Degrees paſt its Perihelion, the Annual Period was exactly equal to 12 Synodical or 13 Periodical Months. 'Tis evident, that 12 Synodical, or 13 Periodical Months, (equal to each other in this Caſe) are 355 Days, 4 Hours, 19 Minutes. 'Tis alſo evident, that the Eccentricity of the Earth's Orbit, or the Diſtance between the *Focus* and Center of its *Ellipſis*, was, according to the ancient Aſtronomers, *Hipparchus* and *Ptolemy*, $\frac{21}{1000}$ of the entire middle Diſtance. By the Moderns 'tis found ſomewhat leſs, (and thoſe who know Sir *Iſ. Newton*'s Philoſophy, will eaſily allow of ſome Diverſity in different Ages) by *Tycho* 'twas determined to be near $\frac{18}{1000}$; by *Caſſini* ſince $\frac{17}{1000}$; and laſt of all, by our moſt Accurate Obſerver Mr. *Flamſtead* $\frac{1692}{100000}$ or near $\frac{17}{1000}$, as *Caſſini* had before determined.

All which conſidered, we may very juſtly take the Middle between the Ancient and Modern Eccentricity, $\frac{19}{1000}$, for the true Original one, and about $\frac{185}{10000}$, or more nicely $\frac{1846}{100000}$, for the Difference between the Ancient Semi-diameter of the Circular Orbit and the middle Diſtance in the preſent Ecliptick one; the Point of Acceleration being about 6 Degrees paſt the *Perihelion*, not juſt at it.

Then, by the *Golden Rule*, As the Cube of 100000 (the middle Diſtance in the *Ellipſis*): To the Cube of 98154, (the Semi-diameter of the Ancient Circle) :: So is the Square of 525949, (the Number of Minutes in our preſent Solar Year): To the Square of the Number of Minutes in the Ancient Solar Year, whoſe Root being 511459 Minutes, or 355 Days, 4 Hours, 19 Minutes, appears to be exactly and ſurprizingly equal to the Lunar Year beforementioned.

Upon

Upon this *Hypotheſis* the Ancient Solar and Lunar Year were exactly commenſurate and equal; and 11 Days, 1 Hour, 30 Minutes ſhorter than the preſent Solar Year.

EARTH, which the Chymiſts call *Terra Damnata*, and *Caput Mortuum*, is the laſt of the five Chymical Principles, and is that which remains after all the other Principles are extracted by Diſtillation, Calcination, &c.

EARTH-BAGS, in *Fortification*, the ſame with Canvas-Bags, which ſee.

EARTHQUAKES: Mr. *Boyle* thinks that *Earthquakes* are often occaſioned by the ſudden fall of Ponderous Maſſes in the Hollow Parts of the Earth, whereby thoſe terrible Shocks and Shakings are produced.

The Learned Dr. *Woodward*, in his Eſſay towards a Natural Hiſtory of the Earth, gives the following Account of *Earthquakes*, which is much the beſt of any I have ſeen.

He ſuppoſes the Subterranean Heat or Fire, which is continually elevating Water out of the Abyſs, to furniſh the Earth with Rain, Dew, Springs, and Rivers, when it is ſtopped in any part of the Earth, and ſo diverted from its ordinary Courſe by ſome accidental Glut or Obſtruction in the Pores or Paſſages through which it uſed to aſcend to the Surface, becomes by this means preternaturally aſſembled, in a greater quantity than uſual, into one Place; and therefore cauſes a great Rarifaction and Intumeſcence of the Water of the Abyſs, putting it into very great Commotions and Diſorders, and at the ſame time making the like Effort on the Earth, which is expanded upon the Face of the Abyſs; and that this occaſions that Agitation and Concuſſion of it, which we call an *Earthquake*.

That this Effort is in ſome *Earthquakes* ſo vehement, that it ſplits and tears the Earth, making Cracks, and Chaſms in it ſome Miles in length, which open at the Inſtant of the Shock, and cloſe again in the Intervals betwixt them; nay, 'tis ſometimes ſo extreamly violent, that it plainly forces the ſuper-incumbent *Strata*, breaks them all throughout, and thereby perfectly undermines and ruins the Foundation of them; ſo that theſe failing, *the whole Tract*, aſſoon as ever the Shock is over, ſinks down to rights into the Abyſs underneath, and is ſwallowed up by it, the Water thereof immediately riſing up, and forming a Lake in the Place where the ſaid Tract before was.

That ſeveral conſiderable Tracts of Land, and ſome with Cities and Towns ſtanding upon them; as alſo whole Mountains, many of them very large, and of great Height, have been thus totally ſwallow'd up.

That this Effort being made in all Directions indifferently, upwards, downwards and on every ſide, the Fire dilating and expanding on all Hands, and endeavouring proportionably to the Quantity and Strength of it, to get Room, and make its way thro' all Obſtacles, falls as foul upon the *Water of the Abyſs* beneath, as upon the Earth above, forcing it forth which way ſoever it can find Vent or Paſſage, as well through its ordinary *Exits*, *Wells*, *Springs*, and the Outlets of *Rivers*; as through the Chaſms then newly open'd; through the *Canini* or *Spiracles* of *Ætna*, or other near *Vulcano's*; and thoſe *Hiatus* at the Bottom of the Sea, whereby the *Abyſs* below opens into it, and communicates with it.

That as the Water reſident in the *Abyſs*, is, in all Parts of it, ſtored with a conſiderable Quantity of Heat, and more eſpecially in thoſe where theſe extraordinary Aggregations of this Fire happen; ſo likewiſe is the Water which is thus forced out of it, inſomuch that when thrown forth, and mixed with the *Waters* of *Wells*, of *Springs*, of *Rivers*, and the *Sea*, it renders them very ſenſibly hot.

That it is uſually expelled forth in vaſt Quantities, and with great Impetuoſity, inſomuch that it hath been ſeen to ſpout out of deep *Wells*, and fly forth at the Tops of them upon the Face of the Ground; with like Rapidity comes it out of the Sources of *Rivers*, filling them ſo of a ſudden, as to make them run over their *Banks*, and overflow their *Neighbouring Territories*, without ſo much as one drop of Rain falling into them, or any other concurrent Water to raiſe and augment them.

That it ſpews out of the *Chaſms* opened by the Earthquake in great abundance, mounting up in mighty Streams to an incredible Height in the Air, and this oftentimes at many Miles Diſtance from any Sea.

That it likewiſe flies forth of the *Vulcano's* in vaſt Floods, and with wonderful Violence: That 'tis forced through the *Hiatus's* at the Bottom of the Sea with ſuch Vehemence, that it puts the Sea immediately into the moſt horrible Diſorder and Perturbation imaginable, even when there is not the leaſt Breath of Wind ſtirring, but all till then calm and ſtill, making it rage and roar with a moſt hideous and amazing Noiſe, raiſing its Surface into prodigious Waves, and toſſing and rowling them about in a very ſtrange and furious manner; overſetting Ships in the Harbours, and ſinking them to the Bottom, with many other like Outrages.

That 'tis refunded out of theſe *Hiatus's* in ſuch Quantity alſo, that it makes a vaſt Addition to the Water of the Sea, raiſing it many Fathoms higher than ever it flows in the higheſt Tides, ſo as to pour it forth far beyond its uſual Bounds, and make it overwhelm the adjacent Country; by this means ruining and deſtroying Towns and Cities, drowning both Men and Cattle; breaking the Cables of Ships, driving them from their Anchors, bearing them along with the Inundation ſeveral Miles up into the Country, and there running them aground; ſtranding Whales likewiſe, and other great Fiſhes, and leaving them at its return upon dry Land.

That theſe *Phænomena* are not new, or peculiar to the Earthquakes which have happened in our Times, but have been obſerved in all Ages, and particularly theſe exorbitant Commotions of the Water of the Globe.

This we may learn abundantly from the Hiſtory of former Times; and 'twas for this reaſon that many of the Ancients concluded rightly enough, that they were cauſed by the Impulſes and Fluctuation of Water in the Bowels of the Earth; and therefore they frequently called *Neptune*, Σεισίχθων, as alſo Κινησίχθων, Ἐνοσίγαιος, and Τιναξοχθαίνης; by all which Epithets they denoted his Power of ſhaking the Earth.

They ſuppoſed that he preſided over all Water whatever, as well that within the Earth as the Sea, and the reſt upon it; and that the Earth was ſupported by Water, its Foundations being laid thereon; on which Account it was, that they beſtow'd upon him that Cognomen Γαιήοχος, or Supporter of the Earth, and that of Θεμελιοῦχος, or *The Suſtainer of its Foundations*.

They likewiſe believed, that he having a full Sway and Command over the Water, had Power to ſtill and compoſe it, as well as to move and diſturb it, and the Earth by means of it; and therefore they alſo gave him the Name of Ἀσφάλιος, or, *The Eſtabliſher*; under which Name ſeveral Temples were

were consecrated to him, and Sacrifices offered whenever an Earthquake happen'd, to pacify and appease him, requesting that he would allay the Commotions of the Water, secure the Foundations of the Earth, and put an end to the Earthquake.

That the Fire it self, which being thus assembled and pent up, is the Cause of all these Perturbations, makes its own way also forth, by what Passages soever it can get vent, through the Spiracles of the next *Vulcano's*, through the Cracks and Openings of the Earth above mentioned, through the Apertures of Springs, especially those of the *Therma*, or any other way that it can either find or make; and being thus discharged, the Earthquake ceaseth till the Cause returns again, and a fresh Collection of this Fire commits the same Outrages as before.

That there is sometimes in Commotion a Portion of the Abyss of that vast Extent, as to shake the Earth incumbent upon it for so very large a Part of the Globe together, that the Shock is felt the same Minute precisely in Countries that are many Hundreds of Miles distant from each other; and this, even though they happen to be parted by the Sea lying betwixt them: And there want not Instances of such an Universal Concussion of the whole Globe, as must needs imply an Agitation of the whole Abyss.

That though the Abyss be liable to these Commotions in all Parts of it, and therefore no Country can be wholly exempted from the Effects of them; yet these Effects are no where very remarkable, nor are there usually any great Damages done by Earthquakes, except only in those Countries which are Mountainous, and consequently Stony and Cavernous underneath, and especially where the Disposition of the *Strata* is such, that those Caverns open into the Abyss, and so freely admit and entertain the Fire, which assembling therein, is the Cause of the Shock; it naturally steering its Course that Way where it finds the readiest Reception, which is towards those Caverns, this being indeed much the Cause of Damps in Mines. Besides, that those Parts of the Earth which abound with Strata of Stone or Marble, making the strongest Opposition to this Effort, are the most furiously shattered, and suffer much more by it, than those which consist of Gravel, Sand, and the like laxer Matter, which more easily give way, and make not so great Resistance; an Event observable not only in this, but all other Explosions whatever.

But above all, those Countries which yield great Store of Sulphur and Nitre, are, by far, the most injured and incommoded by Earthquakes; those Minerals constituting in the Earth a kind of Natural Gunpowder, which taking Fire upon this Assembly and Approach of it, occasions that murmuring Noise, that Subterranean Thunder which is heard rumbling in the Bowels of the Earth during Earthquakes, and by the Assistance of its explosive Power, renders the Shock much greater, so as sometimes to make miserable Havock and Destruction.

And 'tis for this Reason that *Italy*, *Sicily*, *Anatolia*, and some Parts of *Greece*, have been so long and so often alarm'd and harrass'd by Earthquakes, these Countries being all Mountainous and Cavernous, abounding with Stone and Marble, and affording Sulphur and Nitre in great Plenty.

That *Ætna*, *Vesuvius*, *Hecla*, and the other *Vulcano's*, are only so many Spiracles serving for the Discharge of this Subterranean Fire, when 'tis thus preternaturally assembled. That where there happens to be such a Structure and Conformation of the Interior Parts of the Earth, as that the Fire may pass freely and without Impediment from the Caverns wherein it assembles, unto those Spiracles, it then readily and easily gets out, from time to time, without shaking or disturbing the Earth: But where such Communication is wanting, or Passages not sufficiently large and open, so that it cannot come at the said Spiracles without first forcing and removing all Obstacles, it heaves up and shocks the Earth with greater or lesser Impetuosity, according as the Quantity of Fire thus assembled is greater or less, till it hath made its way to the Mouth of the *Vulcano*, where it rusheth forth sometimes in mighty Flames, with great Velocity, and a terrible bellowing Noise.

That therefore there are scarcely any Countries that are much annoyed with Earthquakes, that have not one of these Fiery Vents, and these are constantly all in Flames when any Earthquake happens, they disgorging that Fire which, whilst underneath, was the Cause of the Disaster; and were it not for these *Diverticula*, whereby it gains an *Exit*, 'twould rage in the Bowels of the Earth much more furiously, and make greater Havock than now it doth.

So that though those Countries where there are such *Vulcano's*, are usually more or less troubled with Earthquakes; yet were these *Vulcano's* wanting, they would be more troubled with them than now they are; yea, in all probability, to that Degree, as to render the Earth for a vast Space around them perfectly uninhabitable.

In one word, so Beneficial are these to the Territories where they are, that there do not want Instances of some which have been rescued and wholly delivered from Earthquakes by the breaking forth of a new *Vulcano* there, this continually discharging that Matter, which being till then barricado'd up and imprisoned in the Bowels of the Earth, was the occasion of very great and frequent Calamities.

That most of these Spiracles perpetually, and at all Seasons, send forth Fire more or less; and though it be sometimes so little that the Eye cannot discern it; yet even then, by a nearer approach of the Body, may be discovered a copious and very sensible Heat continually issuing out.

EASE, in the Sea Phrase, is the same as *slack*, or let go slacker: Thus, they say *Ease the Bowling*, *Ease the Sheet*, *i. e.* let it go slacker.

EBBING and *Flowing* of the Sea: See *Tides*.

EBULLITION: The great Boiling, Struggling or Effervescence which arises upon the mingling together of an Acid and an Alkalizate Liquor; and from hence any Intestine violent Motion of the Parts of a Fluid, occasioned by the struggling of Particles of different Natures, is called by this Name, *Ebullition*.

That a considerable *Ebullition* may be produced without Heat (*da veniam verbo*) nay, that a Degree of Cold may be produced greater than was in either of the Bodies singly, and that it shall arise purely upon their Mixture, though accompanied with a great Struggle, Tumult, Noise and Froth:

Mr. *Boyle* plainly proves from this Experiment:

He shook one Part of Oil of Vitriol into 12 Parts of common Water; the Mixture was at first sensibly warm: Then the Ball of a Thermoscope was placed within it, till the includ'd Spirit had gained the Temperament of the Mixture; but then a convenient Quantity of Volatile Salt of Sal Armoniack being

being gradually put in, to ſatiate the acid Spirits of the Mixture, the Spirit in the Thermoſcope deſcended above an Inch.

EBOLICA, are Medicines which help the Deliwery in hard Labour: Alſo Medicines which cauſe Abortives. *Blanchard.*

ECCENTRICITY, in the *Ptolemaick Aſtronomy*, is that Part of the *Linea Apſidum* lying between the Center of the Earth and of the Eccentrick, (*i. e.*) that Circle which the Sun is ſuppoſed to move in about our Earth, and which hath not the Earth exactly for its Center: And the Ancients found this muſt be ſuppoſed, becauſe the Sun ſometimes appears large, and then it is neareſt to us, and ſometimes ſmaller, and then further off.

ECCENTRICITY *Simple or Single*, in the new *Elliptical Aſtronomy*, is the Diſtance between the Center of the *Ellipſe* and the *Focus*; or between the Sun and the Center of the Eccentrick.

ECCENTRICITY *Double*, is the Diſtance between the *Foci* in the *Ellipſe*, and is equal to twice the Single Eccentricity.

ECCENTRICK *Circles*, are Circles not having the ſame Center. Of which Kind ſeveral Orbits were invented by Ancient Aſtronomers, to ſolve the Appearances of the Celeſtial Bodies.

The Eccentricks of the Planets they called alſo *Deferents*, becauſe they ſeemed to carry the Body of the Planet round in their Circumferences.

ECCENTRICK *Equation*, in the old Aſtronomy, is an Angle made by a Line drawn from the Center of the Earth, and another drawn from the Center of the Eccentrick, to the Body or Place of any Planet; the ſame with the *Proſtaphæreſis*; and is equal to the Difference (accounted in an Arch of the Ecliptick) between the Sun's or Planets real and apparent Place.

ECCENTRICK *Place of a Planet*, is that very Point of the Orbit, where the Circle of Inclination coming from the Place of a Planet in his Orbit, falls thereon with Right Angles.

In *Philoſoph. Tranſact. N.* 57. there is a Geometrick Method of Signior *Caſſini* for finding the Eccentricities of the Planets.

And in *N.* 128. there is another Direct and Geometrical Method for finding the *Aphelions*, *Eccentricities* and *Proportions* of the Orbits of the Primary Planets. By Mr. *Halley*.

ECCHOPROTICA, the ſame with *Catharticum*.

ECCHYLOMA, the ſame with *Extractum*.

ECCHYMOMA, are Marks and Spots in the Skin, ariſing from the Extravaſation of Blood. *Blanchard.*

ECCHYMOSIS, the ſame with *Ecchymoma*.

ECCOPE, the ſame with *Extirpatio*.

ECCRIMOCRITICA, are Signs to judge of a Diſtemper from particular Excretions. *Blanchard.*

ECCRISIS, is a Secretion of Excrements out of an Animal Body, or out of ſome Part of it.

ECHINUS, among the Botaniſts, is the prickly Head, Cover of the Seed, or Top of any Plant: So called from its Likeneſs to a Hedge-hog.

ECHINUS, in Architecture, is a Member or Ornament firſt placed on the Top of the *Ionick Capitals*, taking its Name from the Roughneſs of the Carving, reſembling the prickly Rind of the Cheſnut, and not unlike the Thorny Coat of a Hedge-hog.

This Ornament is made uſe of by Modern Architects in Cornices of the *Ionick*, *Corinthian* and *Compoſite* Orders, and generally ſet next to the *Abacus*, being carved with Anchors, Darts and Ovals, or Eggs; whence 'tis called *Ove* by the *French*, and *Ovolo* by the *Italians*; but the *Engliſh* Workmen commonly call it the *Quarter round*.

ECLEGMA, the ſame with a *Linctus Lambative*, *Loch*, or *Lohoch*, being a Medicine deſign'd to heal or eaſe the Lungs in Coughs, Peripneumonies, &c. being uſually compoſed of Oils and Syrups, and ſometimes Powders incorporated together into a Conſiſtence thicker than a Syrup, but not ſo thick as an Electuary.

ECLIPSE, is a Deprivation of the Light of one of the Luminaries, when by their Conjunction in the Orbit of the Sun, or in the Ecliptick, his Face, by the Interpoſition of the *Moon*'s Body, is hidden from our Sight; or when by their Oppoſition in the ſame Orbit, the *Moon*, by the Shadow of the intervening Earth, is obſcured.

So that in a Lunar *Eclipſe*, ſhe really loſes her Light, and is obſcured, by wanting the Illumination of the Sun either totally or partially. But in an *Eclipſe* of the Sun, he loſes not his Light, but only we are deprived of it in part by the Interpoſition of the *Moon*'s Body between us and the Sun: And therefore this ought rather to be called an Eclipſe of the Earth; for 'tis the Earth that is deprived of Light, and not the Sun.

A central Eclipſe of the *Moon*, is when not only the entire Body of the *Moon* is covered by the Shadow, (which is a Total one; as when it is covered by it in Part, it is called a Partial one) but alſo the Center of the *Moon* paſſes through the Center of that Circle, which is made by a Plane cutting the Cone of the Earth's Shadow at Right Angles with the Axis, or with that Line which joins the Centers of the Sun and the Earth.

For the Method of Calculation of the Eclipſes of both the Luminaries, ſee Dr. *Gregory*'s Aſtronomy, *Book* IV. *Sect.* 7, and 8; and Mr. *Flamſtead*'s Doctrine of the Sphere, in *Moor*'s Mathematicks, Part the Second.

Becauſe the Earth (or Sun) always moves in the Ecliptick, the *Moon* can never be Eclipſed, but when her *Plenilunium* happens in or near her *Nodes*, (that is, in the Interſection of the Plane of the Orbit with that of the Ecliptick.)

The Shadow of the Earth obſcuring the *Moon*, though projected into a Cone of a vaſt Length, yet reaches not ſo far as the Planet *Mars*, for he is never Eclipſed by it, tho' he be in the Plane of the Ecliptick, and at Oppoſition to the Sun.

If the *Moon* be ſo near the *Node*, that the Aggregate of the apparent Semi-diameters of the *Moon* and of the Earth's Shadow be greater than the *Moon*'s Latitude, ſhe will be Eclipſed, otherwiſe not. And becauſe the Sum of the Semi-diameter of the *Moon* and of the Earth's Shadow, is always greater than *that* of the Semi-diameters of the *Sun* and *Moon*; for the Former is never leſs than 53′, and the Latter never greater than 35′, 'tis plain, that *Lunar Eclipſes* may happen in a greater Latitude of the Moon, or when ſhe is farther from the *Node* than *Solar* ones; and in this reſpect, of one and the ſame Place upon the Earth, will more often become viſible there; though in regard to the View of the whole Earth, the Solar Eclipſes will happen more frequently.

Our moſt Accurate Aſtronomer Mr. *Flamſtead*, in the Second Part of his Excellent Doctrine of the Sphere, which is Printed in the Firſt Vol. of Sir *Jonas Moor*'s Mathematicks, gives you an Orthographick Projection of the Sphere on a Plane touching the Moon's Orbit, at Right Angles to the Line connecting the Centers of the Earth, Sun, or given Star, by Right Lines proceeding from any of them

to

to the Sphere, whereby are determined the Moon's Parallaxes in Altitude, Longitude, and Latitude; and by it he ſhews alſo how to determine the Breadth of the Semi-diameter of the Diſk of the Penumbra, and the Earth's Shadow in an Eclipſe, and how that of the Sun is made.

He teaches alſo very briefly and plainly, how the true Places of the Sun and Moon, her Latitude, Horary Diſtance, Horizontal Semi-diameters and Parallaxes may be found by Calculation; as alſo, how to find the ſame way, the Times of the mean and true Conjunctions or Oppoſitions of the Luminaries; as alſo, the principal Phaſes of a Solar Eclipſe for the Meridian of *London*, with the Longitudes from it, and the Latitudes of ſuch Places as the Eclipſe will be ſeen at, or where the ſaid Phaſes ſhall appear; that is, where the Eclipſe begins in the Vertex of the Riſing, or Ends in the Vertex of the Setting Sun: Where he riſes or ſets Centrally Eclipſed; where the Eclipſe ends in the loweſt Point of the Riſing, or begins in the Loweſt Point of the Sun Setting; where the Sun is Centrally Eclipſed in the Meridian; and to mention no more, where the Sun is Centrally Eclipſed in the Nonageſimal Degree, without the help of Nonageſimary Tables; of which he gives an Example, and demonſtrates the Reaſon of the *Calculus*.

He gives there alſo a Geometrical Conſtruction of Eclipſes, ſhewing how to find the exact Conjunction, &c. of the Luminaries, Digits then darkned, Inclination of the *Cuſps*, End of the Eclipſe, or Time when any poſſible Number of Digits ſhall be darkned, by Scale and Compaſs; all which is done with great Plainneſs, Brevity and Accuracy, and is very well worth the Mathematical Reader's Peruſal.

ECLIPSIS, in a Medicinal Senſe, is a Defection of the Spirits, or Fainting, or Swooning.

ECLIPTICK, is a great Circle of the Sphere, ſuppoſed to be drawn through the Middle of the Zodiack (which ſee) and making an Angle with the Equinoctial (in the Points of *Aries* and *Libra*) of 23°. 20′. which is the Sun's greateſt Declination.

This is by ſome called *Via Solis*, or the Way of the Sun, becauſe the Sun, in his Annual Motion, never deviates from this Line, as all the other Planets do more or leſs; from whence the Zodiack hath its Breadth. 'Tis this Line which is drawn on the Globe, and not the Zodiack; but in the New Aſtronomy, the *Ecliptick* is that Path or Way among the fix'd Stars, which the Earth appears to deſcribe to an Eye placed in the Sun, as in its Annual Motion it runs round the Sun from Weſt to Eaſt: And if you ſuppoſe this Circle to be divided into 12 equal Parts, they will be the 12 Signs, each of which is denoted or diſtinguiſhed by ſome Aſteriſm or Conſtellation.

Note, If the Spectator's Eye be ſuppoſed to be on the Earth, the Sun will appear always to be in the oppoſite Sign to what the Earth is in.

ECLYSIS, is when the Strength of the Patient is a little decayed, proceeding from a want of a ſufficient Warmth and Spirits in the Body. *Blanchard.*

ECPHRACTICUM, is a Medicine good againſt Obſtructions.

ECPHRAXIS, is a taking away of Obſtructions in any Part. *Blanchard.*

ECPHYSESIS, is a Diſeaſe in which the Patient breathes thick.

ECPHYSIS, is any Proceſs that coheres with, or adheres to a Bone.

ECPIEMA, the ſame with *Empiema.*

ECPIESMA, is a Juice ſqueezed out; alſo the Dregs which remain of any Thing that is ſqueezed; likewiſe a Fracture of the Skull, wherein the broken Parts preſs upon the Meninges or Skin of the Brain. *Blanchard.*

ECPIESMUS, is a very great Protuberance of the Eyes.

ECPLEXIS, is a Fright or Stupor.

ECPNEUMATOSIS, the ſame with *Expiration.*

ECPTOSIS, the ſame with *Luxation.*

ECPUCTICA, are condenſing Medicines: See *Incraſſantia.*

ECPYESIS: See *Empiema.*

ECRITHMUS, is a Pulſe which obſerves no Method nor Number, incident to any Age. *Blanchard.*

ECTHLIMA, is an Ulceration ariſing from a violent Compreſſion in the Surface of the Skin. *Blanchard.*

ECTHLIPSIS, is a Figure in Grammar relating to the Dimenſion of *Latin* Verſes, whereby the Letter *M*, with its preceding Vowel, is cut off, becauſe the ſucceeding Word begins with a Vowel, as in this Verſe;

O Curas Hominum! O quantum eſt in Rebus Inane!

Where the *um* in *Hominum* and *Quantum* is entirely cut off, and not ſounded before the Vowels *o* and *e*.

ECTHYMATA, are Pimples or certain breakings out in the Skin, as the Small Pox, &c. *Blanchard.*

ECTHYMOSIS, is a Commotion or Intumeſcence of the Blood; alſo a Cheerfulneſs of the Mind. *Blanchard.*

ECTILLOTICA, are Medicines which conſume Callous Parts, and pull out Hairs, &c. *Blanchard.*

ECTROPIUM, is a growing of the Eye-lids, when the lower is ſhorter than the upper. *Blanchard.*

ECZEMATA, are extreme hot, or, as it were burning Pimples: Some take *Hydroa* for *Eczemata*, but it is a Miſtake. *Blanchard.*

EDDY, is when the Water at any Place runs back, contrary to the Tide or Stream, and ſo falls into the Tide or Current again. The Seamen call alſo that *Eddy Water*, which falls back, as it were, on the Rudder of a Ship under Sail, the *Dead Water*. They call alſo an *Eddy Wind*, that which returns, or is beat back from any Sail, &c.

EDULCORATION, (*i. e.* Sweetning) is a Term uſed by the Chymiſts for the clearing of any Matter from the Salts it may be impregnated or mixed with, by waſhing it throughly in common Water.

EFFECTIONS, is a Word uſed by Geometers, in the ſame Senſe with the *Geometrical Conſtruction* of Propoſitions, and often of *Problems* and *Practices*; which, when they are deducible from, or founded upon ſome General Propoſition, are called the *Geometrical Effections* thereunto belonging.

EFFERVESCENCE, a Word much uſed by the Modern Philoſophers and Chymiſts; it expreſſes a greater Degree of Motion and Struggling of the ſmall Part of a Liquor, than we underſtand by the Word *Fermentation*, and implies a great Ebullition or Boiling up with ſome Degree of Heat; and is the uſual Term for the Effect of pouring an acid Liquor, (as ſuppoſe *Oil of Vitriol*) on an *Alkaliſate* one, as on *Oil of Tartar per Deliquium*: for a very great Commoti-

motion, ſtruggling Heat, and boiling will immediately ariſe; which may be called a great *Effervescence.*

Lemery defines it to be an Ebullition or Boiling of any Liquor without the Separation of its Parts; but that doth not fully expreſs the Meaning of the Word.

EFFLUVIUMS, are ſuch very ſmall Particles or Corpuſcles, as are continually flowing out of all mix'd Bodies.

The very great Subtilty and Fineneſs of the Effluvia of many Bodies, appears from their being able for a long time together, to produce ſenſible Effects, without any ſenſible, or at leaſt, conſiderable Diminution of the Bulk or Weight of the Body that emits them.

And that theſe *Effluviums* may conſiderably operate upon, and have great Effect on Bodies within the Sphere of their Activity, Mr. *Boyle* proves from theſe Conſiderations;

1. That the *Number* of the Particles or Corpuſcles emitted as Effluviums out of any Body, is *vaſtly great.*

2. That they are of a very *penetrating* and *pervading* Nature, and ſo can moſt eaſily inſinuate themſelves into the Bodies they operate upon.

3. That they are moved with vaſt Celerity, and oftentimes with all manner of Directions, and very various Modifications.

4. That there is often a wonderful Congruity or Incongruity of the Bulk and Shape of theſe Effluvia, to the Pores of the Bodies they penetrate into and act upon.

5. That eſpecially in Animal and Organical Bodies, theſe Effluvia may excite great Motions of one Part of the curious Engine upon another, and thereby produce very conſiderable Effects in the Animal Oeconomy.

6. That they may have ſometimes a Powder to make themſelves be aſſiſted in their Operations *by the more Catholick Agents of the Univerſe*; ſuch as Gravity, the Preſſure of the Atmoſphere, Light, Magnetiſm, &c.

EGESTION, the ſame with *Dejection.*

EJECTIONE *Cuſtodiæ*, is a Writ which lieth properly againſt him that caſteth out the Guardian from any Land during the Minority of the Heir.

EJECTIONE *Firmæ*, is a Writ that lieth for the Leſſee for Term of Years, that is caſt out before his Term expired, either by the Leſſor or a Stranger.

EIRE, or *Eyre*, in *Britton*, Cap. 2. ſignifies the Court of Juſtices *Itinerant.* And Juſtices in *Eyre*, are thoſe which *Bracton* in many Places calleth *Juſticiarios itinerantes*, of the *Eyre.* The *Eyre* alſo of the Foreſt is nothing but the *Juſtice-Seat* otherwiſe called, which is, or ſhould by Ancient Term, be held every three Years by the Juſtices of the Foreſt.

ELABORATORY: See *Laboratory.*

ELASTICK *Force*, primarily, is the Force of a Spring when bent, and endeavouring to unbend it ſelf again.

In Phyſicks, 'tis taken for the Endeavour of Springing or Elaſtick Particles, when compreſs'd or crowded into a little Room, to dilate and evolve themſelves again: Wherefore by this Name they frequently call ſuch an Exploſion of Animal Spirits as is frequent in Cramps or Convulſions. The Effect of this Power, or this Quality in Bodies, is called *Elaſticity*; and Bodies that have it, *Elaſtick Bodies.*

And as a *Soft Body* is that which when preſs'd yields to the Stroke, and loſes its former Figure, and cannot recover it ſelf again; ſo an *Elaſtick Body* is that which though it yields for a while to the Stroke, yet can afterwards recover its former Figure by its own natural Power; and if it can do this with the ſame Force as that which preſs'd upon it, we ſay 'tis perfectly *Elaſtical.*

If there were no *Elaſticity*, the Laws of Motion found by Mathematicians, about the Percuſſion of two Bodies, would hold univerſally, and be without Exception true: And the Bodies (as Mr. *Keil* obſerves in his *Introduct. ad Veram Phyſicam*, P. 151.) would move jointly that way towards which the ſtronger Body tended before the Shock or Percuſſion, and with a Celerity eaſily determinable by thoſe Laws of Motion. But becauſe there are very few Bodies without ſome Degree of *Elaſticity*, even ſoft Clay, Wax, &c. containing within them ſome Particles of Elaſtick Air; from hence it is, that Bodies which ſtrike or move one againſt another, do ſpring or leap back, and move with very different Velocities, ſometimes one way, ſometimes another.

If you imagine a String or Wire to be ſtrained, and faſtened firm at each End, then 'tis plain, that if either the Middle Part of the String (or any other) be either drawn by the Hand, or preſs'd by a Weight out of the right Poſition it was at firſt in; then if the Force that removed it, be not greater than the Elaſtick Force of the String, the String will fly back; and if the Weight or Body be not removed, drive it before it, as the String of a Croſs-bow doth the Bullet; and the acquir'd Velocity of the String will carry it beyond its firſt right Poſition towards the oppoſite Parts, and that ſo far as till the Motion that way be equal to the Elaſticity of the String; and then being quite deſtroyed, the String will return again as before; and thus ſpringing forward and backward; would (abſtractly from the Reſiſtance of the Medium) like a double Pendulum, make continual Vibrations. Thus alſo, if you ſuppoſe any Weight to fall on an immoveably fix'd and perfectly Elaſtick Body; on the Contact, the Parts of the Elaſtick Body will ſpring back or recede inwards, till the Elaſtick Force be raiſed up equal to the *Momentum* of the falling Body; and then this latter ceaſing, the Elaſtick Force will caſt the Body upwards or from it, with the ſame Velocity it came down, or was impelled againſt it, recovering again its former Figure; but if both the Bodies being Elaſtick, neither of them be fixed or moveable, then the Elaſtick Force will act equally in each Body, and produce equal Mutations of Motion.

And from this *Elaſticity* in Bodies ariſes that *Reſilition* or leaping back from one another, which we obſerve in many Bodies on their moving ſwiftly one againſt another. The uſual Method to judge whether Bodies are endowed with this Elaſtick Quality or not, is to enquire whether, on being ſtruck, they give any *Tinnitus*, or ringing Sound, or indeed any ſenſible Noiſe; for if they do, you may conclude them in ſome Meaſure Elaſtical; and that they are ſo in Proportion to the Strength and Acuteneſs of the Sound they emit.

Mr. *Keil* gives theſe Rules for the Motion of Elaſtick Bodies.

THEOREM.

If two Bodies perfectly Elaſtick ſtrike one againſt another, there will be or remain in each the ſame Relative Velocity as was before; that is, ſuch Bodies will recede from each other with the ſame Velocity that they met together with.

For the compreſſive Force or the Magnitude of the Stroke in any given Bodies, ariſes from the relative Velocity of thoſe Bodies, and is proportional to it: And Bodies perfectly Elaſtick, will reſtore themſelves compleatly to the Figure they had before the Shock: or in other Words, the Reſtitutive Force is equal to the Compreſſive, and therefore muſt be equal to the Force with which they acceded, and conſequently they muſt by Elaſticity recede again from each other with the ſame Velocity. *Q. E. D.*

COROLLARY.

Hence taking equal Times before and after the Shock, the Diſtances between the Bodies will be equal: And therefore the Diſtances of the Bodies from the common Center of Gravity will, in the ſame Times, be equal.

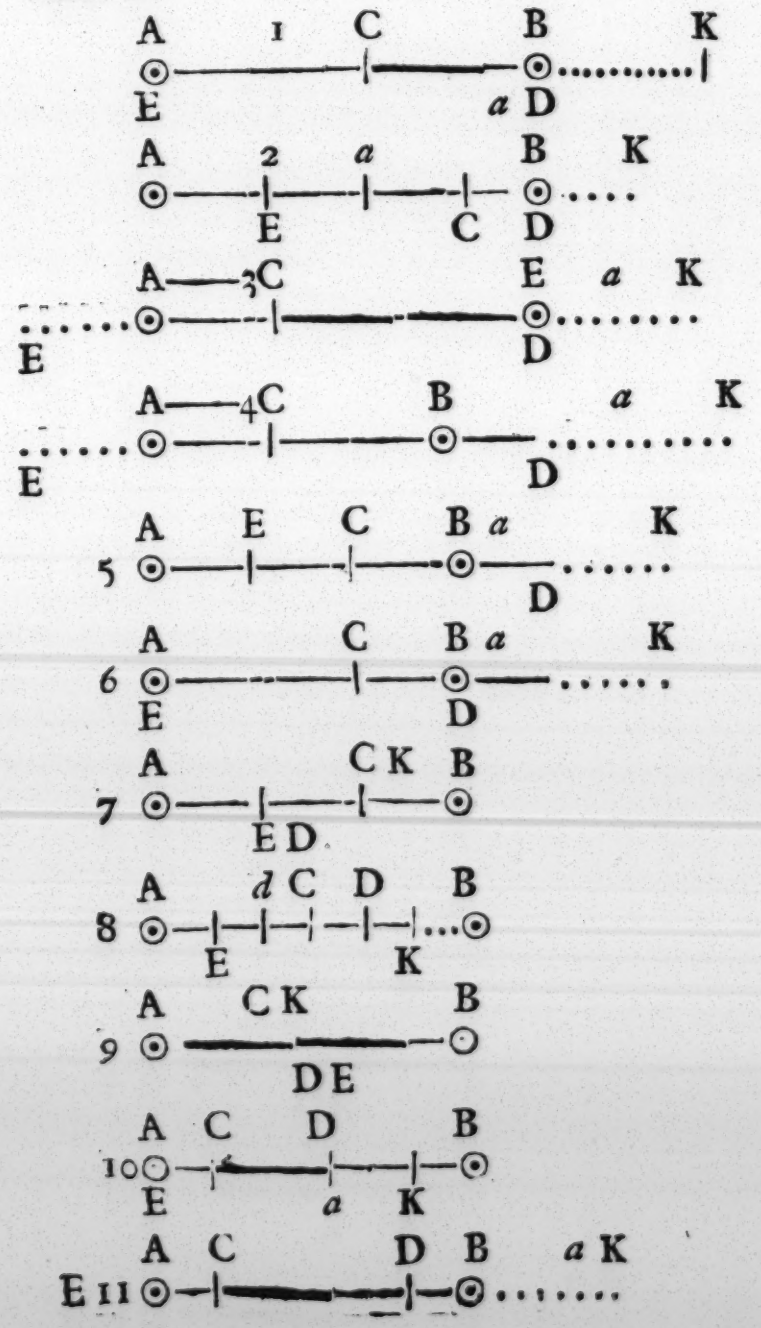
Whence the Laws of the meeting of Bodies perfectly Elaſtick are eaſily deduced, which he doth by this Problem.

PROBLEM.

To determine the Rules of the direct Meeting or Shock of Bodies perfectly Elaſtical.

One Conſtruction will ſerve for all Caſes of this Problem.

Let there be two Bodies, *A* and *B*, perfectly Elaſtical, whoſe common Center of Gravity let be *C*, and let *D* be the Point of Concourſe where the Bodies meet; make *CE* always equal to *CD*. Then I ſay, that after the Concourſe or Shock, the Right Line *CE* will expreſs the Velocity of the Body *A* from *E* towards *A*; and the Right Line *EB* will expreſs the Velocity of the Body *B*, from *E* towards *B*.



DEMONSTRATION.

Since the common Center of Gravity of any Bodies, proceeds on with the ſame uniform Progreſſion, and with the ſame Velocity both before and after the Shock and Impulſe, as he proves in *Theorem* 18; and that in a Time equal to that in which the Body *A* moves the Length *AD*; or the Center of Gravity *C* moves the Length *CD*; and after the Concourſe, the ſame Point *C* will move the Length *DK* = to *DC*. This being ſo, let *Ka* be taken equal to *CA*; then, ſince by *Cor.* of the preceding *Theorem*, taking equal Times both before and after the Impulſe, the Diſtances of the Bodies from the common Center of Gravity will always be equal; then at what time the common Center of Gravity will be in *K*, the Body *A* will be found to be in *a*; and therefore after the Impulſe, its Motion will be from *D* towards *a*, and its Velocity will be expreſſed by *Da*, which is the Length run over in that Time. But becauſe *CE* = *CD*, or to *KC*, and *Ca* = *Ka*, the Difference between the Right Lines *CE* and *CA* will be equal to the Difference between the Right Lines *KD* and *Ka*; that is, *EA* = *Da*: But the Right Line *Da* expreſſes the Velocity of the Body *A* after the Shock or Impulſe, and conſequently its Velocity will alſo be expreſſed by the right Line *EA*. Beſides, ſince the relative Velocity of theſe Bodies remains the ſame both before and after the Shock, and that the right Line *EA* denotes the Velocity of the Body *A*, the Velocity of the Body *B* muſt neceſſarily, after the Impulſe, be denoted by the Line *EB*, and the Direction of the Motion will be from *E* towards *B*.

COR. I.

Hence, if the Body *B* be at reſt, the Points *D* and *B* will be co-incident, as in the Caſe of the three firſt Lines in the Figure: and becauſe *B* : *A* :: *AB* : *CB*, therefore, by Compoſition, *B* + *A* : *AA* :: *AB* : *CB*; and doubling the conſequent Terms of the Proportion, *B* + *A* : 2 *A* :: *AB* : 2 *CB*; that is in Words, *As the Aggregate or Sum of the Bodies: Is to the Double of the moving or ſtriking Body:: So will the Velocity of the ſtriking Body be before the Shock: To the Velocity of the quieſcent Body after it.*

COR. II.

Wherefore if the Bodies *A*, *B* are equal, the Sum or Aggregate of them muſt be 2 *A*: Whence the Velocity of the Body *B*, after the Shock, ſhall be equal to *AB*, the Velocity of the Body *A* before it; and conſequently the Points *E* and *A* being co-incident, *AE*, the Velocity of the moving Body after the Impulſe or Shock, will be = 0; that is, none at all. Which alſo may be eaſily ſhewn thus; becauſe the Bodies *A* and *B* are equal, *AC* will be = *CB* = *CD* = *CE*; wherefore the Point *E* will co-incide with *A*, and conſequently the Body *A*, after the Shock, will be at reſt, and the Body *B* will move with the Velocity *EB* or *AB*.

If therefore a perfectly Elaſtick Body ſtrike directly againſt another equal to it, and which is at reſt; after the Shock the moving Body will loſe all its Motion, and the Quieſcent move on with the Velocity of the Former.

COR-

COR. III.

If the Bodies A and B are equal, and both move the ſame way, as in Line the 4th of the Figure, they will move alſo both the ſame way after the Shock, and with the mutual Exchange of their Velocities.

For ſince $CE = CD$, and $AC = CB$; $CE - AC$, that is, EA, muſt be $= CD - CB$, or to BD; and conſequently, the Velocity of the Body after the Shock, will be equal to that of B before it. Beſides, ſince $EA = BD$, EB will be $= AD$; and therefore the Velocity of the Body B after the Shock, muſt be equal to that of A before it.

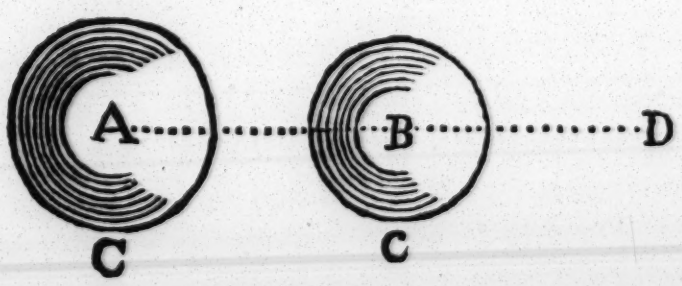
COR. IV.

If the equal Bodies B and A move with contrary Directions, as in Line the 10th of the Figure, they will alſo, after the Concourſe and Shock, move contrary ways, and with their Velocities counter changed.

For ſince $AC = CB$, and $CE = CD$, $AC - CE$; that is, AE muſt be equal to $CB - CD$, or to BD; and therefore the Velocity of the Body A, after the Shock, will be equal to that of B before it. Beſides, ſince $EA = BD$, AD will be $= EB$: But AD expreſſes the Velocity of the Body A before the Shock, and EB the Velocity of B after it; wherefore the Truth of this *Corollary* is plain.

After this he ſhews a very eaſy Method to bring theſe Theorems to Practice, by a Calculation in Numbers.

For ſuppoſe (1) the Bodies A and B both move the ſame way, and that the Velocity of the precedent Body B be c, and that of the ſubſequent A be C; wherefore the relative Velocity of theſe two Bodies will be $C - c$, and the Sum of their Motions the ſame way $AC + Bc$: Let x denote the Velocity of the ſubſequent Body A after the Concourſe and Shock; then becauſe the relative Velocity of Bodies before and after the Shock continues the ſame, the Velocity of the Body B will be expreſſed by $x + C - c$.



For the relative Velocity of Bodies is equal to that by which the Velocity of the Swifter exceeds that of the Slower; and therefore that Exceſs muſt be expreſſed by $C - c$. Wherefore, ſince the Velocity of the ſubſequent Body $A = x$, its Motion towards D muſt be Ax: And ſince the Velocity of the preceding Body $B = x + C - c$, its Motion alſo towards D muſt be expreſſed thus, $Bx + BC - Bc$; and the Sum of theſe two Motions will be equal to the Sum of the former Motions: That is, in Species, $Ax + Bx + BC - Bc = AC + Bc$; and by Tranſpoſition, $Ax + Bx = 2Bc - BC + AC$; and then by Diviſion, $x = \frac{2Bc - BC + AC}{A + B}$ = Velocity of the Body A. And ſo alſo the Velocity of the Body B is $= x +$

$C - c = \frac{AC - BC + 2Bc}{A + B} + C - c =$
$\frac{AC - BC + 2BC + AC + BC - Ac - Bc}{A + B}$
$= \frac{2AC - Ac + Bc}{A + B}$.

If BC be greater than $AC + 2Bc$, then x or $\frac{AC - BC + 2Bc}{A + B}$ will be a Negative Quantity; and conſequently the Velocity of the Body A will have a contrary Direction, and its Motion towards D will be Negative.

If the Body B be at reſt, that is, if $c = 0$, then the Velocity of the Body A after the Shock will be $+ \frac{AC - BC}{A + B}$, forwards or backwards according as the Sign + or − prevails.

If the Bodies A and B, with the Velocities C and c move contrary Ways, and conſequently meet one another directly; their Motion the ſame way will be expreſſed by $AC - Bc$, and the relative Velocity of the Bodies will be $C + c$.

Let then x ſtand for the required Velocity of the Body A after the Shock; its Motion that way, which it went before the Shock, will be expreſſed by Ax, and the Velocity of the Body B will be $x + C + c$ (for the relative Velocity of Bodies is not altered by the Shock) and then the Motion in the Body B towards D, will be $Bx + BC + Bc$; wherefore the Sum of the Motions the ſame way will be $Ax + Bx + BC + Bc$ which (by his 14th Theorem about the Laws of Motion) will be $= AC - Bc$; ſo that $Ax + Bx = AC - BC - 2Bc$, and $x = \frac{AC - BC - 2Bc}{A + B}$.

And the Velocity of the Body B will be
$\frac{AC - BC - 2Bc}{A + B} C + c =$
$\frac{AC - BC - 2Bc + AC + Ac + BC + Bc}{A + B}$
$= \frac{2AC + Ac - Bc}{A + B}$

If $BC + 2Bc$ be greater than AC, the Motion of the Body A will be backwards or a contrary way; in which Caſe x or $\frac{AC - BC - 2Bc}{A + B}$

Whatever be the Phyſical Cauſe of *Elaſticity*; Sir *Iſaac Newton*, Prop. 23. Book 2. of his admirable *Princip.* demonſtrates, That "Particles which mu-
" tually avoid or fly from one another by ſuch For-
" ces as are reciprocally proportional to the Diſtan-
" ces of their Centers, will compoſe an Elaſtick
" Fluid, whoſe Denſity ſhall be proportional to its
" Compreſſion.

And *vice verſa*, "If any Fluid be compoſed of
" Particles, that fly or avoid one another, and
" hath its Denſity proportional to its Compreſſion,
" then the Centrifugal Forces of thoſe Particles
" will be reciprocally as the Diſtances of their
" Centers.

ELATERISTS, Mr. *Boyle*'s Word, are ſuch as hold the Doctrine of *Elaterium*, or the Spring and Weight of the Air, which he defends againſt *Linus*.

ELATERIUM is the Juice of wild Cucumbers made up in a thick and hard Conſiſtence: Alſo, according to ſome, any Medicine that purges the Belly.

ELECTICA: See *Attrahentia*.

ELECTION *de Clerk*, is a Writ that lieth for the Choice of a *Clerk*, aſſigned to take and make Bonds called *Statute-Merchant*; and is granted out of the *Chancery* upon Suggeſtion made, That the *Clerk* formerly aſſigned is gone to dwell in another Place, or hath Hindrance to lett him from following that Buſineſs, or hath not Land ſufficient to anſwer his Tranſgreſſion if he ſhould deal amiſs.

ELECTRICITY, is the Quality that Amber, Jett, Sealing-Wax, *&c.* have of attracting all Kinds of very light Bodies to them, when the attracting Body is rubbed or chafed. And this is moſt probably the Effect of a *Material Effluvium* (as the Noble Mr. *Boyle* expreſſes it in his Notes on this Quality) iſſuing from, and returning to the *Electrical Body*, and aſſiſted alſo in ſome Caſes by the External Air. For the Solution of this Phænomenon there are ſeveral Hypotheſes, and all Mechanical.

1. *Cabæus* ſuppoſes, That actual Streams do iſſue out of the Electrick Body when agitated by Attrition; and that theſe do diſcuſs and repel the Ambient Air, which, after it hath been driven off a little way, makes, at it were, a little Whirl wind from the Reſiſtance which it finds in the remoter Air, to which theſe Electrick Streams did not reach: And that theſe Streams ſhrinking quickly back again to the attracting Body, do, in their Return, attract or bring along with them ſuch light and ſmall Bodies as they meet with in their way. To which Mr. *Boyle* adds, that the Gravity of the incumbent Atmoſphere ſurmounting the ſpecifick Gravity of the little rarified Atmoſphere of the Electrick Body, may probably facilitate the Tendency of the ſmall Particles of Matter towards the attracting Body.

2. Our Famous *Gilbert*, Sir *K. Digby*, *Gaſſendus*, Dr. *Brown*, and many others, ſuppoſe, That on rubbing or chafing, the Electrick Body is made to emit Rays or Files of an unctuous Nature, which, when they come to be condenſed and cooled by the Ambient Air, do loſe their Agitation, and then ſhrink back again into the Body from whence they ſally'd out; and by that means do carry along with them ſuch light and ſmall Bodies as happen to be faſtened or ſticking to their further Ends. *Gaſſendus* thinks alſo, That theſe unctuous Effluvia being emitted all manner of ways, do decuſſate frequently, or croſs one another; and by this Means do take the better hold of Straws, *&c.* into whoſe Pores they inſinuate themſelves.

3. *Des Cartes* being not able to imagine that ſo ſolid a Body as Glaſs was capable of emitting Effluvia; (tho' it is certain that two Pieces of Glaſs rubbed one againſt another, will ſend forth an unpleaſing Odour, which muſt conſiſt of material Effluvia) he had recourſe to the Operation of his *Materia Prima* for the Solution of *Electricity*; but he ſpeaks of it doubtingly himſelf, and unintelligibly to the Reader, as it appears to me; therefore I ſhall refer you to the Place it ſelf, where if you think it worth while, you may ſee what he ſaith at large. *Vid. Cartes Princip. Lib.* 4 *Chap.* 184. *p.* 210.

Mr. *Boyle*, in order to prove Electricity to be a Quality which hath, like all others, in natural Bodies, a Mechanical Original, hath given us the following Obſervations and Experiments about this *Effect*: from whence a very good gueſs may be made how *Electrical Attraction* is produc'd, *viz.*

1. That Electrical Bodies do not at all, or at beſt but very rarely *attract*, but when they are *warm'd*, and thereby ſollicited to emit Effluvia more copiouſly.

2. That theſe Bodies warm'd only by the Fire, don't attract ſo forcibly as they will when heated by rubbing; tho' if they are firſt warmed at the Fire, and then rubbed afterwards, they will attract moſt ſpeedily and powerfully. So that Heat ſeems neceſſary in general to put the Parts into Agitation; and rubbing or chafing in particular, to give them their moſt proper Modification.

3. *Terſion* (as he calls it) or *Wiping*, is almoſt univerſally neceſſary, as well as Attrition or Rubbing, to produce Electricity; for thereby the Steams or Effluvia can the better get out, when there is nothing to ſtop up, or choak the Pores of the attracting Body.

4. The Magnetical Effluvia will pervade all manner of Bodies freely; yet the Interpoſition of the fineſt Linnen or Paper will hinder the Operation of all Electrical Particles; which ſeems to confirm their being ſomething of an unctuous Nature.

5. This Effect is very much weaken'd if the Weather be thick and cloudy, and eſpecially if the South Wind blow, as *Kircher* aſſerts from his own Experience. But it always continues ſome time after it is once excited by rubbing and chafing, and doth not ceaſe in an Inſtant.

6. Electrical Bodies attract all Things indifferently, whereas the Magnet draws only Iron and Steel.

7. Our Excellent Naturaliſt ſuſpended a fine large Piece of very Electrical Amber by a Silken Thread, and then had one end of it rubbed ſtrongly on a little Cuſhion, and then he found that when the Amber was made to hang perfectly at reſt, if the Cuſhion was brought near it, tho' not to touch it, it would plainly make the Amber tend towards it, and follow it. From whence it plainly appears, that other Bodies can draw or move the Electrick one, as well as *it*, the others; and that it is by Accident only, and not from Neceſſity, that the ſmall attracted Bodies go to the Electrick one.

8. By many repeated Experiments he found this Electrical Quality to be producible and deſtructible.

9. He found alſo that a Piece of Amber did ſenſibly attract when the Air was pumped out of the Receiver; which confirms the Hypotheſis of thoſe that ſuppoſe actual Strings or little unctuous Rays to go out of the Electrical Body.

10. He found alſo, that after an Electrical Body had been well rubbed, there was a certain Nick of Time in which the light Body would inſtead of being attracted, be actually driven away from the Electrical Body, by the Effluvia going briſkly out and not yet returning again; which much confirms the Hypotheſis of *Gilbert*, *Digby*, *Brown*, *&c.* mentioned in *N.* 2. See Vol. II.

ELECTUARY, is a Medicine of a Conſiſtence, thicker than a Syrup or Linctus, and compoſed of hard things reduced to Powder, and accurately mixed with Syrups, Conſerves, Honey, *&c.*

ELEGIT, is a Writ Judicial, that lieth for him that hath recover'd Debt or Damages in the King's Court againſt one not able in his Goods to ſatisfy, and directed to the Sheriff, commanding him that he make Delivery of half the Parties Lands or Tenements, and all his Goods, Oxen and Beaſts of the Plow excepted.

ELEMENTS, is a Word uſed by Natural Philoſophers, in the ſame Senſe uſually as *Principles*; and by the Elements and Principles, or as they ſometimes call them *the Elementary Principles* of a Natural or Mixed Body', they mean thoſe ſimple Particles out of which the Mixed is compoſed, and into which 'tis ultimately reſolvable

The Word comes from L, M, N, three of the Letters of the Alphabet; and is alſo frequently uſed for the firſt Principles or Rudiments of any Science.

Thus

Thus the Propoſitions of *Euclid* are called his Elements, becauſe they contain the firſt Principles of Geometry.

ELÆOSACCHARUM, is Sugar incorporated with ſome Drops of diſtilled Oil, ſo as to make the Oil more eaſy and agreeable to be ſwallowed by the Patient.

ELEPHANTIASIS *Arabum*, of which the *Greeks* ſpeak nothing, but the *Arabians* do frequently, is a-kin to a *Varix* or crooked Swelling in the Veins, and proceeds from thence, and is only a Tumour in the Feet. *Avicenna* treats of this Diſtemper, where he ſpeaks of the *Varices*; yet *Rhaſes* differs from him, and *Haly Abbas* follows the *Greeks*, who ſay, That an *Elephas* is a Diſeaſe which corrupts all the Members of the Body, and is as it were, an *Univerſal Cancer*. But neither is he conſiſtent with himſelf, when he writes, that *Ulcers* in the Legs and Feet are called *Elephas*; and that *Elephanticus Morbus* is an Apoſtume proceeding from Melancholly in the Legs and Feet; and the Sign of it is, That the Shape of the Foot is like the Figure of an Elephant. All the reſt treat ſeparately of a *Leproſy* and an *Elephantia*, and make the latter to be a Swelling of the Feet, proceeding from Melancholly and Pituitous Blood, and the crooked Swelling of the Veins, whereby the Feet reſemble the Feet of an Elephant in Shape and Thickneſs: And this ſort of Tumour is often ſeen in Beggars who wander much. *Blanchard.*

ELEPHANTIASIS *Græcorum*, which the *Arabians* call a Leproſy: It is called alſo *Elephas*, *Elephantiaſis*, and *Elephantia*, from an Elephant, as ſome think, becauſe it makes People big like an Elephant, which is a fooliſh Notation of the Word; for the Body is no bigger, though the Diſeaſe be. Others think 'tis ſo called, becauſe the Diſtemper lying in the Legs, make them ſtiff and equal like an Elephant; or becauſe 'tis a ſtrong vehement Diſeaſe like an Elephant, with ſuch like Stuff. *Galen*, in his 14th Chapter of Tumours, ſays, that "This Diſeaſe is called a *Saturiaſmus* when firſt it "begins, becauſe it makes the Face like that of a "Satyr; for the Lips are thick, the Noſe ſwells, "the Ears Decay, the Jaws are red, the Foreherd "is ſet with Tumours like ſo many Horns." Though others think it is called *Saturiaſmus*, becauſe the Perſons afflicted are much inclined to Leachery at the beginning, as Satyrs are. *Celſus* deſcribes it thus: "The whole Body (ſays he) is ſo affect-"ed, that the very Bones may be ſaid to be cor-"rupted. The upper Parts of the Body are full "of Spots and Tumours, the Redneſs whereof is "gradually turned into Black: The Top of the "Skin is unequally thick, thin, hard, ſoft, rough, "as if it had Scales on it; the Body decays, the "Bones, Calves of the Legs, and Feet, ſwell. "When the Diſeaſe is old and inveterate, the Toes "and Fingers are hid in the Swelling, and a ſmall "Fever ariſes, which eaſily conſumes a Man "loaden with ſo many Infirmities. *Blanchard.*

ELEVATION *of a Mortar-piece or Gun*, is the Angle which the Chaſe of the Piece, or the Axis of the hollow Cylinder, makes with the Plane of the Horizon.

ELEVATION *of the Pole*, is the Heighth or Number of Degrees that the Pole, in any Latitude, is raiſed, or appears above the Horizon.

ELEVATION *of the Pole*, in Dyalling, is the Angle which the Style makes with Subſtylar Line.

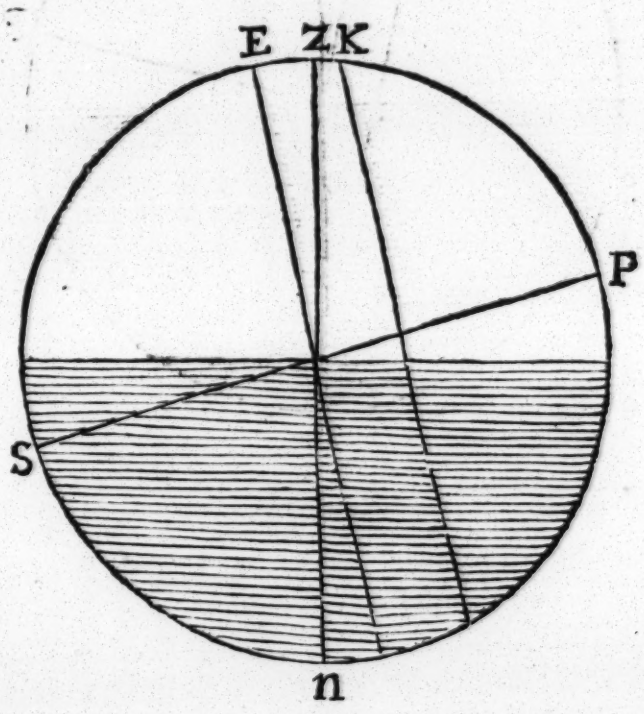
To find the Elevation *or Height of the Pole, having given the Declination and Meridian Altitude or Zenith Diſtance of the Sun or Star.*

Note, 1. If the Sun or Star have no Declination, the Zenith Diſtance is the Latitude or Heighth of the Pole; and if the Sun or Star come to the Meridian due North, the Latitude is Southerly; if it come to the Meridian South, the Latitude is Northerly.

2. If the Sun or Star be in the Zenith, the Declination is the Latitude; and if the Declination be Southerly, the Latitude is Southerly; but if the Declination be Northerly, the Latitude is Northerly.

Rule 1.

If the Declination be North or South, and the Meridian Altitude be the ſame way that the Declination is, the Difference between the Declination and Zenith Diſtance, is the Heighth of the Pole towards which the Declination is.

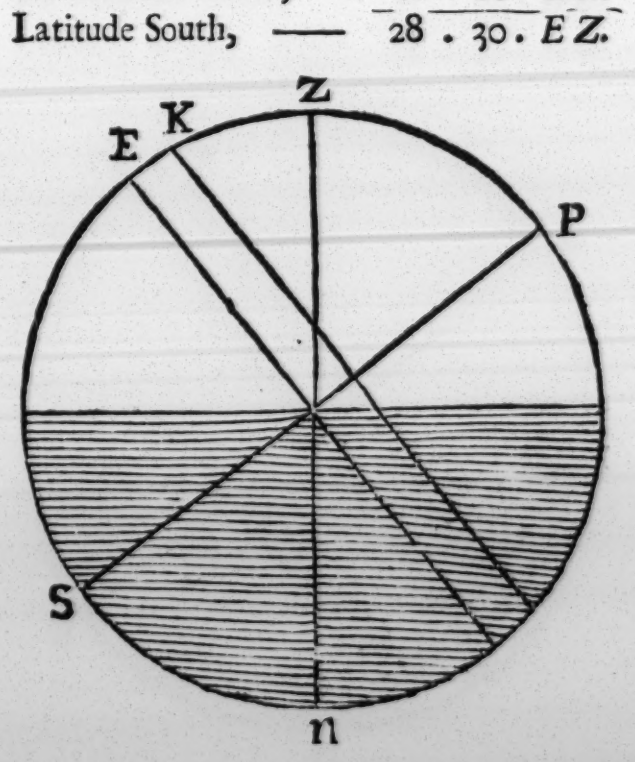


Example 1.

Declination North, —— 23°. 30′. *EK.*
Zenith Diſtance North, — 8 . 30 . *ZK.*
Latitude North, —— 15 . 00 . *EZ.*

But if the Declination be leſs than the Zenith-Diſtance, then the contrary Pole to the Declination is elevated: As,

Zenith Diſtance South, 48°. 30′. *ZK.*
Declination South, — 20 . 00 . *EK.*
Latitude South, —— 28 . 30 . *EZ.*



Example

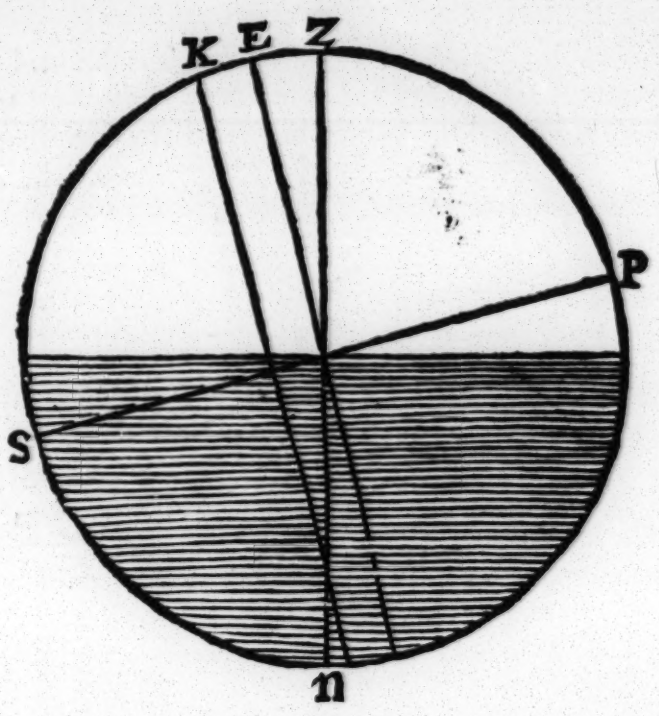
Example 2.

Zenith Distance North, 50°. 00′.
Declination North, — 15 . 00.

Latitude South, —— 35 . 00.

Rule 1.

If the Sun or Star's Declination be North or South, and the Zenith Distance be contrary to the Declination, the Sum of the Co-altitude and Declination is the *Heighth of that Pole* that the Declination is towards.



Example.

Zenith Distance South, 31°. 30′. *ZK.*
Declination North, — 20 . 00. *EK.*

Latitude North, —— 51 . 30. *ZE.*

Note, If the Declination be the same way that the Meridian Altitude is, and greater than the Meridian Altitude, then the Sun or Star may have two Meridian Altitudes in 24 Hours, *viz.* the one above the Pole, and the other below.

In such Case the Sum of the Co-declination and Altitude, is the *Heighth of the Pole* towards which the Declination is.

Example.

Declin. North 21°. 30′. its Compl. 68°. 30′.
Meridian Altitude North, —— 10 . 30.

Elevation of the North Pole, — 79 . 00.

But if the Meridian Altitude be greater than the Declination, then the Difference between the Zenith Distance and Co-declination, is the *Heighth of the Pole* towards which the Declination is.

Example.

Declination North, 22°. 30′.
Zenith Distance, — 10 . 30. North.

Latitude North, — 12 . 00.

Note, Which way soever the Meridian Altitude be, if the Meridian Altitude and twice the Co-declination be less than 180 Degrees, the Sun or Star hath two Meridian Altitudes in 24 Hours, and the Latitude is found by the 2d *Rule*.

Example.

Meridian Altitude South, — 77°. 00′.
Decl. 62°. 00′. North Compl. 28 . 00.

Sum, 133 . 00.

Which is less than 180°. 00′. Therefore,

Zenith Distance South, 13°. 00′.
Declination North, — 62 . 00.

Latitude North, — 75 . 00.

ELEVATOR, the same with *Elevatorium.*

ELEVATOR *Labii Inferioris*, is a Muscle which, with its Partner, lies within the lower Lip. They arise fleshy from the inferior Part of the Gums of the lower Jaw which belong to the *Dentes Incisorios*, and descend directly to their Implantations in the Inferior Part of the Skin of the Chin. Hence it is, when these act, they make divers Indentations in the Chin, as may be observed in living Persons, when the lower Lip is drawn upwards.

ELEVATOR *Labii Superioris*, is a Muscle which arises fleshy from the Fore-part of the *Os Quartum* of the upper Jaw, immediately above the *Elevator Labiorum*, and descends obliquely under the Skin of the upper Lip, joining with its Partner in a middle Line from the *Septum Narium*, to its Termination in the *Sphincter Labiorum*. Its Name shews its Use.

ELEVATOR *Labiorum*, is a Muscle which lies between the *Zygomaticus* and the *Elevator Labii Superioris Proprius*. It arises from the *Os Quartum* of the upper Jaw, and descends to its Insertion under the Termination of the . . . Its Name shews its Use.

ELEVATOR *Oculi*, is a Muscle of the Eye, called *Superbus* from its Moral Signification, it being one of the common Marks of a haughty Disposition to look high; wherefore its opposite Muscle is called *Humilis*. This Muscle arises sharp and fleshy near the Place where the *Optick Nerve* enters the *Orbit*; and becoming a fleshy Belly, makes a thin Tendon inserted to the *Tunica Sclerotis* on the Superior and Fore-part of the Bulb of the Eye under the *Adnata*.

ELEVATORES, or *Elevating Muscles*, are those that serve to draw the Parts of the Body upwards.

ELEVATORIUN, so called from the lifting up, is a Chyrurgeon's Instrument, wherewith Pieces of Sculls that are depressed are raised up again.

ELIXATION, is the boiling of any thing for a Medicinal Use in a proper Liquor, in order that the thing may impart its Vertue to the Liquor 'tis boiled in.

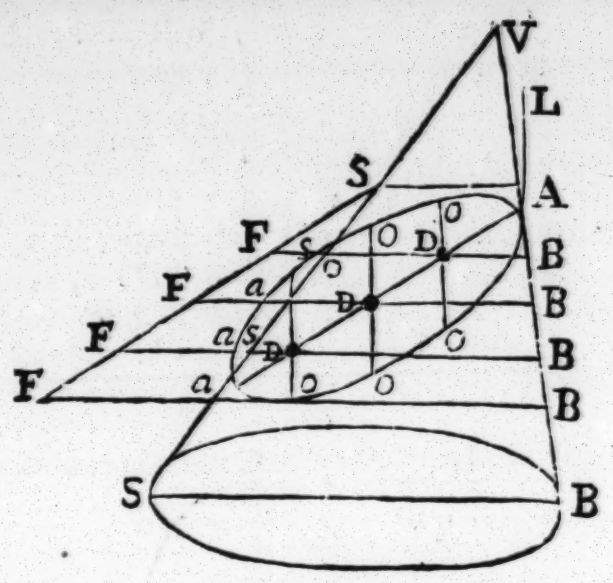
ELIXIR, the Chymist's Name for a very fine and useful Tincture; as *Elixir Proprietatis*, *Salutis*, &c.

ELIXIR *Proprietatis*, is a Tincture of Myrrh, Aloes and Saffron, drawn by Spirit of Wine and Spirit of Sulphur. This is *Paracelsus* his way, and, is really the best of any, though many others are prescribed.

ELLIPSIS, in Grammar, is that Figure whereby some Part of our Discourse is left out or retrenched: As in the Latin Expression *Paucis te volo*, in which Words *verbis alloqui* are left out. This Figure is very common in the Oriental Languages.

ELLIPSIS, in Geometry, is an Oval Figure; 'tis produced from the Section of a Cone by a Plane cutting both ſides of the Cone (but not parallel to the Baſe, for then it produces a Circle) and meeting with the Baſe produced, as *F D K E O* in the ſecond Figure following.

But firſt I will give you Dr. *Wallis*'s General and Geometrical Way of demonſtrating the General Property of the *Ellipſe*, and which he expreſſes thus.



PROP. I.

In the Ellipſe *the Squares of the Ordinates are equal to the Differences between two Rectangles, of which the Greater are as the Abſciſſæ; the Leſſer as the Squares of the Abſciſſæ.*

For,

1. The Squares of *D O* are = Rectangles *B D* × *D S* every where, becauſe *S B* is the Diameter of a Circle.

2. Drawing then *S F* parallel to *A a*, the *Latus Tranſverſum*, and producing the *B S*'s every where to *F*, the Lines *D S* will every where be = *D F* — *F S*, where the *D F*'s are all equal, becauſe *S F* parallel *A a*.

3. You will find alſo, That the Rectangles under *B D* and *D S* (= *D O q*) will be = to the Rectangle under *B D* and *D F*, deducting that under *B D* and *F S*: That is, *B D* × *D S* = *B D* + *D F* — *B D* × *F S*.

4. Alſo becauſe the *D F*'s are all equal, the Rectangle *B D F* will ſtill be as the *B D*'s; and thoſe *B D*'s, becauſe of the ſimilar Triangles *A D B*, will ſtill be as the *D A*'s, or the Abſciſſæ. Wherefore the Rectangles *B D F* will every where be as the Abſciſſæ *A O*; which is the Proof of the firſt Part.

5. But the Squares *B D* × *F S*, ſince both the *B D*'s and *F S*'s are every where as the *A D*'s, muſt be in a duplicate Ratio of, or as the Squares of the Abſciſſæ *A D*.

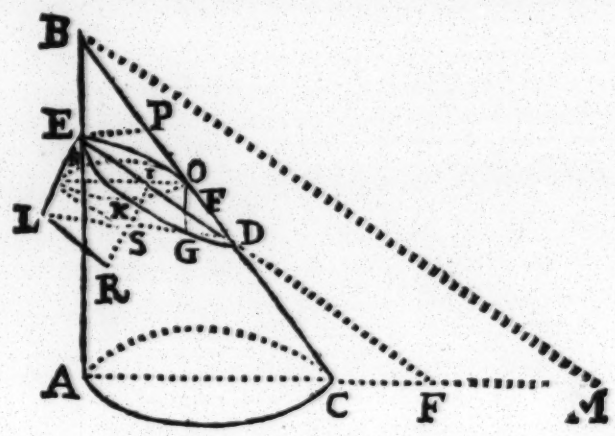
6. Wherefore, ſince the Square of the Ordinate *D O* (= *D B* × *D S*) is equal to *B D* × *D F* — *B D* × *F S* (*Prop.* 3.) the Propoſition is plain.

COROLLARY I.

Hence 'tis plain, That if you have the Right Lines *B D* and *D S*, you have the Ordinate *D O*, but *è contra*, becauſe the Lines *B D*, *D S* may vary infinitely, and yet make a Rectangle equal to *D O q*. Wherefore the Conick Writers thought to to determine the Ordinates another Way; for inſtead of *B D*, they took in the Section the Line *A D*, or the Abſciſſa; and inſtead of *A S* they ſubſtituted another imaginary Line, ſuppoſe *L A* (which they called the *Latus Rectum*) and ordered it ſo, that it ſhould be a fourth proportional reciprocally to the Lines *A S*, *B D* and *D A*: So that every where it ſhould be *B D* × *A S* = *D A* × *L A*, and conſequently the *Latus Rectum* = $\frac{BD}{AD} \times AS$, and $AS = \frac{DA}{BD} \times LA$.

PROP. II.

The Square of any Ordinate (I K) in the Ellipſis, *is equal to the Rectangle (I L) under the* Latus Rectum *(E L) and the Abſciſſa (E I) leſs, or abating out of it another Rectangle made by the ſame Abſciſſa (E D) and a fourth Proportional (R S) to the* Latus Tranſverſum, *the* Latus Rectum *(D E) and the Abſciſſa.*



Draw a Parallel to the Section, as *M B*, which note with *b*, and continue the Axis of the Section till it meet with the Diameter of the Baſe of the Cone produced in the Point *F*, and draw it on to *M*, and call *A M*, *c*.

Draw alſo the *Latus Primarium E P*, and parallel to it *N O* through any given Point, I: Call the Side of the Cone, in which the upper Vertex of the Section is, *a*. Let the Abſciſſa *E I* be noted with *e b*; and then (working by the ſimilar Triangles *B C A*, and *E I N*) according to the Rule of proportions, *N I* will be expreſſed in this Notation by *e c*. Let the produced part of the Baſe *M C* be called *d*; and the *Latus Tranſverſum*, or Tranſverſe Diameter *E D*, be called *o b*: Then will *I D* be = *o b* — *e b*.

Since the Triangles *B M C*, *D E P*, and *D E O* are all Similar, work for a fourth proportional to expreſs *E P*, and you will find it to be *o d*; and *I O* in this Notation (by the ſame Way of working) will be *o d* — *e d*.

Here alſo, as in the Parabola and Hyperbola, the Square *I K* = Right-angle *N I O*, which you will find in the *Ellipſis*, muſt be noted by *o e c d* — *e e c d*; as in the Hyperbola (you may ſee) 'tis *o e c d* + *e e c d*.

If therefore you divide *o e c d* — *e e c d* = the Square of the Ordinate *I K*, by *E I* the Abſciſſa in this Notation = *e b*, it will ſtand thus, $\frac{oecd - eecd}{eb}$, or $\frac{ocd - ecd}{b}$, which is equal to the Line *I S*, and which, with the Abſciſſa *E I* = *e b*, will make *E S* a Rectangle = to *I K* Square.

And if you work here to find the *Latus Rectum*, according to the Canon given in the Parabola, by ſaying, as *b* : *c* :: *o d* : $\frac{od\,c}{b}$, you will have $\frac{od\,c}{b}$ for

for the *Latus Rectum*, which you see is plainly one Part of the Line *I S*; and the other, *viz.* $\frac{e\,c\,d}{b}$, is a fourth Proportional to *b*, *c*, and *e d*; that is, in *Apollonius*'s way, to *o b* the *Latus Transversum*, $\frac{o\,c\,d}{b}$ the *Latus Rectum*, and *e b* the Abscissa, (for the same Quantity $\frac{e\,c\,d}{b}$ comes out both ways.)

Wherefore the Square of the *Applicate K I*, is equal to the Remainder of the Rectangle *I L*, contained under the *Latus Rectum* and Abscissa; when out of that Rectangle another is taken, which is made by the same Abscissa, and a fourth Proportional *R S* to the *Latus Transversum*, *Latus Rectum*, and the Abscissa. *Q. E. D.*

COROLLARIES.

1. Hence the Reason of the Name *Ellipsis* given to this Section is evident, because the Square of the Ordinate is less than, or defective of the Rectangle under the *Latus Rectum*, and the Abscissa.

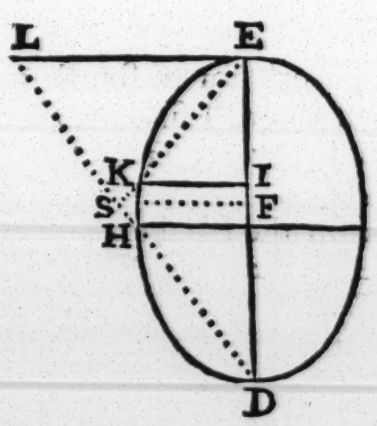
COROLLARY II.

The *Latus Rectum* here, as well as in the Parabola and Hyperbola, is found by making, As *b*, parallel to the Section: Is to *c*, the produced Diameter of the Base of the Cone :: So is *o d*, the *Latus Primarium*: To $\frac{o\,c\,d}{b}$, the *Latus Rectum E.L.*

And here, if the Quantity above and below the Line be multiplied by *b*, you will have $\frac{o\,c\,d\,b}{bb}$, a Quantity equal to the Former, but more agreeable to *Apollonius*'s Way of Expression, who gives this Canon for the *Latus Rectum*, As *b b* = the Square of the Parallel to the Section: Is to *c d* = to a Right-angle under the whole Base and the Part produced :: So is *o b* = *Latus Transversum*: To $\frac{o\,c\,d\,b}{bb}$ (or $\frac{o\,c\,d}{b}$) the *Latus Rectum*.

COROLLARY III.

Which *Latus Rectum* may be had Geometrically thus;



Having the Ordinate *K I*, and the Abscissa *E I*, find a third Proportional (*F H*) to *E I* and *K I* (= *E F*;) and then find a fourth Proportional to *I D*, (the Difference between the *Latus Transversum*, and the Abscissa) to the third Proportional *F H*, before found, and to the *Latus Transversum*; and then that fourth Proportional shall be the *Latus Rectum* sought, *L E*.

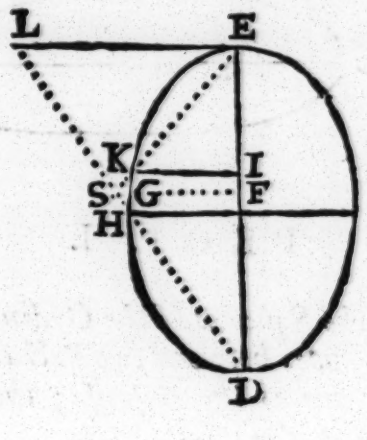
COROLLARY IV.

Hence may as many Points as you please, be found to draw an *Ellipsis*, whose *Latus Rectum* and *Transversum* are given, by giving Ordinates, and applying them to the Axis; Thus,

Take any Abscissa, as *E I*, and then make, As *D E* : *E L* :: So *D I* : *I S*. Then find a mean Proportional between this Fourth, *I S* and *E I*, which will be *I K*, the Ordinate sought, whose End *K*, when rightly applied, will always be in the Curve of the *Ellipsis*.

PROP. III.

In the Ellipsis *the Square of the Ordinates, K I, G F, are as the Rectangles D I E and D F E, made by the Lines lying between the Ordinates, and the Vertices of the* Latus Transversum.



Let *F F* be here called *i b*, as *E I* was before called *e b*; then it will be plain from what hath been said in the precedent Proposition, That the Square *G F*, the Ordinate will be in this Notation *o i c d* — *e i c d*. Also the Rectangle *D F E* will by multiplying *D F* (= *o b* — *i b*) by *F E* (= *ib*) be found to be *o i b b* — *i i b b*.

Now since, by *Prop.* 1. the Square *K I* = *o e c d* — *e e c d*, and here we have found the Square *G F* = *o i c d* — *e i c d*; it must needs be that the Square *K I* : Square *G F* :: *o e c d* — *e e c d*: *o i c d* — *e i c d*; that is, (dividing all by *c d*) as *o e* — *c e*, is to *o i* — *i i*.

But the Rectangle *D I E* : *D F E* :: *e e* — *e e*: *o i* — *i i* (for by bare Multiplication the Rectangle *D I E* will be found equal to *o e b b* — *e e b b*, and *D F E* was above found to be = *o i b b* — *i i b b*) which two Quantities divided by *b b*, will leave *o e* — *e e*, and *o i* — *i i*;) wherefore the Square *K I* : Square *G F* :: Rectangle *D I E*: Rectangle *D F E*. *Q. E. D.*

Which Proposition may be better expres'd thus.

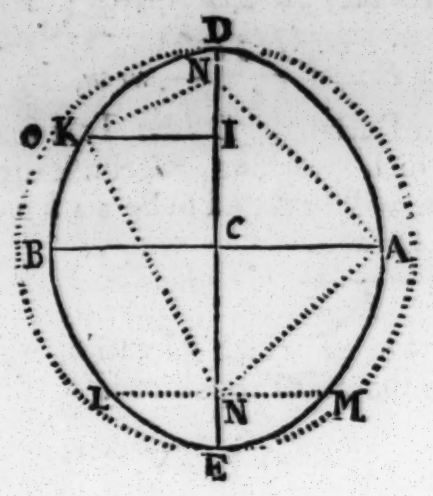
In an Ellipsis *the Squares of the Ordinates are as the Rectangles under the Segments of the Diameter, or Axis Transversus.*

Which is certainly true also in a *Circle*, where the Squares of the Ordinates are equal to such Rectangles, as being mean Proportionals between the Segments of the Diameter.

COROL-

COROLLARY I.

In any *Ellipsis*, draw an Ordinate as IK, and suppose the Focus to be in N, and the *Latus Rectum* LM applied in N at Right-angles to the Axis.



Then will the Square of $\frac{ocd}{2b}$ ($= \frac{1}{2}$ the *Latus Rectum*) = Square of LN be $= \frac{oo\,cc\,dd}{4bb}$. Wherefore by this Proposition, As Square IK : Square LN :: Rectangle DIE : Rectangle DNE; that is, $ooc\,d - eec\,d : \frac{oo\,cc\,dd}{4bb} :: oebb - eebb : \frac{oo\,cd}{4}$. Wherefore the Rectangle DNE; $= \frac{oo\,cd}{4}$.

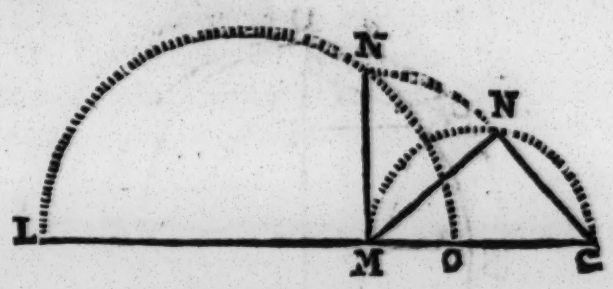
Now Rectangle DNE + the Square of CN = Square CE (by 5. *e.* 2. *Euclid*) and consequently CN Square = CE Square — Rectangle DNE: That is, $\frac{oo\,bb}{4} - \frac{oo\,cd}{4}$ (for $CE = \frac{1}{2}\,ob$.) And therefore CN, the Distance from the Center to the Focus, is equal to $\frac{\sqrt{:oo\,bb - oo\,cd}}{4}$.

COROLLARY II.

And from hence will arise this Canon for determining the Foci of an *Ellipsis* from the Square of half the *Latus Transversum*; Substract the fourth Part of the Figure (or $\frac{1}{2}$ of the Rectangle under the *Latus Rectum* and *Transversum*) and then extract the Square Root of the Remainder: That shall be the Distance of the Focus from the Center, and then substract that from half the *Latus Transversum*, and it gives EN the Distance of the Focus from the Vertex.

COROLLARY III.

Which Rule is very easy in Practice, for $\frac{oo\,bb}{4}$ is only the Square of CE (half the *Latus Transversum*) and $\frac{oo\,cd}{4}$ nothing but the Rectangle of $\frac{1}{4}$ DE into LM the *Latus Rectum* (for $\frac{ob}{4} \times \frac{ocd}{b} = \frac{oo\,cd}{4}$.)



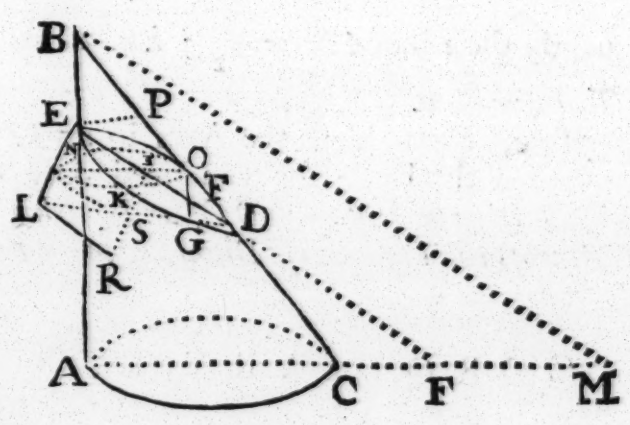
Wherefore find MN a mean Proportional between LM and $MO = \frac{1}{4}\,DE$;) then on CM ($= CE$) describe a Semi-circle, and in it apply MN, and then draw CN, which shall be the Distance of the Focus from the Center.

COROLLARY IV.

Since in *Cor.* 1. 'twas proved, that the Rectangle $DNE + CN$ Square = CE Square; that is, Rectangle $DNE = CE$ Square $- CN$ Square. Call CN Square, mm; and then will the Rectangle DNE = (CE Square) $\frac{oo\,bb}{4} - mm$: Which Notation, as one of the same Nature in the Hyperbola, will be of use hereafter.

PROP. IV.

In the Ellipsis, *The* Latus Rectum: *Is to the* Latus Transversum :: *As the Square of any Ordinate, IK: Is to the Rectangle DIE, made by the Lines intercepted between it and the Vertices of the* Latus Rectum.



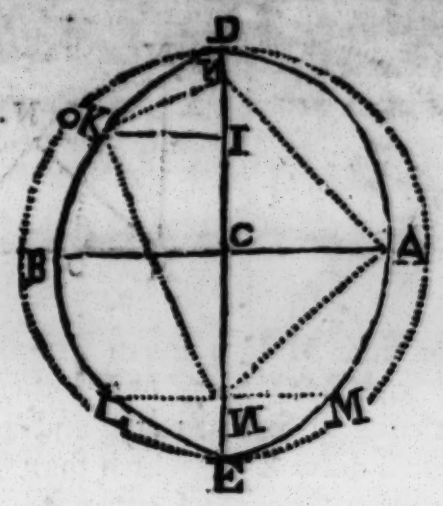
For the *Latus Rectum* is $\frac{ocd}{b}$, and the *Latus Transversum* ob; the Square of the Ordinate $oecd - eecd$, and the Rectangle DIE is $eobb - eeb$, IK is b, as hath been shewn in the former Propositions: Place therefore these four Quantities in the Form of Proportionals, *viz.*

As $\frac{ocd}{b} : ob :: oecd - eecd : oebb - eebb$.

And multiplying the Extreams and Means, you will find the same Quantity $ooebcd - oeebcd$ produced both ways, which shews they are truly proportional. *Q. E. D.*

COROLLARY I.

Wherefore, if the *Latus Rectum* and the *Axis Transversus* be given in the *Ellipsis*, 'tis easy to find the second Axe, by making, As $ob : \frac{ocd}{b} :: \frac{oo\,bb}{4}$ (= Rectangle DCE) : To $\frac{oo\,cd}{4}$ = Square AC.) Wherefore AC is known, and consequently its Double AB.



Whose Square muſt be $oocd$ = Rectangle of the *Latus Rectum* into the *Tranſverſum*; *i.e.* the Figure, as *Apollonius* calls it. Wherefore the *Axis Secundus*, and any Second Diameter, is a mean Proportional between the *Latus Rectum* and *Tranſverſum*; or to ſpeak with *Apollonius*, is *equal in Power to the Figure.*

COROLLARY II.

Since the Square of $AC = \frac{oocd}{4}$, and the Squ. of CN (the Diſtance of the Focus from the Center) $= \frac{oobb - oocd}{4}$, by *Corol.* 1. of *Prop.* 2. Put them into one Sum, and they will make $\frac{oobb}{4}$, which therefore muſt be equal to Square AN, and conſequently the Line $AN = \frac{ob}{2}$; *i. e.* to half the *Latus Tranſverſum.*

Wherefore, if you have the Axes in an *Ellipſis*, 'tis eaſy to find the Foci; for you need only *open the Compaſſes to the Diſtance DC, and ſetting one Foot in A, croſs the Tranſverſe Diameter in the Points N and N.*

COROLLARY III.

Since by *Cor.* 1. *Prop.* 2. the Rectangle DNE was proved equal to $\frac{oocd}{4}$, which, by *Cor.* preceding, $= AC\,q$, 'tis plain Rectangle $DNE = AC$ Square.

COROLLARY IV.

The Square of CE (= half the Tranſverſe Diameter) : Is to the Square of AC half the Diameter *ſecunda* :: As *Latus Tranſverſum* : To *Latus Rectum.* For $\frac{oobb}{4} : \frac{oocd}{4} :: oobb : oocd :: obb : ocd :: \frac{obb}{b} : \frac{ocd}{b} :: ob : \frac{ocd}{b}$; *i.e. Latus Tranſverſum, Latus Rectum.*

COROLLARY V.

Alſo ſince CE Square : AC Square :: ob : $\frac{ocd}{b}$; that is, by this *Prop.* As Rectangle DIE : Square IK. Therefore Square CE : Square AC :: Rectangle DIE : Square IK; that is alſo (by *Cor.* 3.) As Square CE : Rectangle DNE :: Rectangle DIE : Square IK.

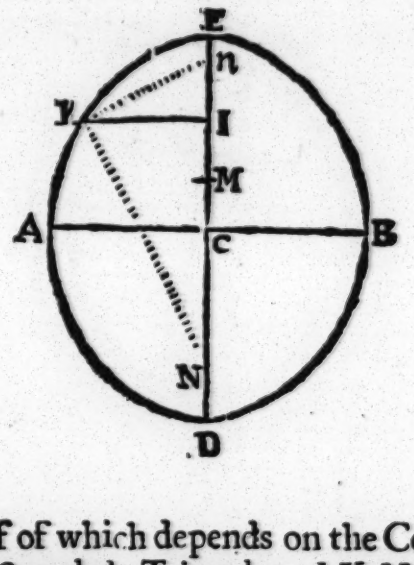
COROLLARY VI.

Wherefore there will be found a new and uſeful Way of expreſſing the Square of the Ordinate IK (which we found above in *Prop.* 1. was $oocd - eecd$) if you make, As CE Square $\left(= \frac{oobb}{4}\right)$: Rectangle $DNE = \left(\frac{oobb}{4} - mm\right.$, by *Corol.* 4. *Prop.* 2.) :: So Rectangle DIE: To a fourth Proportional; which working Algebraically by the *Rule of Three*, will be found to be $oebb - eebb - \frac{4emm}{o} \times \frac{4mmee}{oo}$

The Advantage of which Notation will ſufficiently appear in the next Propoſition.

PROP. V.

In the Ellipſis, *the Aggregate or Sum of the Right Lines KN and Kn, drawn from the ſame Point K, in the Curve of the* Ellipſis, *to both the Foci N and n, is always equal to the Tranſverſe Diameter or Axis DE.*



The Proof of which depends on the Conſideration, of the Rectangled Triangles IKN and IKn, where the Sides being given, the Hypothenuſes are eaſily had.

For if (as in *Cor.* 4. *Prop.* 2.) you call $CN = m$, then will m be $\frac{\surd : oobb - oocd}{4}$, and $IN = CI + CN = \frac{1}{2}ob - eb + m$; but In will be $= Cn - CI = m - \frac{1}{2}ob + eb$.

Wherefore the Square of $IN = \frac{1}{4}oobb - oebb + eebb + obm - 2ebm + mm$; and the Squ. of $In = \frac{1}{4}oobb - oebb + eebb - obm + 2ebm + mm$.

Now if to each of theſe Squares you add the Square of IK, which (by *Cor.* 6. of the precedent) was $oebb - eebb - \frac{4emm}{o} + \frac{4mmee}{oo}$, the Sum will be KN Square (or the Square of the Hypothenuſe) which is $= \frac{1}{4}oobb + obm + 2ebm + mm - \frac{4emm}{o} + \frac{4eemm}{oo}$.

And Square $Kn = \frac{1}{4}oobb - obm + 2ebm + mm - \frac{4emm}{o} \times \frac{4eem}{oo}$.

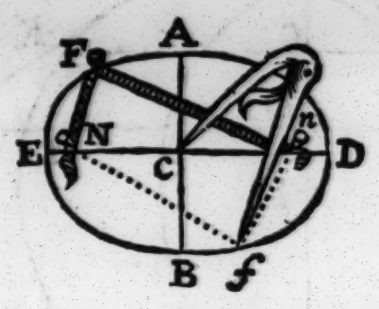
And conſequently extracting the Roots of thoſe Equations (which is very eaſy) you will have $KN = \frac{1}{2}ob + m - \frac{2em}{o}$, and $Kn = \frac{1}{2}ob - m + \frac{2em}{o}$.

Which

Which two added together, are manifeſtly equal to *o b* the Tranſverſe Diameter. *Q. E. D.*

COROLLARY I.

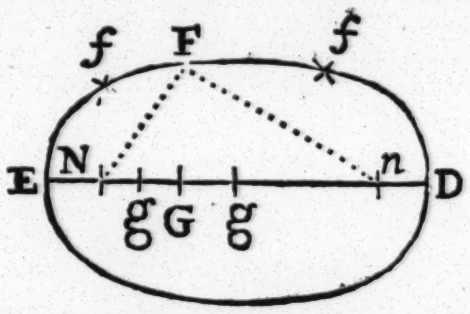
From whence ariſes the Reaſon of the *Ordinary Way* uſed by *Gardeners, &c.* to deſcribe *Ovals* or *Ellipſis*'s by two Pins in the *Tranſverſe Diameter* at *N* and *n*, and a String mov'd about them by another Pin,



as *F*; for by this Means the Point *F* will always be in the *Ellipſis*; and ſince a Circle is deſcribed by a String moving round one Pin placed in the Center, 'tis plain a Circle is an *Ellipſis*, whoſe Foci are coincident.

COROLLARY II.

Hence alſo 'tis eaſy to deſcribe an *Ellipſis* on a Plane *Geometrically*, by only *Scale* and *Compaſs*: For



having drawn the *Axis Tranſverſus D E*, and in it taken the Foci *n* and *N*; at a Diſtance, not more than half the Tranſverſe Axis, with the Compaſſes in *N* ſtrike an Ark, as *f*, and ſet the ſame Diſtance from *E* to *G*.

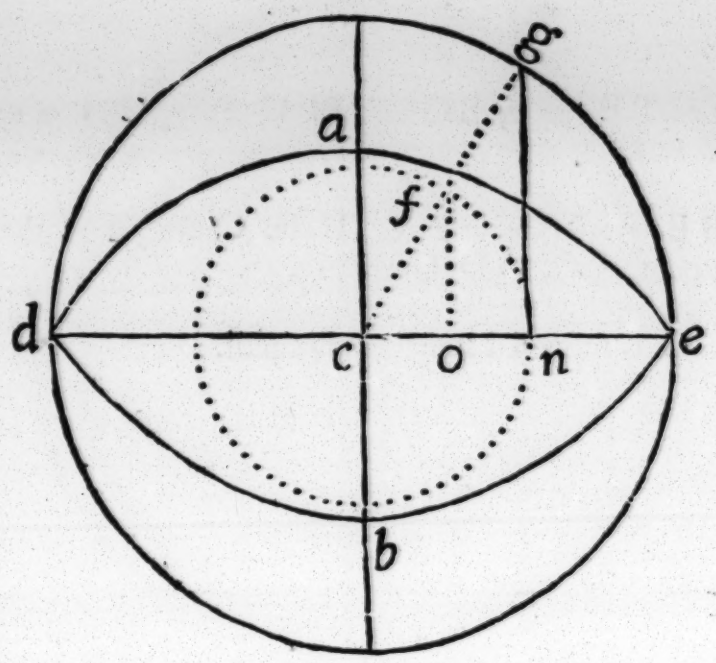
Then opening the Compaſſes to the remaining Diſtance *G D*, with one Foot in *n* croſs the Ark *f*, and that Point will be in the *Ellipſis*: And thus you may find as many Points as you pleaſe with all Readineſs imaginable.

ELLIPTICAL *Compaſſes*, is an Inſtrument made in Braſs, to draw at one Revolution of the Index, any *Ellipſis* or Oval.

ELLIPTICAL *Dyal*, is an Inſtrument made commonly of Braſs, with a Joint to fold together, and the Gnomons to fall flat, commodiouſly contrived to take little room in the Pocket. By it may be found the true Meridian, Hour of the Day, Riſing and Setting of the Sun, with ſeveral other Propoſitions of the Globe.

ELLIPTICAL *Space*, is the Area contained within the Curve of the *Ellipſis*.

The *Elliptical Space d a e b*: Is to a Circle deſcribed on the Tranſverſe Axe *d e* :: As the Conjugate Diameter, or *Axis Rectus a b* : Is to the Tranſverſe Axe *d e*.



Draw *f o*, *g n* perpendicular to *C e*.

Then will *f o* : *f c* :: *g n* : *g c*.
And therefore *f o* : *g n* :: *f c* : *g c*.
:: *a c* : *c e*.
:: *a b* : *d e*.

But this Proportion of *f o* : *g n* :: *a b* : *d e* will be true, whereever the Perpendiculars *f o* and *g n* are drawn; that is, of all the Indiviſible of the outer Circle and *Ellipſis*: Wherefore the Plane *Spaces* made out of them, muſt, in the whole, be in the ſame Proportion to one another: That is, the *Ellipſis* to the Circle, is as the Conjugate *a b*, to the Tranſverſe Diameter *d c*. *Q. E. D.*

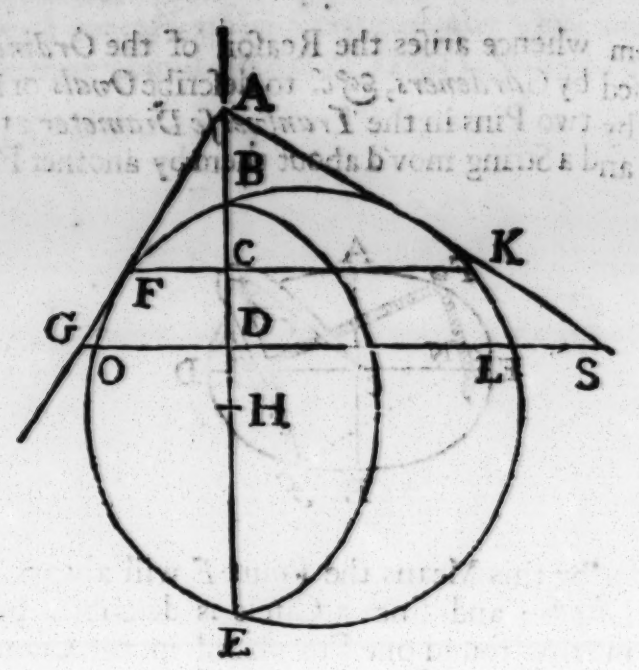
COROLLARY I.

Wherefore the *Quadrature* of the *Ellipſis* will be had, when that of the Citcle is found, and *vice verſa*.

COROLLARY II.

The *Ellipſis* is a mean Proportional between the greater and leſſer Circle; For a Circle, or any ſimilar Figure on *a b*: will be to one of the ſame Kind on *d e* :: As *a b* : To a third Proportional; *i.e.* As the *Ellipſis* : Is to the greater Circle :: So is the leſſer Circle : To it, *viz.* as *a b* to *d e*.

The Inveſtigation of the Tangent to the Ellipſe.



Let BE $= q$, BC $= x$, FC $= y$, CD $= n$, AC $= t$.

BE the Tranſverſe Ax, H the Center, FA the Tangent, FC, OD Ordinates.

CD is ſuppoſed indefinitely ſmall.

$AC^q : FC^q :: AD^q : GD^q$,	By Similar Triangles,
But $GD^q = OD^q$,	Becauſe CD is indefinitely ſmall.
Wherefore $AC^q : FC^q :: AD^q : OD^q$.	
But $FC^q : OD^q :: EC \times BC : ED \times BD$,	By the Curve's Property.
Therefore $AC^q : AD^q :: EC \times BC : ED \times BD$,	By Equality of Proportion.
$\parallel \quad \parallel \quad \parallel \quad \parallel$	

$t^2 : t^2 + 2tn + n^2 :: qx - xx : qx - x^2 + qn - 2nx - n^2$	The laſt Step in Symbols.
Wherefore $t^2\,qn - 2nxt^2 - n^2t^2 = 2tnqx - 2tnx^2 + n^2\,qx - nnxx$	By forming an Equation, and caſting off the Terms common on both Sides.
Therefore $t^2\,q - 2xt^2 - nt^2 = 2tqx - 2tx^2 + nqx + nx^2$	By dividing all by n.
And conſequently $t^2\,q - 2xt^2 = 2t\,q\,x - 2t\,x^2$	Caſting off n, or putting $n = 0$.
Wherefore $tq - 2xt = 2qx - 2xx$	By dividing all by t.
And therefore $t = \frac{2qx - 2xx}{q - 2x}$. *Q. E. I.*	By dividing by $q - 2x$.

PROPOSITION. I.

I ſay, **AC : CE :: AC : CH.**

$t : 2q - 2x :: x : q - 2x$	By the laſt Equation reſolv'd into an Analogy.
Wherefore $t : q - x :: x : \frac{q}{2} - x$	By dividing the ſecond and fourth Term by 2.
$\parallel \quad \parallel \quad \parallel \quad \parallel$	
AC : CE :: BC :: CH. *Q. E. I.*	

PROP.

PROPOSITION II.

I say, $\boxed{HC : HB :: HB : HA}$

$\frac{q}{2} - x : x :: q - x : t$ — By the laſt Step of the laſt Propoſition.

Wherefore $\frac{q}{2} - x : x :: q - x : \frac{2qx - 2xx}{q - 2x}$ — By Subſtituting the Value of t.

And therefore $\frac{q}{2} - x : \frac{q}{2} - x + x ::$
$q - x : q - x + \frac{2qx - 2xx}{q - 2x}$ } By Compounding.

That is, $\frac{q}{2} - x : \frac{q}{2} :: q - x : \frac{q^2 - qx}{q - 2x}$ — By caſting off Contradictories.

Or, $\frac{q}{2} - x : \frac{q}{2} :: q - x : \frac{q2}{q - 2x} - \frac{qxx}{q - 2}$ — By expreſſing the laſt Term in two Parts.

But $q - x : q - x + x :: \frac{q^2}{q - 2x} - \frac{qx}{q - 2x}$
$: \frac{q^2}{q - 2x} - \frac{qx}{q - 2x} + \frac{qx}{q - 2x}$ } By compounding the two laſt Terms.

That is, $q - x : q :: \frac{q^2}{q - 2x} - \frac{qx}{q - 2x}$
$\frac{q^2}{q - 2x}$ } Caſting off Contradictories.

But $q - x : \frac{q^2 - qx}{q - 2x} :: \frac{q}{2} - x : \frac{q}{2}$ — By a Step before.

Wherefore $\frac{q}{2} - x : \frac{q}{2} :: q : \frac{q^2}{q - 2x}$ — By Equality of Proportion.

And conſequently, $\frac{q}{2} - x : \frac{q}{2} :: \frac{q}{2} : \frac{q^2}{2q - 4x}$ — By Dividing the two laſt Terms by 2.

HC : HB :: HB : HA

Sir *Iſ. Newton Prop.* XI. *Prob.* 6. of *Princip. Philoſoph. Mathemat.* demonſtrates, That if any Body revolve round another in an Ellipſis, the Centripetal Force or Gravity of it will be in a Duplicate Ratio, or as the Square of its Diſtance from the *Umbilicus* or *Focus*.

ELMINTHES, or *Helminthes*, are little Worms bred in the Guts; eſpecially that called *Rectum*, or the Lowermoſt, the Strait or Great Gut.

ELODES, or *Helodes*, a ſort of Fever accompanied with a violent and perpetual Sweating.

ELONGATION, in Aſtronomy, ſignifies the Removal of a Planet to the furtheſt Diſtance it can be from the Sun, as it appears to an Eye placed on the Earth; but this is moſt commonly taken notice of in *Venus* and *Mercury*.

The utmoſt Elongation of *Venus* can be but 45 Degrees, and that of *Mercury* but of 30 Degrees; which is the Reaſon this Planet is ſo rarely ſeen.

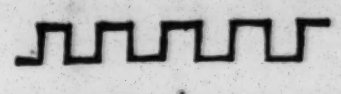
ELONGATION, in Chirurgery, is an imperfect Luxation, occaſioned by the ſtretching or lengthening of the Ligaments of any Joint. *Blanchard.*

ELOPEMENT, is when a married Woman departs from her Huſband and dwells with an Adulterer; for which, without voluntary Reconcilement to the Huſband, ſhe ſhall loſe her *Dowry*; nor ſhall the Huſband in ſuch caſe be compelled to allow her any *Alimony*.

ELYTHROIDES, or *Vaginalis*, is a ſecond proper Tunick which immediately involves the *Teſtes*.

EMANCIPATION, a Term in the *Roman* Law, ſignifying the ſetting free of a Son from the Subjection of his Father; which was ſo hard by the *Roman* Law, that (they ſay) before a Son could be releaſed from ſuch Subjection, he ſhould be ſold (imaginarily) three times by his natural Father to another Man; and this Perſon the Lawyers called *Pater Fiduciarius*, a Father in Truſt; after this he was to be bought again by the natural Father, and then on his manumitting of him he became Free. Now they called this imaginary Sale *Mancipatio*, and conſequently, the ſetting of any Perſon free from it, *Emancipation*. *Blount.*

EMBATTELED, or *Crenelle*, a Term in Heraldry, when the Out-line of any *Ordinary* is of this Figure,



which represents the Battlements of a Wall or Castle.

EMBLEMENTS (in Law) are the Profits of Lands which have been sowed; but sometimes it is taken more largely, for any Profits that arise and grow naturally from the Ground, as Grass, Fruit, Hemp, &c. If the Tenant for Life sow the Land, and afterwards die, the Executor of the Tenant for Life shall have the *Emblements*, and not he in Reversion: But if a Tenant for Years sow the Lands, and before he hath reaped his Term expires, there the Lessor, or he in Reversion, shall have the *Emblements*.

EMBOLISM, is the Excess of the *Solar Year* above the *Lunar*, whereby the *Lunations* happen every subsequent Year, eleven Days sooner than in the foregoing; which, when they amount to thirty Days, make a new Month, called the *Emboliſmical Lunation* or *Emboliſmatical Month*; which must be added, to make the common *Lunar Year* equal to the *Solar*.

EMBOLUS, is the Sucker of a Pump or Syringe; which, when the Pipe of the Syringe is close stopt, can't be drawn up, but with the greatest Difficulty; and when forced up by main Strength, will, on being let go, return again with great Violence.

The *Aristotelians* attribute this Effect to the common Notion of Nature's Abhorrence of a *Vacuum*. But Mr. *Boyle* found, that in his exhausted Receiver the Sucker would be as easily drawn up, tho' the Orifice of the Pipe were close stopt, as it would be when open in the common Air. From whence it seems plain, that the Difficulty of drawing back this *Embolus* or Sucker, when the End of the Syringe is stopt, arises from the Pressure of the Atmosphere on the external End of the Sucker; which having at the other End no *Counter-pressure*, nor Spring of the Air to balance it, must press with all its Weight and keep down the Sucker; but when by pumping the Air out of the Receiver, this Pressure, or its equivalent Spring of the Air is taken away, there is nothing to keep down the Sucker, and so it may be easily drawn up. He found also, That when the Sucker could *in vacuo* thus easily be drawn back, yet on the Re-admission of the Air it would be forc'd in again, and raise along with it a considerable Weight, which was suspended at the external End of the Sucker. *Vid. Continuation of Physico-Mechan. Exp.* Part 1.

EMBRACEUR, or *Embrasour*, (in Law) is he that when a Matter is in Trial between Party and Party, comes to the Bar with one of the Parties (having received some Reward so to do) and speaks in the Case, or privily labours the Jury, or stands there to over-look and survey them, thereby to put them in Fears and Doubt of the Matter, the Penalty whereof is 20 *l.* and Imprisonment at the Justice's Discretion. But Persons learned in the Law may speak in the Case of their Clients.

EMBRASURE, in Architecture, is the Enlargement made in the Walls, to give more Light and greater Convenience to the Windows and Doors of a Building.

EMBRASURES, in Fortification, are the Holes in a Parapet, through which the Cannons are pointed to Fire into the Moat or Field: They are generally 12 Foot distance from one another; every one of them being from 6 to 7 Foot wide without, and about 3 within; their Height above the Platform is 3 Foot on that Side toward the Town, and a Foot and a half on the other Side toward the Field, that so the Muzzle may be sunk on occasion, and the Piece brought to shoot low.

EMBROCATION, (from ἐμβρέχω; *Irrigation*, or Wetting) is a kind of Fomentation, wherein the fomenting Liquor is let distil, drop by drop, or very slowly, upon the Part of the Body to be fomented.

EMBRYO, is the *Fœtus* in the Womb of the Mother, before its Members come to be distinctly form'd.

EMBRYOTHLASTES, an Instrument with which Chirurgeons break the Bones of a dead Child, that it may be the more easily taken out of the Womb.

EMBRYOTOMY, the Anatomical Dissection of an *Embryo* or *Fœtus*.

EMBRYULCUS, an Iron Hook with which Chirurgeons pull a dead *Fœtus* out of the Mother's Womb.

EMERGENT, the same with *Emersion*.

EMERSION, in Astronomy, is the Time when any Planet that is eclipsed begins to *emerge* or get out of the Shadow of the eclipsing Body. When any Body also, lighter in Specie than Water, being thrust violently down into it, rises again, 'tis said to *emerge* out of the Water; and this is the most proper Signification of the Word.

EMETICK, or *Vomitive Medicines*, are those which with their pungent Particles contract the Fibres of the Stomach upwards, and so eject at the Mouth whatsoever is offensive to the Stomach, as is the commonly received Notion. But Dr. *Purcel*, in his Book of *Vapours*, *p.* 39. supposes that Vomiting is caused by Salts, which prick and corrode the Nerves of the Stomach, from whence the Spirits flow to the Brain in great quantity; and either by the Proximity of the Origin of those Nerves, or by the Angle of Incidence, they are forced into the Nerves belonging to the Diaphragm, and the Muscles of the lower Belly; both which contracting themselves, squeeze the Stomach into a less compass, and so make it eject its Contents: and though some part of the Matter may go downwards by the *Pylorus*, yet the far greater Quantity must go upwards, because when the Diaphragm is contracted, it forces down the Liver, and makes it compress the *Pylorus*, and hinder any Thing from passing out that way; and this Account he confirms by the Experiments of Dr. *Chirac*, an eminent Anatomist at *Montpellier* in *France*, and of his own made upon Dogs, above twenty times: And how he solves the Difficulty of the Muscles of the Diaphragm, and of the Abdomen contracting themselves both at the same time, when they are really Antagonists to one another, you will see in his Book, *p.* 43.

EMETICK *Tartar*, is only Cream or Crystal of Tartar powder'd and mix'd with a quarter part of *Crocus Metallorum*, and then the Mixture is boiled in an earthen Pan in a sufficient Quantity of Water, for about 8 or 9 Hours: It must be stirred about continually, and new Water put in as the Former boils away. The hot Liquor at last is strained through a woolen Cloth, and then about half of it is gently evaporated; the rest is set to cool; and it will shoot into Crystals. 'Tis a fine, gentle, yet certain Vomitive. The Dose from 3 or 4 Grains to 10 or 12.

EMMENAGOGUES, are Medicines which excite the Menses.

EMMOTON, is a Liquid Medicine which is injected into Ulcers.

EMOLLIENTIA, softning Things, are such as with a moderate Heat and Moisture dissolve those Parts which before cohered close; and dissipating others, make them loose and soft.

EMPALEMENT, according to our Learned Dr. *Grew*, is the outmoſt Part of the Flower of a Plant encompaſſing the Foliation of the Attire: 'Tis compounded of the three general Parts of all Plants, the Skin, the Cortical, and the Ligneous Bodies, each Empaler being (whether conſiſting of one or more Pieces) as another Leaf, and is deſigned to be a Guard and a Band to the Flower where it is weak and tender; and therefore ſuch Plants as have Flowers with a firm and ſtrong Baſis, as Tulips, &c. have no Empalement, nor need any.

EMPANEL, in Law, ſignifies the Writing and Entring the Names of a Jury into a Parchment Schedule or Roll of Paper by the Sheriff, which he hath ſummon'd to appear for the Performance of ſuch publick Service as Juries are employ'd in.

EMPARLANCE, in Common Law, ſignifies a Deſire or Petition in Court of a Day, to pauſe what is beſt to do: And 'tis called by the Civilians *Petitionem induciarum.*

EMPASMA, the ſame with *Catapaſma.*

EMPATTEMENT, according to ſome, is the ſame with *Talus* in Fortification; which ſee.

EMPERICKS, are the ſame with Mountebanks, or bold ignorant Pretenders to the Practice of Phyſick. However *Emperical* Medicines, as ſome are pleaſed to call the very beſt in Uſe, are by no Means totally to be ſlighted, nor that Practice of this Art, which is built on Experience, to be condemn'd; but only the daring Attempts of ſuch ignorant Pretenders as are no way qualify'd to judge of the Symptoms of a Diſeaſe, nor the peculiar Circumſtances of their Patient's Temper and State of Body.

EMPHATICAL, is uſed in two Senſes; when any thing is ſpoken with great Earneſtneſs and Emotion of Mind, we ſay, 'twas ſpoken very *Emphatically*, or with a great *Emphaſis*. 'Tis uſed alſo by the old Natural Philoſophers for thoſe *Apparent* Colours (as they would call them) which are often ſeen in Clouds before the Riſing, or after the Setting of the Sun, or thoſe in the Rain-bow, &c.

And theſe, becauſe they are not permanent or laſting, they will not allow to be true Colours: But ſince theſe *Emphatical Colours* are Light, modified chiefly by Refraction, and with a Concurrence of Reflections, and ſome other accidental Variations; and being the proper Objects of Sight, and capable as truly to affect it as other permament Colours are, there is no reaſon for excluding them from the Number of true and genuine Colours, ſince all other Colours are only Modifications of Light as theſe are.

EMPHRACTICK, the ſame with *Emplattomena*, or *Emplaſticks.*

EMPHRAXIS, is an Obſtruction in any Part.

EMPHYSEMA, is an Inflammation or a windy Swelling or Blowing up any Part of the Body. *Blanchard.*

EMPHYTON *Thermon*, or *Calor Innatus*, is the innate Heat, or Heat firſt ſuppoſed to be produc'd in the Fœtus from the Parent's Semen, which afterwards, when Reſpiration is begun, and the Fœtus ſubſiſts of it ſelf, decays forſooth, by Degrees. Many Philoſophers and Phyſicians call this Heat an *innate* or *native Spirit*, and ſay that it conſiſts of three Parts, of a *primogenial Moiſture*, an *innate Spirit*, and *Heat*. Whence *Fernelius* defines *innate Heat* to be a *grimogenial Moiſture every way qualified with an innate Spirit and Heat*. Blanchard.

EMPIRICAL *Medicine*, now-a-days called *Quacking*, is a practiſing Phyſick, without enquiring either into the Nature of the Diſeaſe, or of the Medicines employed to cure them; but depending ſolely on the Authority of experienc'd Medicines, which are uſually apply'd too univerſally, in all Caſes and Circumſtances alike. *Acron Agrigentinus* was the firſt Author of it, who neglecting the Reaſons of Things, contented himſelf with bare Experience.

Quacks firſt flouriſhed amongſt the *Egyptians*; from this Trade came *Mountebanks*; and thoſe that now practice Phyſick after this bold and heedleſs rate, are called *Empericks.*

EMPLASTRUM, a Plaiſter, is a Medicine applied outwardly to the Skin, ſpread upon Linnen or Leather: It is commonly made of Oils, or of thoſe Things which are of a like Conſiſtence with Oil; as Swine's-greaſe, Butter, ſlimy, viſcous Extractions from Gums, Roots, &c. Alſo of Powder and Wax, are theſe Things which are of a like Conſiſtence with Wax, as Roſin, Pitch, Gum, &c. The Maſs whereof being yet hot, is formed into a *Cylindrical* Figure. *Blanchard.*

EMPLASTICKS, } are Salves which ſo
EMPLATTOMENA, } conſtipate and ſhut up the Pores of the Body, that Sulphurous Vapours cannot paſs. *Blanchard.*

EMPNEUMATOSIS, is an alternate Dilatation of the Thorax, whereby the external Air is continually breathed in, and by the Wind-pipe and the Lungs, is communicated to the Blood to accend it. *Blanchard.*

EMPORIUM, is often uſed for the *common Senſory* in the Brain.

EMPROSTHOTONUS, is a continual Contraction of the Muſcles of the Neck towards the Foreparts. *Blanchard.*

EMPYEMA, properly ſo called, is a Collection of purulent Matter in the Cavity of the *Thorax*; but largely taken, ſignifies the ſame in the *Abdomen* too. *Blanchard.*

EMPYREUMATA, are little Feveriſh Remains after a *Criſis*; alſo that thick viſcous Matter which ſubſides to the Bottom in diſtilled Waters. *Empyreuma* ſignifies alſo that Taſte and Smell of the Fire which in Diſtillations affects ſome Oils, Spirits and Waters, by reaſon of their being drawn off by too great a Degree of Heat.

EMRODS: See *Hæmorrhoids.*

EMULGENT *Veſſels*, are the two large Arteries and Veins which ſpring, the Former from the deſcending Trunk of the *Aorta* or great Artery, the Latter from the *Vena Cava.* They are both inſerted into the Kidneys, and the *Emulgent Arteries* carry the Blood (with the *Serum*) to them, and the *Emulgent Veins* bring it back again after the *Serum* is ſeparated from it by the Kidneys.

EMULSION, is a Liquid Medicine to be taken inwardly, of the Form and Colour of Milk, whence comes its Name (*Quaſi Lacmentiens.*)

EMUNCTORIES, are the Cavities into which the Excrements of an Animal Body are emptied, as the pituitous Humour of the Brain, into the Noſtrils; the yellow thickiſh Humour, which we call Ear-wax, into the Ears; the Excrements, into the Bowels; the Urine, into the Bladder, &c.

ENÆMON, is a Medicine which ſtops the Blood, or which, by binding, cooling or drying, cloſes the Paſſages of the Veſſels which were open; ſtops or diminiſhes the Fluidity and violent Motion of the Blood. *Blanchard*

ENÆOREMA, is that Craſs Subſtance which is ſuſpended in the Middle of the Urines, call'd the *Hypoſtaſis Urinæ. Blanchard.*

ENALLAGE, a Figure in Grammar, whereby there is a Change either of a Pronoun, as when a Poſſeſſive is put for a Relative, as *Suus* for *Ejus*; or

of a Verb, when one *Mood* or *Tense* is put for another, &c.

ENALURON, the Term in Heraldry for a Bordure charged with *Martlets*, or any Kind of Birds: Thus they say, he beareth *Argent*, a *Bordure Azure*, charged with an *Enaluron of Martlets*; meaning, that there are *Martlets* all round the *Bordure*.

ENARTHROSIS, is (in Anatomy) a kind of Jointing, when the Cavity that receives it is deep, and the Head of the Bone that is inserted is oblong, as may be seen in the Huckle-bone and its Cavity; in the principal Bone of that Part of the Foot which immediately succeeds the Leg, with the Bone call'd *Cymbiforme*.

ENCATHIS, or *Encanthis*, is the *Caruncula Lacrymalis*; which see.

ENCAUMA, or *Epicauma*, is a deep, hard, and crusty Ulcer of the Eye. *Blanchard.*

ENCIENTE a *French* Term, in Fortification, signifying the whole Enclosure, Circumference, or Compass of a Fortified Place, whether composed of Bastions or not

ENCEPHALOS, is whatsoever is within the Compass of the Skull, as the Brain, the *Cerebellum*, the *Medulla Oblongata*, &c.

ENCHARAXIS: See *Scarificatio.*

ENCHEIRESIS *Anatomica*, is a Readiness in Dissections, when an Anatomist shews the Parts of a Body dexterously and expeditiously.

ENCHYMONA, is an Afflux of the Blood, whereby the external Parts are render'd black and blue; as in the Scurvy, Blood-shot Eyes, &c. Also an Afflux of the Blood by the Quickness and Suddenness of its Motion, as in Anger and Joy. *Blanchard.*

ENCHYTA, or *Infundibulum*, is an Instrument wherewith Liquids are instilled into the Eyes, Nostrils and Ears.

ENCHYSMA, the same with *Clyster.*

ENCOPE, is an Incision of any Part, as in a Gangrene, &c.

ENCRANIUM, the same with *Cerebellum.*

ENCROACHMENT, or *Accroachment*, in Common Law, signifies an unlawful gaining upon the Right or Possessions of another.

END *for End:* When a Cable, Hawser or other Rope of a Ship is run clear off from the Block or Place it was wound about, they say at Sea, *'Tis run out End for End.*

ENDECAGON; a plain Figure in Geometry, of eleven Sides and Angles.

ENDEIXIS, is an Indication of Diseases, whereby is shewn what is to be done: As for Example, a *Plethora*, or too great Fulness of Blood, indicates the opening of a Vein. *Blanchard.*

ENDEMICAL, *Endemial*, or *Endemious Disease*, is what some call *Morbus Vernaculus*, & *Communis*; that is, a Disease which always infects a great many in the same Countrey, proceeding from some Cause peculiar to the Countrey where it reigns: Such is the Scurvy to the *Hollanders*; intermitting Fevers to the Inhabitants of our Submarine and Marshy Places, &c.

ENDITEMENT, or *Indictment*, in Common Law, is the same with *Accusatio* in the Civil Law, tho' in some Points it differs. It may be thus defined: An *Indictment* is a Bill or Declaration made in Form of Law (for the Benefit of the Commonwealth) exhibited as an Accusation of one for some Offence, either Criminal or Penal, unto Jurors, and by their Verdict found and presented to be true, before an Officer, having Power to punish the same Offence. It is always at the Suit of the King, and differs from an Accusation in this, that the *Preferrer* is no way tied to the Proof thereof, upon any Penalty, if it be not proved, except there appear Conspiracy.

ENDORSE, a Term in Heraldry, signifying the $\frac{1}{3}$ Part of a *Pale*; and some say it is not used but when the *Pale* is between two of them; but this *Guillim* finds fault with as too bold a Saying.

He beareth *Or*, an Endorse Gules.

ENDORSED, when two Lions are born rampant, and turning their Backs to each other, the Heralds say they are *Endorsed*; but if their Faces be towards each other, they call it *Combatant.*

ENDOWMENT, signifies the giving or assuming of a Dower to a Woman; also the setting or severing of a sufficient Portion for a Vicar towards his perpetual Maintenance when the Benefice is appropriated; and such a Vicarage is called a *Vicarage Endow'd.*

ENDOWMENT *de la plus belle part*, is where a Man dying, seized of some Lands holden in Knight's Service, and other some in Soccage, the Widow is sped of her Dower, rather in the Soccage Lands, than those holden in Knight's Service, as being *le plus belle part*, the fairer Part.

ENEMA, the same with *Clyster.*

ENERGETICAL *Bodies* or *Particles*, are such as are eminently active, and which produce manifest Operations of various Natures, according to the various Circumstances and Motions of such Bodies or Particles.

ENERGY, in a Medicinal Sense, is an Agitation or Operation of the Animal Spirits and Blood.

ENFANS *Perdans*, the same with *Forlorn Hope* in an Army; which see.

ENFILADE, in Fortification, signifies a Situation of Ground which discovers a Post according to the whole Length of a Right Line, so that it can be scoured with the Cannon, and rendred almost Defenceless: Wherefore to

ENFILE or *Enfilade* the Curtain or Rampart, is to sweep the whole Length of it with the Cannon.

ENFRANCHISE, to make Free, to incorporate a Man into a Society or Body-politick, or to make one a Free *Denizon.*

ENGINE, in the general, is any Mechanick Instrument composed of Wheels, Screws of Pulleys, in order to lift, cast, or sustain any Weight, or to produce any considerable Effect which cannot so easily be obtained by the bare Application of Men's Hands without such help; such as Warlike *Engines*, *Engines* to raise Water, Cranes, &c.

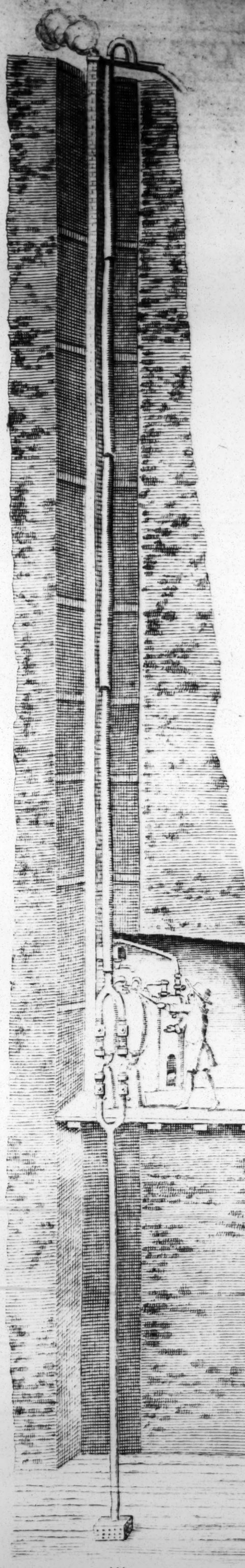
And here I think it proper to give the Reader a Description of two very useful *Engines*, which are the Invention of one of our own Nation, *Thomas Savery*, Esq; a Gentleman very skilful in all Things of this Nature, and now Treasurer to the Sick and Wounded Office.

The First is an *Engine* to row Ships and Boats at Sea, or in a River, when there is a stark Calm or very little Wind.

A Description of this the Inventor published in the Year 1698, with his Answers to the Objections raised against it by Mr. *Dummer*, and others: And the Thought is so natural, and the Manner of its working so plain and easy, that 'tis an amazing thing to one that there is no more use made of it.

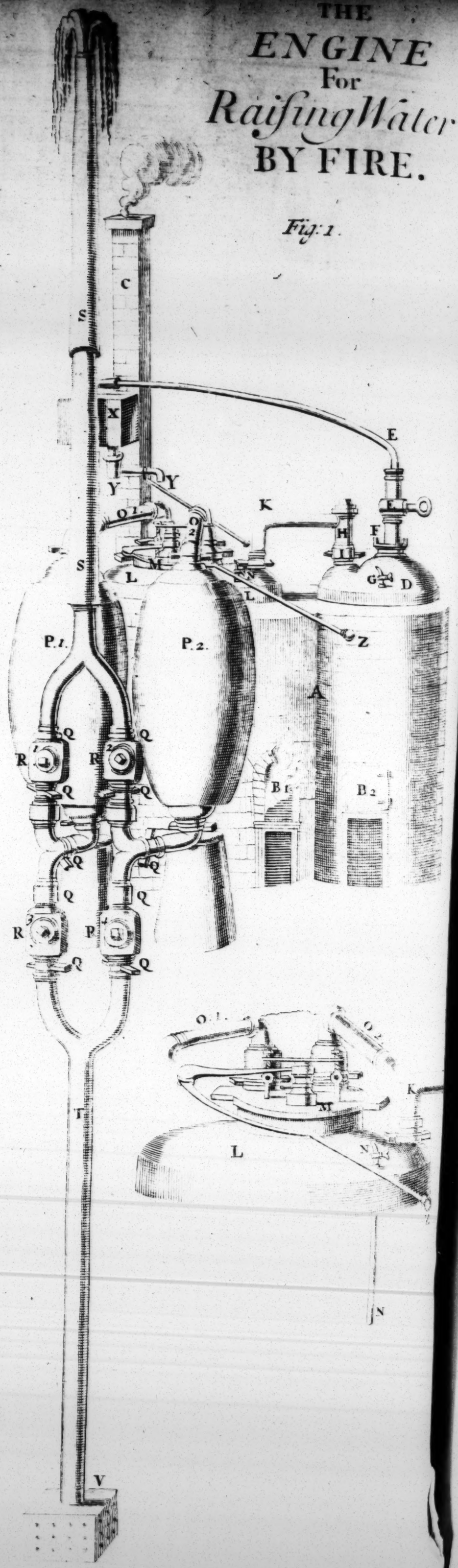
He fits a Wheel to the Drum-head of the Capstan, whose Teeth turn a Trundle-head; through which is run an Iron Bar that reaches clear a-cross, and goes through the Sides of the Ship: and on its Ends, without Board, at a convenient Distance from the Ship's

Fig. 2.



THE
ENGINE
For
Raising Water
BY FIRE.

Fig. 1.



The
ENGINE
Working in a
HINT. Place this at the word Engine

B. Lens Adin. I. Short Sculp.

Ship's Sides, are faſtened two Drum-heads like that on the Capſtan, in which are fitted, to take out at pleaſure, 6 or 8 Paddles; and at the outermoſt Ends of the Paddles is faſtened an Iron Pin with an Head to it; by which Means, and by the help of a Cord, taking an half turn round about all theſe Pins, both the Paddles may be *ſwifted* or ſtrain'd, and ſtrengthned ſo, that they ſhall all work proportionably; and alſo the Paddles may with a Luff Tackle be the more handily and eaſily lifted in and out, in order to be fitted into or taken out of the Drum-heads of the Bar: See the Figure annexed.

Now here if the Men will but work, if there be enough of them, and the Paddles be made proportionably large, according to the number of the Men that can be brought to work at the Capſtan; I cannot ſee but that the *Engine* will give the Veſſel freſher Way than any Oars can do, work'd by the ſame, or a far greater number of Hands, as the Experiments that have been tried do abundantly ſhew, according to the beſt Information I can get of the Matter.

The other *Engine* is for raiſing Water by the Force of Fire, in which he hath ſhewed as great Ingenuity, Depth of Thought, and true Mechanick Skill, as ever diſcovered it ſelf in any Deſign of this Nature.

The Deſcription of this Engine is as follows.
See the Figure.

A denotes two Furnaces, whoſe Fire-places are *B*, 1, 2, and their Funnel or Chimney *C*.

In theſe two Furnaces are placed two Veſſels of Copper, which he calls *Boylers*, the one a larger, as *L*, the other a ſmaller, as *D*.

Theſe Boylers have each a *Gage Pipe*, as *G* and *N*, of which *G* goes within eight Inches of the Bottom, but *N* reaches only half way down the great Boyler.

By theſe Pipes, before the *Engine* can work, you muſt firſt fill the ſmall Boyler quite full, and the great Boyler two Thirds full of Water: Then light the Fire at *B* 1, and make the Water in *L* boil, by which Means the Steam of it being quite confined, muſt needs be wonderfully compreſſed, and therefore will, on the opening of a Way for it to iſſue out (which is done by turning *Z* the Handle of the Regulator from you) ruſh with a great Force thro' the *Steam Pipe O*, 1, into the Receiver *P* 1, driving all the Air before it, and forcing it up into the Force-Pipe through the Clack *R*, 1, as you will perceive by the Noiſe and Ratling of the Clack. And when all the Air is thus driven out, the Receiver *P*, 1, will be very much heated by the Steam: When you find that it is throughly emptied, and is grown very hot, as you may both ſee and feel, then pull the Handle of the Regulator towards you, by which Means you will ſtop the Steam-Pipe *O*, 1, ſo that no more Steam can yet come into it, but you will open it a Way into *O*, 2, and by that Means fill the Receiver *P*, 2, with the Steam, as the other was before. While this is doing, let ſome cold Water be poured on the Receiver *P*, 1, by which Means the Steam there being coo'ed, and condenſed, and contracted into a very little Room, and conſequently preſſing but very little (if at all) on the Valve or Clack *R*, 1, at the Bottom of the Receiver, *P*, 1. There is nothing there to counterbalance the Preſſure of the Atmoſphere on the Surface of the Water in the lower Part of the Sucking-Pipe *T*; wherefore it will be preſſed up, and aſcend into, and fill the Receiver *P*, 1, driving up before it, as it riſes, the Clack or Valve *R*, 1, which afterwards falling down again and ſhutting cloſe, hinders the Deſcent of the Water that Way.

Then (the Receiver *P*, 2, being in the mean time emptied of its Air) turn the Handle of the Regulator from you, and the Force of the Steam coming from the Boyler, will be all upon the Surface of the Water contained in the Receiver *P*, 1, where it gravitates or preſſes hard upon it, and ſtill increaſes its Spring or Elaſticity till it comes to over-balance, or exceed the Weight of the Water in the Receiver, which then it will neceſſarily drive up through the Paſſage *Q*, *R*, 1, *Q*, *Q*, into the Force-pipe *S*, and at laſt diſcharge it out at the Top, as you ſee in the Figure.

After the very ſame Manner, tho' alternately, is the Receiver *P*, 2, filled with and emptied of Water; and by this Means a conſtant Steam is kept continually running out at the Top of the Force-pipe *S*, and ſo the Water is raiſed very eaſily from the Bottom of the Mine, *&c.* to the Place where it is deſigned to be diſcharged.

Only I ſhould add, That after the *Engine* begins to work, and the Water is riſen into and hath filled the Force-Pipe *S*, then it fills the little Ciſtern *X*, and by that Means feeds the Pipe *YY*, which he calls the *Condenſing-Pipe*, becauſe Water is conveyed down from thence to cool the Receivers when throughly heated by the Steam, in order to make them *Suck* (as 'tis uſually called) the Water out of the Well up into the Receiver.

Alſo a little above that Ciſtern goes the Pipe *E*, which conveys Water from the Force-pipe into *D* the leſſer Boyler, which is there placed to repleniſh the greater Boyler *L* when the Water in it begins to be almoſt conſumed. Now when there is need of doing this, turn the Cock *E* ſo, that there can be no Communication between the Force-pipe *S*, and the leſſer Boyler *D*; and putting in a little Fire at *B*, 2, the Water there will grow preſently hot; and when it boils, its own Steam, which hath no vent out, preſſing on its Surface, will force the Water up the Pipe *H*, through *K*, into the great Boyler *L*, and ſo long will it run till the Surface of the Water in the Boyler *D*, get to be as low as the Bottom of the Pipe *H*; and then the Steam and Water will run together, and by its Noiſe and rattling of the Clack *I*, will give him that works the *Engine* ſufficient Aſſurance that *D* hath emptied and diſcharged it ſelf into *L*, and carried in as much Water as is then neceſſary; after which, by turning the Cock *I* again, you may let new cold Water out of *S* into *D* the leſſer Boyler, as before: And thus will there be a conſtant Motion, and a continual Supply of the *Engine* without fear of Decay or Diſorder.

Alſo to know whether *L* want repleniſhing or not, you need only turn the Cock *N*, and if Water come out, there is no need to repleniſh; but if Steam only come, you may conclude there is: And the like will the Cock *G* do in reference to the leſſer Boyler *D*, ſhewing when 'tis neceſſary to ſupply that with freſh Water from *S*; ſo that in working the *Engine* there is very little Skill or Labour required, it being only to be injured by either a ſtupid or wilful Neglect.

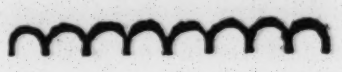
Of the Uſes and Application of this Engine, the Reader will find a full Account in the Inventor's Book called the *Miner's Friend*.

ENGIZOMA, is a Blow upon the Skull, wherewith the Bone deſcends to the inner Membrane of the Brain, and preſſes upon it. Alſo an Inſtrument in ſuch like Caſes. *Blanchard.*

ENGONASIS *Herculis*, the Name given by Aſtronomers to one of the Northern Conſtellations, containing about 48 Stars.

ENGONIOS, is the bending of the Arm or Leg.

ENGRAILED, a Term in Heraldry, when a Bordure, &c. is formed by a Line of this Shape;



and the little Arches turn outward from the Center of the Eſcutcheon; for if they turn the other way, 'tis called *Invected.*

ENGYSCOPE, the ſame with a *Microſcope*, being an Inſtrument to view ſmall Bodies diſtinctly; and 'tis ſo called, becauſe it brings the Eye much nearer to theſe ſmall Bodies, and conſequently makes them appear to us to have larger Parts and Dimenſions than they had before: See *Microſcope.*

ENHARMONICAL, } a Term in Muſick, u-
ENHARMONICK, } ſually applied to the laſt of the three kinds of Muſick, abounding in *Dieſis*, which are the leaſt ſenſible Diviſion of a Tone: See *Dieſis.*

ENIGMA, or *Riddle*, is an obſcure Allegory, where the Natural Senſe of the Words are not preſently perceptible, being, in Appearance, frequently Contradictory.

ENIXUM-SAL, is the Chymical Term for what they otherwiſe call a *Neutral Salt*, which participates both of the Nature of an *Acid* and an *Alkali*; as *Common Salt*, *Nitre*, *Allum*, *Vitriol*, &c.

ENNEADECATERIDES, the ſame with the *Golden-Number*, which ſee; or the *Cycle of the Moon.*

ENNEAGON, is a Polygon of Nine equal Sides.

ENNEATICAL *Days*, ſignifies every ninth Day of a Sickneſs, which ſome will ſuppoſe doth bring ſome great Alteration in the Diſeaſe.

ENNEATICAL *Years*, are every ninth Year of ones Life, which, by ſome weak Men, are thought to bring a great Mutation of Fortune along with them.

ENNEEMIMERIS, is one kind of the *Cæſura* of a *Latin* Verſe, where, after the fourth Foot, there is an odd Syllable ending a Word, which helps to make the next Foot with the following Word; as in this Inſtance,

Ille latus Niveum Molli fultus Hyacintho.

Where all the four kinds of the *Cæſura* occur.

ENORTHROSIS: See *Diarthroſis.*

ENQUEST, is taken for an Inquiſition by a Jury, which is the moſt uſual Trial in all Cauſes both Civil and Criminal within this Realm; for in Cauſes Civil, after Proof is made on either Side of ſo much as each Party thinketh good for himſelf; if the Doubt be in the Fact, it is referr'd to the Diſcretion of twelve indifferent Men, empanell'd by the Sheriff for that Purpoſe; and as they bring in their Verdict, ſo Judgment paſſeth; for the Judge ſaith, The Jury findeth the Fact thus, and the Law is thus. For the *Enqueſt* in Criminal Cauſes, ſee *Jury.*

ENS, or *Being*, is whatever hath any kind of Being or Exiſtence; for that which hath no Exiſtence nor Eſſence, is really nothing at all. This the Schools, (who make a great Variety of Beings) call *Ens Reale*, and *Ens Poſitivum*, to diſtinguiſh it from their *Ens Rationis*, which is only an imaginary thing, a Creature of the Brain, and exiſts no where but in the Underſtanding.

ENS PRIMUM, according to the Cant of *Paracelſus*, is the moſt Efficacious Part of any natural mixt Body, Vegetable, Animal, or Mineral, which he pretends to have been able to ſeparate from them, and with it to effect prodigious things towards the Renovation and Reſtoration of Youth: And though he delivers his Proceſſes ſo obſcurely, as to encourage no Body to try them; yet Mr. *Boyle* gives us a Proceſs of Mr. *L. F.* Chymiſt to the *French* King, whereby the *Ens Primum*, or Eſſence of any Vegetable, may eaſily be obtained, as he had tried himſelf, and is as follows.

Gather, at a convenient Seaſon of the Year, and Time of the Day, *Balm*, for Inſtance, or ſome other fitting Herb (for all Plants cannot this way be turned into Water) beat it to a ſoft Maſs or Pulp in a Marble Mortar, and then putting it into a Bolt-head hermetically ſealed, digeſt it for 40 Days in a Dunghil, or ſome Analogous Heat: After this take out the Matter, which will now be much more liquid than before, and ſeparating from it the Dregs or groſſer Parts, digeſt it anew in a gentle Bath, that the remaining groſſer Parts alſo may ſubſide; filtrate it, and then add to it the fix'd Salt drawn from the former Dregs dried and calcined. To this prepared Liquor add equal Parts of the Liquor of good Sea Salt, well purified, melted, and then let it run *per Deliquium.* Seal up then the Mixture in a Bolt-head, and let it be expoſed to the Sun for ſix Weeks longer; at the End of which Term there will ſwim upon the Liquor the *Ens Primum* of the Plant in a liquid tranſparent Form, ſometimes of a Green, and ſometimes of a Reddiſh Colour, according to the Nature of the Plant thus managed.

M. *Boyle* ſays, That Mr. *L. F.* aſſured him once in the preſence of another Virtuoſo, to whom he appealed for the Truth of the Fact, as having been made acquainted with the Operation, That a ſpecial Friend of his thus drawing the Eſſence of Balm, tried it upon himſelf for about a Fortnight, taking it according to *Paracelſus* his Deſcription; before the End of which Time the Nails of his Hands and Feet came off without pain, being ſucceeded by a Sett of new ones; and convinced him ſo far of the Efficacy of it, that he having no need of any ſuch help, left off taking it; and tried it no farther; but that giving it to an old Woman of 70 Years of Age, who ſerved in the Houſe, it produced the *Menſes* again, and that ſo copiouſly, as wonderfully to ſtartle the old Woman.

Nay, he told Mr. *Boyle* farther, on his enquiring why he did not try it on Beaſts, That he gave of it, tho' but in a little quantity, as having not much of it left, to an old Hen, who on the ſixth Day began to moult her Feathers till ſhe grew ſtark naked; but before a Fortnight was paſſed, received others in their room, which were fairer and better coloured than the former Feathers.

This is an odd Relation, but however 'tis eaſy to make Trial of Matter of Fact; and I wonder no one hath attempted all this while to proſecute a thing which is ſo eaſy to effect, and whoſe Succeſs would reward ſufficiently the Explorer's Pains and Time, if it will do.

ENS *Veneris*, is a Sublimation of equal Parts of the Powder of *Cyprus Vitriol*, calcined till 'tis of a dark Colour, and of Salt-Armoniack into the Form of a Yellow Flower; and they are so called from some Particles of Copper which they have carried away from the Vitriol: The Chymists calling Copper *Venus*.

Mr. *Boyle* commends them as an admirable Medicine in the Rickets, obstinate Cachexies, Loss of Appetite, and all Obstructions. Their Dose is from six Grains to a Scruple.

ENSCONCED: See *Insconced*.

ENSIFORMIS *Cartilago*, or *Mucronata*, is the lowest Part of the *Sternum*, or the Breast Bone; and because of its pointed triangular Shape, 'tis called *Mucronata* and *Ensiformis*: 'Tis about an Inch long, and on the Out-side of it there is formed a Cavity in the Breast called *Scrobiculus Cordis*, or the Heart-Pit; and a gnawing Pain which is sometimes felt here, is called *Cardialgia*, the Heart-burn: But this Pain proceeds not from the Heart, but from the upper Orifice of the Stomach, which lies under this Cartilage, and hath the Name of *Cardia*, because of its great Consent with the Heart, as some fancied formerly.

ENTABLATURE, or *Entablement*, a Term in Architecture, signifying the *Architrave*, *Frise*, and *Cornice* of a *Pillar*, being, in effect, the Extremity of the Flooring, which is either supported by Pillars, or by a Wall, if there are not Columns.

ENTAYLE, in common Law, signifies *Fee-tail*, or *Fee-intailed*, or Abridged.

ENTELECHIA, a *Greek* Word used by *Aristotle* to express the Human Mind: They tell us, that *Hermolaus Barbarus* went to the Devil to know the Meaning of it; and either the Devil for him, or his own great Understanding, renders it *Perfectihabia*; by which his Readers are much the wiser.

The Ancient Commentators on *Aristotle* interpret it by the Word *Actus*, and mean by it a kind of *Substantial Form*, by which Action is produced in the Body.

The Modern Peripateticks come nearer to what perhaps was *Aristotle*'s Meaning; for they make a kind of Motion and happy Modification of Matter qualifying the Whole, to be able to perform such Acts as are proper to it: And thus *Cicero* in his *Tuscul. Quest.* renders *Entelechia, quadam quasi Continuata & perennis Motio.*

ENTERENCHITA, is a Clyster-Pipe, which is also called *Siphon* and *Syringa*.

ENTEROCELE, or *Hernia Intestinalis*, is the fall of the *Intestines*, especially of the *Ilium*, thro' the Processes of the *Peritoneum*, dilated into the Groins, or outward Skin that covers the *Scrotum*. *Blanchard*.

ENTEROEPIPLOCELE, a sort of Rupture, in which the Guts and Caul fall down into the *Scrotum* together. *Blanchard*.

ENTEROMPHALUS, or *Hernia Umbilicalis*, a Rupture of the Navel, or the Bunching out of the Guts at the Navel, which is common with Teeming Women.

ENTERPLEDER, in Common Law, signifies as much as *Cognitio præjudicialis* in the Civil; that is, the discussing of a Point incidentally falling out before the principal Cause can take end. For Example, Two several Persons being found Heirs to Land, by two several Offices in one County, the King is brought in doubt to which of them Livery ought to be made, and therefore first they must *Interplead*: that is, formally try between themselves who is the right Heir.

ENTHYMEME, is a Syllogism perfect in the Mind, but imperfect in the Expression; because some one of the Propositions is suppressed, as being too clear and common, and easily supplied by the Understanding of those with whom we discourse: As, *Every Right-lined Triangle hath all its three Angles just equal to two Right ones; therefore it will be so in an Isoceles*; where the Proposition, that an *Isoceles is a Right-lined Triangle*, is omitted, as being sufficiently known, and therefore it would have been impertinent to have inserted it.

ENTIRE *Tenancy*, is contrary to *Several Tenancy*, signifying the sole Possession in one Man, whereas the other signifieth Joint or Common in more.

ENTOYRE, the Term in Heraldry to Blazon a Bordure when it is charged with things without Life, such as *Bezants*, *Plates*, &c.

ENTRING-LADDER, in a Ship, is of two Sorts; one is used by the Ship's Sides in a Harbour, or in fair Weather, for Persons to go in and out of the Ship; the other is made of Ropes with small Staves for Steps, and is hung out of the *Gallery* to enter into the Boat, or to come Aboard the Ship from thence, when the Sea runs so high, that they dare not bring the Boat to the Ship's Side for fear of *Staving* of her.

ENTRUSION, in Law, signifies a violent or unlawful Entrance into Lands or Tenements, being utterly void of a Possessor, by him that hath no Right unto them.

ENTRUSION *de gard*, is a Writ that lies where the Infant within Age, entred into his Lands, and held his Lord out; for in this Case the Lord shall not have the Writ *de communi Custodia*, but this.

ENTRY, a Term in Law, signifies properly the taking Possession of Lands or Tenements: 'Tis used also for a Writ of Possession.

And in the Plea of Entry there be three Degrees.

First, Where a Man demandeth Lands or Tenements of his own Seisin, after the Term is expired.

The Second is, Where one demandeth Land or Tenements, lett by another after the Term is expired.

The Third, Where one demandeth Lands or Tenements of that Tenant that had *Entry* by one to whom some Ancestor of the Plantiff did lett for a Term now expired; according to which Degrees, the Writs for more fit Remedy are varied.

A Writ of *Entry* differeth from an Assise, because it lieth for the most part against him who entred lawfully, but holdeth against Law; whereas an Assise lieth against him that unlawfully disseised: Yet sometimes a Writ of *Entry* lieth upon an Intrusion.

There are Five Things which put the Writ of *Entry* out of the Degrees, *viz.* *Intrusion*, *Succession*, *Disseisin* upon *Disseisin*, *Judgment*, and *Escheat*.

1. *Intrusion*, is where the Disseisor dies seised, and a Stranger abates.

2. *Succession*, is when the Disseisor is a Man of Religion, and dies, or is disposed, and his Successor *Enters*.

3. *Disseisin* upon *Disseisin*, is when the Disseisor is disseised by another.

4. *Judgment*, is when one recovers against the Disseisor.

¶. *Eſcheat*, is when the Diſſeiſor dies without Heir, or doth Felony, whereby he is Attaint, by which the Lord *Enters*, as in his *Eſcheat*.

ENTRY *ad Communem Legem*, is a Writ which lies where Tenants for Term of Life, Tenant for Term of another's Life, Tenant by the Courteſy, or Tenant in Dower, aliens and dies, he in the Reverſion ſhall have this Writ againſt whomſoever is in.

ENTRY *ad terminum qui præteriit*, lies where a Man Leaſes Land to another for Term of Years, and the Tenant holds over his Term, the Leſſor ſhall have this Writ.

ENTRY *cauſa Matrimonij prælocuti*, is a Writ which lies where Lands or Tenements are given to a Man upon Condition, That he ſhall take the Donor to his Wife within a certain Time, and he eſpouſes another, or otherwiſe diſables himſelf that he cannot take her according to the ſaid Condition; then the Donor and her Heirs ſhall have the ſaid Writ againſt him, or againſt whoever elſe is in the ſaid Lands.

ENTRY *in caſu Proviſo*, lies if Tenant in Dower aliens in Fee, or for Term of Life, or for another's Life living the Tenant in Dower, he in the Reverſion ſhall have this Writ.

ENTRY *in caſu conſimili*, is a Writ that lies where Tenant for Life, or Tenant by the Courteſy aliens in Fee, he in the Reverſion ſhall have this Writ.

ENTRY *ſine aſſenſu Capitali*, lies where an Abbot, Prior, or ſuch as has Convent or Common Seal, aliens Lands or Tenements of the Right of the Church, without the Aſſent of the Convent or Chapter, and dies, then the Succeſſor ſhall have this Writ.

ENVELOPE, in Fortification, is a Mount of Earth, ſometimes raiſed in the Ditch of a Place, and ſometimes beyond it, being either in form of a ſimple *Parapet*, or of a ſmall *Rampart* bordered with a Parapet. Thoſe *Envelopes* are made when one would only cover the weak Places with ſingle Lines, without any Deſign of advancing toward the Field, which cannot be done but by Works that require a great deal of Breadth; ſuch as *Horn-works*, *Half-Moons*, &c.

Theſe *Envelopes* are ſometimes called *Sillons*, *Contregards*, *Conſerves*, *Lunettes*, &c.

ENUNCIATION, with the Logicians, is the ſame as a Propoſition.

ENURNY, the Herald's Term for a *Bordure* of a Coat of Arms being charged with any kind of Beaſts.

ENVY, is by ſome well enough defined to be an Uneaſineſs of the Mind, cauſed by the Conſideration of a Good we deſire, obtained by one we think ſhould not have had it before us.

EPACMASTICA, is a Fever that commonly grows ſtronger. *Blanchard.*

EPACT, is uſed for a Number, whereby we note the Exceſs of the common *Solar Year* above the *Lunar*, and thereby may find out the Age of the Moon every Year: For the *Solar Year* conſiſting of 365 Days, the *Lunar* but of 354, the *Lunations* every Year get 11 Days before the *Solar Year*; but thereby in 19 Years the *Moon* compleats 20 times 12 *Lunations*, or gets up one whole *Solar Year*; and having finiſhed that Circuit, begins again with the *Sun*; and ſo from 19 Years to 19 Years: For the firſt Year afterwards, the *Moon* will go before the *Sun* but a 11 Days; the ſecond Year 22 Days, which is called the *Epact* of that Year; the third Year 33 Days; but 30 being an entire Lunation, caſt that away, and 3 ſhall be that Year's *Epact*, the next Year 14; and ſo on, adding Yearly 11 Days, and caſting away 30, when the Number amounts to more.

To find the Epact, *having the* Prime *or* Golden Number *given, you have this*

RULE.

Divide by 3, *for each one left add Ten.*
30 *reject*; *the* Prime *makes* Epact *then.*

Example.

Anno 1701, *Golden Number* 11, divided by 3, leaves 2; therefore 10 times 2, which is 20, added to 11, makes 31, from which take 30, the Remainder is 1, the *Epact* for the Year 1701.

EPANORTHOSIS, is a *Greek* Word, the ſame with *Correctio* or *Emendatio* in *Latin*; and ſignifies a Pathetical Form of Speech, in which the firſt Expreſſion appearing too weak, the Speaker ſtill endeavours to correct or mend it, by uſing ſtronger ways of ſpeaking.

EPAPHALESIS, is an irritated or repeated *Phlebotomy*. *Blanchard.*

EPAR: See *Hepar*.

EPARMATA, are Tumours of the Glandules, called *Parotes*, behind the Ears. *Blanchard.*

EPAULE, in Fortification, is the Shoulder of the Baſtion, or the Angle of the *Face* and *Flank*; whence that Angle is often called the Angle of the *Epaule*.

EPAULEMENT, in Fortification, is a *Side-work* made either of Earth thrown up, of Bags of Earth, Gabions, or of Faſcines and Earth, of which latter make the *Epaulments* of the *Places of Arms* for the Cavalry behind the Trenches are. Sometimes the Word

EPAULMENT is uſed for a *Demi-Baſtion*; and ſometimes it ſignifies a *Square Orillon*, which is a Maſs of Earth almoſt Square, faced and lined with a Wall, and deſigned to cover the Cannon of a *Cazematte*.

EPENTHESIS, in *Grammar*, is the Addition of a Vowel or Conſonant in the Middle of a Word; but if it be prefix'd, 'tis called *Prothesis*, if added at the End *Paragoge*.

EPHELÆUM, is the Place from the *Hypogaſtrium*, or Part of the *Abdomen*, to the Secret Parts. *Blanchard.*

EPHELIS, or *Ephellides*, is *Freckles* in the Face, Neck, or Hands, &c.

EPHELCIS, is that bloody Subſtance which is brought up in ſpitting of Blood: Alſo a Shell or Cruſt that is brought over Ulcers. *Blanchard.*

EPHEMERA, or *Diaria*, is a continued Fever which laſts but a Day; if it laſts above a Day, it is called *Synochus Simplex*. *Blanchard.*

EPHEMERIS, thoſe Books or Journals which contain the Daily Motions of the *Planets*, and other Circumſtances relating thereto, for every Day in the Year, are called an *Ephemeris*, or *Ephemerides*.

EPHIALTES, or *Incubus*, the *Night-Mare*, is a depraved Imagination, whereby People aſleep fancy that their Wind-pipe is oppreſs'd by ſome ſuperincumbent Body; and that their Breath is ſtopp'd: This ſeems to proceed from Compreſſion of the *Cerebellum*, when the Ventricles are too full of Moiſture; for if thoſe who are thus affected lie upon their Backs, then the whole Bulk of the Brain lies upon

upon the *Cerebellum*; whereupon all the Pores and Paſſages being ſtop'd by ſo much Weight, the Spirits are hindred from influencing the Nerves called *Per vagum*, and the *Intercoſtal Nerve*; which being thus deſtitute of Spirits, the Lungs are oppreſſed and flag, and cannot perform their Office. *Blanchard.*

EPHIDROSIS, is Sweating.

EPHIMERIS, or *Ephimerides*, is a Diary or Daily Regiſter of the Motions and Places of the Heavenly Bodies, eſpecially ſhewing their Place at Noon: The ſame with *Ephemeris*.

EPHIPTIUM, or *Sella Equina*, or *Turſica*, is Part of the Bone *Sphenoides*, wherein the *Pituitary* Gland is placed.

EPIALA, a kind of continual Fever, wherein both Heat and Cold is felt at the ſame time. *Blanchard.*

EPICARPIUM, is a Medicine applied outwardly like a Plaiſter or a *Cataplaſm*; applied to the Pulſe or Wriſt of the Hand to drive away intermitting Fevers.

EPICAUMA, is a cruſty Ulcer that ſometimes happens to the Black of the Eye.

EPICERASTICA, are Medicines which obtund and temperate ſharp Humours.

EPICHEIRESIS, the ſame with *Encheireſis*.

EPICHEREMA, is a kind of Complex Argumentation conſiſting of many Propoſitions depending one upon another, whereby at laſt ſome particular Point is made out: As when *Cicero*, in his Oration *pro Milone*, argues, That thoſe who lay in wait to deprive a Man of his Life, or of his Money, may, by the Law of Nature, of Nations, and by common Practice, be juſtly ſlain: And therefore, ſince it appears that *Clodius* did by ſeveral Acts prove himſelf to be in ſuch a Deſign, 'twas lawful for *Milo* to kill him. 'Tis a kind of *Sorites*, which ſee.

EPICRASIS, is a gradual Evacuation of ill Humours in the Blood.

EPICUREAN *Philoſophy*, was the Natural Philoſophy firſt taught by *Epicurus* and *Democritus*, and afterwards delivered in Verſe by *Lucretius*: It is much the ſame with the preſent Mechanical Philoſophy, which ſee.

EPICYCLE, a little Circle whoſe Center is in the Circumference of a greater; or a ſmall Orb, which being fixed in the Deferent of a Planet, is carried along with its Motion, and yet with its own peculiar Motion, carries the Body of the Planet faſtened to it round about its proper Center, which Ancient Aſtronomers attribute to all the Planets, for ſolving their Appearances, except the Sun.

EPICYEMA, is a Superfœtation.

EPIDEMICK *Diſeaſe*, is one proceeding from a common Cauſe, ſpreading it ſelf over divers Countries at divers times; ſuch are the Plague, Malignant Fevers, &c.

EPIDERMIS: See *Cuticula*.

EPIDIDYMIS, or *Epididymida*, or *Pariſtata*, in Latin *Supergeminalis*; it is a winding Veſſel, making a Figure like the Winding of crooked Veins that are ſwoln with ill Blood, and is affixed to the Back of the Teſticles: Its greater Globe is annexed to the Teſticles, conſiſting of one Veſſel or Paſſage above five Ells long: The leſſer Globe is connected to the Veſſel that carries the Seed. *Blanchard.* See *Teſtes*.

EPIGASTRICK *Artery*, is ſaid by ſome to be a Branch of the *Iliack Artery*; and diſtributes it ſelf amongſt the Muſcles of the *Epigaſtrius*.

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EPISION, is the Place of the Secret Parts, or *Aqualiculus*. *Blanchard.*

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EPISTO-

5. *Eſcheat*, is when the Diſſeiſor dies without Heir, or doth Felony, whereby he is Attaint, by which the Lord *Enters*, as in his *Eſcheat*.

ENTRY *ad Communem Legem*, is a Writ which lies where Tenants for Term of Life, Tenant for Term of another's Life, Tenant by the Courteſy, or Tenant in Dower, aliens and dies, he in the Reverſion ſhall have this Writ againſt whomſoever is in.

ENTRY *ad terminum qui præteriit*, lies where a Man Leaſes Land to another for Term of Years, and the Tenant holds over his Term, the Leſſor ſhall have this Writ.

ENTRY *cauſa Matrimonij prælocuti*, is a Writ which lies where Lands or Tenements are given to a Man upon Condition, That he ſhall take the Donor to his Wife within a certain Time, and he eſpouſes another, or otherwiſe diſables himſelf that he cannot take her according to the ſaid Condition; then the Donor and her Heirs ſhall have the ſaid Writ againſt him, or againſt whoever elſe is in the ſaid Lands.

ENTRY *in caſu Proviſo*, lies if Tenant in Dower aliens in Fee, or for Term of Life, or for another's Life living the Tenant in Dower, he in the Reverſion ſhall have this Writ.

ENTRY *in caſu conſimili*, is a Writ that lies where Tenant for Life, or Tenant by the Courteſy aliens in Fee, he in the Reverſion ſhall have this Writ.

ENTRY *ſine aſſenſſu Capitali*, lies where an Abbot, Prior, or ſuch as has Convent or Common Seal, aliens Lands or Tenements of the Right of the Church, without the Aſſent of the Convent or Chapter, and dies, then the Succeſſor ſhall have this Writ.

ENVELOPE, in Fortification, is a Mount of Earth, ſometimes raiſed in the Ditch of a Place, and ſometimes beyond it, being either in form of a ſimple *Parapet*, or of a ſmall *Rampart* bordered with a Parapet. Thoſe *Envelopes* are made when one would only cover the weak Places with ſingle Lines, without any Deſign of advancing toward the Field, which cannot be done but by Works that require a great deal of Breadth; ſuch as *Horn-works*, *Half-Moons*, &c.

Theſe *Envelopes* are ſometimes called *Sillons*, *Contregards*, *Conſerves*, *Lunettes*, &c.

ENUNCIATION, with the Logicians, is the ſame as a Propoſition.

ENURNY, the Herald's Term for a *Bordure* of a Coat of Arms being charged with any kind of Beaſts.

ENVY, is by ſome well enough defined to be an Uneaſineſs of the Mind, cauſed by the Conſideration of a Good we deſire, obtained by one we think ſhould not have had it before us.

EPACMASTICA, is a Fever that commonly grows ſtronger. *Blanchard.*

EPACT, is uſed for a Number, whereby we note the Exceſs of the common *Solar Year* above the *Lunar*, and thereby may find out the Age of the Moon every Year: For the *Solar Year* conſiſting of 365 Days, the *Lunar* but of 354, the *Lunations* every Year get 11 Days before the *Solar Year*; but thereby in 19 Years the *Moon* compleats 20 times 12 *Lunations*, or gets up one whole *Solar Year*; and having finiſhed that Circuit, begins again with the *Sun*; and ſo from 19 Years to 19 Years: For the firſt Year afterwards, the *Moon* will go before the *Sun* but a 11 Days; the ſecond Year 22 Days, which is called the *Epact* of that Year; the third Year 33 Days; but 30 being an entire Lunation, caſt that away, and 3 ſhall be that Year's *Epact*, the next Year 14; and ſo on, adding Yearly 11 Days, and caſting away 30, when the Number amounts to more.

To find the Epact, *having the* Prime *or* Golden Number *given, you have this*

RULE.

Divide by 3, *for each one left add Ten.*
30 *reject*; *the* Prime *makes* Epact *then.*

Example.

Anno 1701, *Golden Number* 11, divided by 3, leaves 2; therefore 10 times 2, which is 20, added to 11, makes 31, from which take 30, the Remainder is 1, the *Epact* for the Year 1701.

EPANORTHOSIS, is a *Greek* Word, the ſame with *Correctio* or *Emendatio* in *Latin*; and ſignifies a Pathetical Form of Speech, in which the firſt Expreſſion appearing too weak, the Speaker ſtill endeavours to correct or mend it, by uſing ſtronger ways of ſpeaking.

EPAPHALESIS, is an irritated or repeated *Phlebotomy*. *Blanchard.*

EPAR: See *Hepar*.

EPARMATA, are Tumours of the Glandules, called *Parotes*, behind the Ears. *Blanchard.*

EPAULE, in Fortification, is the Shoulder of the Baſtion, or the Angle of the *Face* and *Flank*; whence that Angle is often called the Angle of the *Epaule*.

EPAULEMENT, in Fortification, is a *Side-work* made either of Earth thrown up, of Bags of Earth, Gabions, or of Faſcines and Earth, of which latter make the *Epaulments* of the *Places of Arms* for the Cavalry behind the Trenches are. Sometimes the Word

EPAULMENT is uſed for a *Demi-Baſtion*; and ſometimes it ſignifies a *Square Orillon*, which is a Maſs of Earth almoſt Square, faced and lined with a Wall, and deſigned to cover the Cannon of a *Cazematte*.

EPENTHESIS, in *Grammar*, is the Addition of a Vowel or Conſonant in the Middle of a Word; but if it be prefix'd, 'tis called *Prothesis*, if added at the End *Paragoge*.

EPHELÆUM, is the Place from the *Hypogaſtrium*, or Part of the *Abdomen*, to the Secret Parts. *Blanchard.*

EPHELIS, or *Ephellides*, is *Freckles* in the Face, Neck, or Hands, &c.

EPHELCIS, is that bloody Subſtance which is brought up in ſpitting of Blood: Alſo a Shell or Cruſt that is brought over Ulcers. *Blanchard.*

EPHEMERA, or *Diaria*, is a continued Fever which laſts but a Day; if it laſts above a Day, it is called *Synochus Simplex*. *Blanchard.*

EPHEMERIS, thoſe Books or Journals which contain the Daily Motions of the *Planets*, and other Circumſtances relating thereto, for every Day in the Year, are called an *Ephemeris*, or *Ephemerides*.

EPHIALTES, or *Incubus*, the *Night-Mare*, is a depraved Imagination, whereby People aſleep fancy that their Wind-pipe is oppreſs'd by ſome ſuperincumbent Body; and that their Breath is ſtopp'd: This ſeems to proceed from Compreſſion of the *Cerebellum*, when the Ventricles are too full of Moiſture; for if thoſe who are thus affected lie upon their Backs, then the whole Bulk of the Brain lies upon

upon the *Cerebellum*; whereupon all the Pores and Paſſages being ſtop'd by ſo much Weight, the Spirits are hindred from influencing the Nerves called *Per vagum*, and the *Intercoſtal Nerve*; which being thus deſtitute of Spirits, the Lungs are oppreſſed and flag, and cannot perform their Office. *Blanchard.*

EPHIDROSIS, is Sweating.

EPHIMERIS, or *Ephimerides*, is a Diary or Daily Regiſter of the Motions and Places of the Heavenly Bodies, eſpecially ſhewing their Place at Noon: The ſame with *Ephemeris*.

EPHIPTIUM, or *Sella Equina*, or *Turſica*, is Part of the Bone *Sphenoides*, wherein the *Pituitary* Gland is placed.

EPIALA, a kind of continual Fever, wherein both Heat and Cold is felt at the ſame time. *Blanchard.*

EPICARPIUM, is a Medicine applied outwardly like a Plaiſter or a *Cataplaſm*; applied to the Pulſe or Wriſt of the Hand to drive away intermitting Fevers.

EPICAUMA, is a cruſty Ulcer that ſometimes happens to the Black of the Eye.

EPICERASTICA, are Medicines which obtund and temperate ſharp Humours.

EPICHEIRESIS, the ſame with *Encheireſis*.

EPICHEREMA, is a kind of Complex Argumentation conſiſting of many Propoſitions depending one upon another, whereby at laſt ſome particular Point is made out: As when *Cicero*, in his Oration *pro Milone*, argues, That thoſe who lay in wait to deprive a Man of his Life, or of his Money, may, by the Law of Nature, of Nations, and by common Practice, be juſtly ſlain: And therefore, ſince it appears that *Clodius* did by ſeveral Acts prove himſelf to be in ſuch a Deſign, 'twas lawful for *Milo* to kill him. 'Tis a kind of *Sorites*, which ſee.

EPICRASIS, is a gradual Evacuation of ill Humours in the Blood.

EPICUREAN *Philoſophy*, was the Natural Philoſophy firſt taught by *Epicurus* and *Democritus*, and afterwards delivered in Verſe by *Lucretius*: It is much the ſame with the preſent Mechanical Philoſophy, which ſee.

EPICYCLE, a little Circle whoſe Center is in the Circumference of a greater; or a ſmall Orb, which being fixed in the Deferent of a Planet, is carried along with its Motion, and yet with its own peculiar Motion, carries the Body of the Planet faſtened to it round about its proper Center, which Ancient Aſtronomers attribute to all the Planets, for ſolving their Appearances, except the Sun.

EPICYEMA, is a Superfœtation.

EPIDEMICK *Diſeaſe*, is one proceeding from a common Cauſe, ſpreading it ſelf over divers Countries at divers times; ſuch are the Plague, Malignant Fevers, &c.

EPIDERMIS: See *Cuticula*.

EPIDIDYMIS, or *Epididymida*, or *Pariſtata*, in Latin *Supergeminalis*; it is a winding Veſſel, making a Figure like the Winding of crooked Veins that are ſwoln with ill Blood, and is affixed to the Back of the Teſticles: Its greater Globe is annexed to the Teſticles, conſiſting of one Veſſel or Paſſage above five Ells long: The leſſer Globe is connected to the Veſſel that carries the Seed. *Blanchard.* See *Teſtes*.

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EPISTO-

EPISTOMIA, are the utmoſt Gapings and Meetings of Veſſels.

EPISTROPHEUS, or *Cardo*, is the ſecond Vertebræ of the Neck; ſo called from turning, becauſe the Head turns upon it. *Blanchard.*

EPISTYLE, in Architecture, is a Maſs of Stone, or Piece of Timber laid upon the Capital of a Pillar.

The Ancient *Grecians* frequently made uſe of this Word, to ſignify that which we call the *Architrave.*

'Tis the firſt Member of the *Entablature*, and is uſually broken into two or three Diviſions, which the Architects call *Faſciæ*, Swathes, Fillets, Bands, or Liſts.

EPITHEME, is a Medicine of a Liquid Form, externally to be applied to ſome particular Part.

EPITRITUS, a Foot of a Latin Verſe conſiſting of four Syllables; of which the *Grammarians* reckon four kinds.

The Firſt is compounded of an *Iambus* and a *Spondæus*, as *Salutantes*, where the firſt Syllable is ſhort, and all the reſt long.

The Second is made out of a *Trochæus* and a *Spondæus*; as *Concitati*, where the firſt Syllable is long, the ſecond ſhort, and the two laſt long.

The Third is compounded of a *Spondæus*, and an *Iambus*; as *Communicans*, where the two firſt Syllables are long; the third ſhort, and the laſt long.

The Fourth conſiſts of a *Spondæus* and a *Trochæus*; as *Incantare*, where the three firſt Syllables are long, and the laſt ſhort.

EITROPE, is a Figure in Rhetorick, whereby we freely grant a thing that might be deny'd, to obtain another that we deſire.

EPNEUMATOSIS, the ſame with *Expiratio.*

EPOCHA, or *Epoche*, in Chronology, ſignifies ſome remarkable Occurrence, from whence ſome Nations date and meaſure their Computation of Time.

The *Julian Epocha* takes its Name from *Julius Cæſar*'s Reformation of the *Roman* Calendar; which was done 45 Years before Chriſt, in the 708 Year from the building of *Rome*, and in the 731 Olympiad.

The *Ethiopick Abyſſyn*, or as ſome call it, the *Diocletian Epocha*; others the *Æra* of the Martyrs, becauſe it bore Date with a very ſevere Perſecution: This *Epocha* began *Aug.* 29. *A. D.* 284. and in the firſt Year of the Emperor *Diocletian.* 'Tis uſed by the *Egyptians* and *Abyſſynes.*

The *Turkiſh* or *Arabick Epocha*, which they call the *Hegira*, bears Date from *Mahomet*'s Flight from *Mecca*, *A. D.* 622. *July* 16.

The *Perſick* or *Jeſdegerdick Epocha*, takes its Date either from the Coronation of the laſt *Perſian* King *Jeſdegerdis*, or *Jeſdagerdis*, as ſome ſay; or from his being conquered rather by *Ottoman* the *Saracen*, which was *June* 16. *A. D.* 632.

EPOMIS, is the upper part of the Shoulder, called alſo *Acroneum.*

EPOMPHALUM, is a Plaiſter, or any ſuch thing, applied to the Protuberances of the Navel.

EPULIS, is an Excreſcence in the Gums, which is ſo large, as ſometimes to hinder the opening of the Mouth.

EPULETICK *Medicines*, are the ſame with *Cicatrizantia.*

EQUABLE *Motions*, are ſuch as always continue the ſame Degree of Velocity, and are neither accelerated nor retarded; but if there be an Acceleration or Retardation of the Velocity of two or more Bodies, and it be exactly and uniformly the ſame in them both or all, they ſay ſuch Bodies are

EQUABLY Accelerated or retarded.

EQUALITY, is the exact Agreement of two things in reſpect of Quantity.

EQUANIMITY, is an even, equal, calm Frame of Mind and Temper under good or bad Fortune; whereby a Man appears to be neither Diſpirited, Soured, nor rendred Uneaſy by Adverſity; nor puffed up, nor overjoy'd with Proſperity.

EQUATION, or the *Total Proſtaphæreſis*, in the Ptolemaick Theory of the Planets, is the Difference between the Planets *mean* and *true* Motion; or the Angle made by the Lines of the true and mean Motion of the Center: But the

EQUATION or *Phyſical Proſtaphæreſis*, is the Difference between the Motions of the Center of the *Epicycle* in the *Equant*, and in the *Eccentrick*; as the

EQUATION, or *Optical Proſtaphæreſis*, is the Angle made by two Lines drawn from the Center of the *Epicycle* to the Centers of the World, and of the *Eccentrick.*

EQUATION *of the Orbit*, is the ſame with the *Total Proſtaphæreſis*, or *Equation Total.*

EQUATION, in Algebra, is a mutual comparing of two equal things of different Denominations; as $3s. = 36d.$ 10 Crowns $= 2l.\ 10s. = 500s. = 6000d. = 2400$ Farthings, &c. $a = b + d$, $36 = \frac{c + R}{2}$, &c.

The *Terms of an Equation*, are the ſeveral Quantities or Parts of which any Equation is compoſed, connected together by the Signs + and —: As in this Equation $a = b + c$, the Terms are a, b, and c, where 'tis ſuppoſed, that ſome Quantity repreſented by a, is equal to the Sum of b and c, or to b and c added together.

Whenever any Queſtion or Problem is propoſed in Algebra, we always ſuppoſe the thing *ſought* or *required* to be *known* or *done*; and then by putting the Letter a, or ſome other Vowel (moſt now uſe the laſt Letters of the Alphabet z, x, y) for the unknown Quantity, or for the Thing ſought, and Conſonants for whatever is *known* or *given*, in order to diſtinguiſh one from the other: The Queſtion or Problem is firſt throughly conſidered, and then duly ſtated; and after this judiciouſly compared, transformed, and varied by Addition, Subſtraction, Multiplication, Diviſion, Extraction of Roots, &c. according as the Nature of the Thing and the Rules of Art direct: till at laſt the Quantity ſought, or at leaſt ſome Power of it, becomes equal to ſome *known* or *given* Quantity, and ſo is it ſelf of conſequence diſcovered.

After a Queſtion is duly ſtated, 'tis proper to conſider whether it be ſubject to any *Limitations* or not: To which end the Writers of Algebra give theſe general Rules.

1. If the Quantities ſought or requir'd, are more than the number of the given Equations, the Queſtion is capable of innumerable Anſwers: See *Kerſey*'s *Algebra*, p. 301. Vol. 1.

2. But if the given Equations, independent one upon another, are juſt as many as the Quantities ſought, then the Queſtion hath only one certain and determinable number of Anſwers.

3. If the Quantities ſought or required, are leſs in number than the given Equations, the Queſtion is yet more limited, and is ſometimes diſcoverable to be impoſſible to be reſolved, by reaſon of ſuch Equations being inconſiſtent with each other.

Equations, in order to be reſolved, muſt firſt be prepared and reduced; which may be done by the following Rules.

1. If the Quantity ſought, or any Part or Degree of it be in Fractions, let all be reduced to one common Denomination, and then omitting the Denominators, let the Equation be continued in the Numerators only; *v. gr.* $\frac{a+b}{c} + d = 100 = B$. Then firſt, $\frac{a+b+cd}{c} = B$, and then $a + b + cd = cB$. Or if $a - b = \frac{aa+cc}{a} + b + b$; multiply all by d, and it will ſtand thus, $ad - db = aa + cc + db + db$. Or if $a - 75 = \frac{3}{4}bb + c - g$; multiply all by 4, then $4a - 300 = 3bb + 4c - 4g$. This is called by *Vieta*, *Iſomeria*, and by others *Converſion*.

2. When there is an intermixture of Quantities, known and unknown, in any Equation, let all the unknown Quantities (by Tranſpoſition) be made to poſſeſs only one Side of the Equation, and all the known ones another.

Tranſpoſition is always done by putting the Quantity over to the other Side with a contrary Sign to what it had before. The Demonſtration of which Rule depends on that Axiom, That if to, or from Equals, you add or ſubſtract Equal, the Sums or Remainder will be equal.

Thus, Suppoſe $a - 34 = 60$, then $a = 34 + 60 = 94$: Or if $a + b - d = b + c + e$, then $a - e = c + d$. If $4a - 300 = 3bb + 4c - 4g$, then $4a = 300 + 3bb + 4c - 4g$. If $36 + 44 = a - 60$, then $a = 140$.

3. If the higheſt Power or Species of the unknown Quantity, be multiplied into any known Quantity or Quantities, let the Whole be divided by ſuch known Quantity or Quantities.

Thus, If $5aa = 30000$, $aa = \frac{30000}{5} = 6000$.

If $ba + da = 100$, then $a = \frac{100}{b+d}$.

If $dee + dde = z$, then $ee + de = \frac{z}{d}$

This is called ſometimes *Depreſſion*, and by *Vieta*, *Paraboliſmus*.

4. If all the known Quantities happen to be multiplied into any Degree of the unknown one, let all be brought down (by Diviſion) to the loweſt Degree thereof that can be.

As if $aaaa + baaa = zzaa$, then by Diviſion of all by aa, $aa + ba = zz$.

If $aa + ab - ac = ad - fa$, then $a + b - c = d - f$, by Diviſion, and $a = d - b + c - f$, by Tranſpoſition.

If $ea + 9e - 7e = 15e + 34e - 10e$, then will $e + 9 - 7 = 15 + 34 - 10$, by Diviſion.

And $e + 2 = 39$; therefore, by Tranſpoſition, $e = 37$. This Rule is that which *Vieta* calls *Hypobibaſmus*.

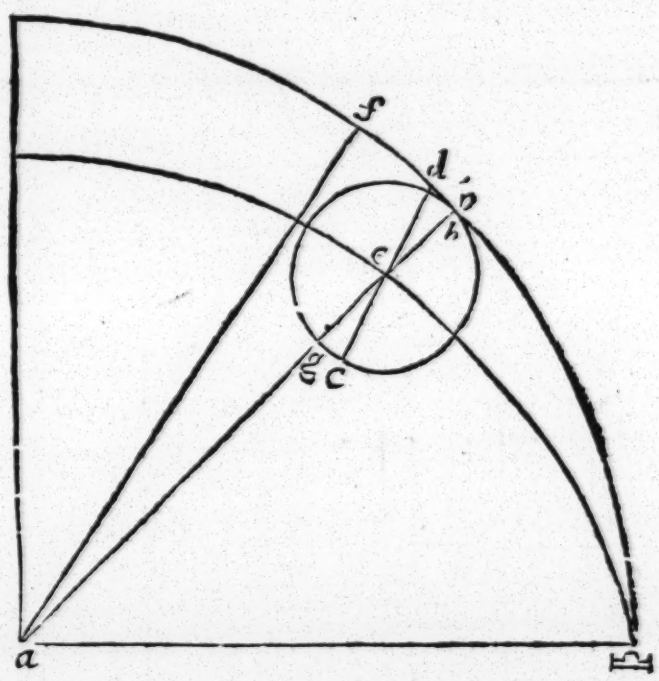
5. If any one Member of the Equation be a Surd Root, all muſt be raiſed up to that Power, and then the Equation continued.

Thus, if $\surd : ba + b = c$, then, by Tranſpoſition, $\surd : ab = c - b$, and by this Rule $cc - 2bc + bb = ab$: And by Rule the Third, $a = \frac{cc - 2bc + bb}{b}$.

EQUATION (*Annual*) of the mean Motion of the Sun and Moon, and of the Moon's *Apogee* and *Nodes*.

The *Annual Equation* of the mean Motion of the Sun, depends upon the Eccentricity of the Earth's Orbit round him; and is $16\frac{11}{12}$ ſuch Parts, of which the mean Diſtance between the Sun and the Earth is 1000: from whence, by ſome, 'tis called the *Equation of the Center*; and this, when greateſt, 1 Deg. 56'. 20". The greateſt *Annual Equation* of the Moon's mean Motion is 11'. 40". of its Apogee 20'. and of its Node 9'. 30". And theſe four Annual Equations are always mutually proportionable to one another; ſo that when any of them is at the Greateſt, the three others alſo will be Greateſt; and when any one Leſs, the reſt diminiſh in the ſame Ratio: Wherefore, the *Annual Equation* of the Center (of the Sun) being given, the other three correſponding *Equations* will be given; ſo that one Table (*i. e.* of the *Central Equation*) may ſerve for all.

EQUATION *of Time*, or of *Natural Days*, in Aſtronomy, as the Noble *Tycho* hath aſſerted, and our Famous Mr. *Street* demonſtrated, is the Difference between the Sun's true Longitude, and his right Aſcenſion.



Let the Center of the Sun be ſuppoſed at *a*, and of the Earth at *e*: Let ♎ *e* repreſent the Earth's Longitude in the Ecliptick, and ♎ the like Arch projected into the Equator: Let ♎ *b* be the Earth's (or Sun's) right Aſcenſion in its true Place; *g h* is a Diameter of the Equinoctial, and Meridian of the Earth's apparent Diurnal Revolution; *a b* is the Semi-diameter of the true Meridian and Equinoctial ſuppoſed in the Heavens; and *g h* is ſuppoſed to be parallel to *a b*, tho' they appear here but as one Line. Let *c d* be drawn parallel to *a f*, and be alſo a Diameter of the Equinoctial and Meridian of the mean or equal Revolution. It will then be plain, that *c e g*, which is the Angle of the Earth's Libration, muſt be equal to *b a f*, the Difference of Longitude and right Aſcenſion; and conſequently muſt be the true Equation of Time, or the Difference between the *equal* and *apparent* Time.

Dr. *Wallis* thus accounts for the Inequality of Natural Days.

The Natural Day is meaſured not only by one entire Converſion of the *Equinoctial* or 24 *Equinoctial* Hours, (which is indeed taken to be performed in equal Times) but increaſes by ſo much, as anſwers to that Part of the *Sun*'s (or *Earth*'s Annual Motion) as is performed in that Time. For when that Part of the *Equinoctial*, which (with the Sun) was at the Meridian Yeſterday at Noon, is come thither again to Day: It is not yet Noon, (becauſe

(becauſe the Sun is not now at the Place where Yeſterday he was, but is gone forward about one Degree more or leſs) but we muſt ſtay till that Place where the Sun now is, comes to the Meridian, before it be now Noon.

This Additament (above the 24 *Equinoctial Hours*, or entire Converſion of the *Equinoctial*) is upon a double Account unequal.

Firſt, Becauſe the Sun, by reaſon of its *Apogæum* and *Perigæum*, doth not at all Times of the Year, diſpatch in one Day an equal Arch of the *Ecliptick*; but greater Arches near the *Perigæum*, which is about the Middle of *December*; and leſſer near the *Apogæum*, which is about the Middle of *June*; as will appear ſufficiently by the *Tables* of the Sun's Annual Motion.

Secondly, Though the Sun ſhould in the *Ecliptick* move always at the ſame rate, yet equal Arches of the *Ecliptick*, do not in all Parts of the *Zodiack* anſwer to equal Arches of the *Equinoctial*, by which we are to eſtimate Time; becauſe ſome Parts of it, as the two Solſtitial Points, lie nearer to a parallel Poſition to the *Equinoctial* than others; as theſe about the two *Equinoctial* Points, where the *Ecliptick* and *Equinoctial* do interſect: Whereupon an Arch of the *Ecliptick* near the Solſtitial Points, anſwers to a greater Arch of the *Equinoctial*, than an Arch equal thereto near the *Equinoctial* Points; as doth ſufficiently appear by the Table of the Sun's Right Aſcenſion.

If you imagine another Sun to move in the Heavens in an equal Emotion, not in the *Ecliptick*, but in the *Equinoctial*; the Difference between their coming to the Meridian every Day (or to any one and the ſame Hour-circle) will be the *Equation of Time*. And becauſe the true Sun, and that Point of the Equator where his right Aſcenſion ends, come always to the Meridian together, the *Equation of Time* may be defined to be that Space of Time which is paſſed over, while an Arch of the Equator, comprehended between the extreme Point of the true Sun's Aſcenſion, and the Place of the feigned Sun, paſſes over the Meridian: And if this Arch be turned into Time, it gives the true *Equation of Time*. Dr. *Greg. Aſtron.*

Mr. Flamſteed's *Tables of* Equation of Natural Days.

Leap-Year.

	Jan.		*Febru.*		*March.*		*April.*		*May.*		*June.*		*July.*		*Auguſt.*		*Septem.*		*Octob.*		*Novem.*		*Decemb*	
	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.
1	8	47	14	49	10	00	0	41	4	10	0	59	4	47	4	26	3	58	13	22	15	19	5	28
2	9	10	14	48	9	43	0	24	4	11	0	47	4	55	4	Watch 16	4	19	13	36	15	10	4	too ſlow 59
3	9	32	14	46	9	26	0	* 8	4	12	0	34	5	2	4	5	4	39	13	49	15	01	4	31
4	9	54	14	43	9	9	0	* 7	4	13	0	22	5	9	3	54	5	0	14	2	14	50	4	2
5	10	15	14	40	8	51	0	22	4	12	0	* 10	5	15	3	43	5	20	14	14	14	38	3	33
6	10	36	14	36	8	33	0	37	4	10	0	* 3	5	20	3	31	5	41	14	26	14	26	3	3
7	10	Watch 55	14	Watch 31	8	Watch 15	0	Watch 52	4	Watch 10	0	Watch 16	5	Watch 25	3	too faſt 18	6	Watch 1	14	Watch 37	14	Watch 13	2	33
8	11	14	14	26	7	57	1	6	4	8	0	29	5	30	3	5	6	22	14	47	14	00	2	3
9	11	32	14	20	7	39	1	19	4	5	0	42	5	34	2	53	6	43	14	57	13	45	1	33
10	11	49	14	13	7	20	1	31	4	2	0	55	5	37	2	38	7	3	15	6	13	30	1	4
11	12	5	14	5	7	1	1	47	3	59	1	7	5	40	2	24	7	24	15	15	13	13	0	34
12	12	too faſt 22	13	too faſt 57	6	too faſt 43	1	too ſlow 57	3	too ſlow 54	1	too faſt 20	5	too faſt 43	2	9	7	too ſlow 44	15	too ſlow 24	12	too faſt 56	0	* 4
13	12	37	13	48	6	24	2	9	3	50	1	33	5	45	1	54	8	4	15	30	12	38	0	* 26
14	12	51	13	39	6	5	2	19	3	45	1	46	5	45	1	38	8	24	15	36	12	19	0	* 56
15	13	5	13	29	5	46	2	30	3	39	1	59	5	46	1	22	8	43	15	42	12	00	1	26
16	13	18	13	18	5	27	2	41	3	33	2	11	5	46	1	5	9	3	15	47	11	40	1	56
17	13	30	13	7	5	9	2	51	3	26	2	22	5	45	0	48	9	23	15	51	11	20	2	Watch 25
18	13	41	12	56	4	50	3	0	3	19	2	35	5	44	0	31	9	42	15	54	10	59	2	34
19	13	51	12	44	4	31	3	8	3	11	2	41	5	42	0	* 13	10	2	15	57	10	37	3	23
20	14	0	12	32	4	13	3	16	3	3	2	59	5	40	0	* 5	10	21	15	59	10	14	3	52
21	14	9	12	18	3	54	3	24	2	54	3	10	5	37	0	22	10	39	16	00	9	50	4	21
22	14	17	12	5	3	36	3	32	2	46	3	22	5	33	0	too ſlow 40	10	57	16	01	9	26	4	too faſt 40
23	14	24	11	51	3	17	3	39	2	37	3	33	5	29	0	59	11	15	16	00	9	2	5	16
24	14	39	11	36	2	59	3	45	2	27	3	44	5	25	1	19	11	32	15	59	8	37	5	43
25	14	35	11	21	2	40	3	50	2	17	3	54	5	19	1	39	11	49	15	56	8	11	6	11
26	14	39	11	5	2	22	3	54	2	6	4	4	5	13	1	58	12	6	15	54	7	45	6	37
27	14	43	10	50	2	5	3	58	1	56	4	13	5	7	2	17	12	22	15	50	7	19	7	3
28	14	46	10	34	1	47	4	2	1	45	4	22	5	0	2	37	12	37	15	46	6	52	7	29
29	14	47	10	17	1	13	4	5	1	34	4	31	4	52	2	57	12	53	15	40	6	24	7	54
30	14	49					4	8	1	22	4	39	4	44	3	18	13	8	15	34	5	57	8	18
31	14	49			2	57			1	11			4	35	3	38			15	27			8	41

The First after Leap-Year.

	Jan.		*Febru.*		*March.*		*April.*		*May.*		*June.*		*July.*		*Auguſt.*		*Septem.*		*Octob.*		*Novem.*		*Decemb*	
	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.
1	9	4	14	48	10	4	0	45	4	10	1	0	4	45	4	28	3	53	13	18	15	21	5	33
2	9	26	14	46	9	47	0	28	4	11	0	50	4	53	4	18	4	14	13	32	15	15	5	too
3	9	48	14	44	9	30	0	* 12	4	12	0	37	5	0	4	8	4	34	13	46	15	3	4	38
4	10	10	14	41	9	13	0	* 3	4	13	0	25	5	7	3	57	4	55	13	59	14	53	4	slow 9
5	10	31	14	37	8	55	0	18	4	12	0	* 13	5	13	3	46	5	15	14	11	14	41	3	40
6	10	50	14	32	8	37	0	33	4	11	0	* 0	5	18	3	34	5	36	14	22	14	29	3	10
7	11	9	14	27	8	19	0	48	4	10	0	13	5	24	3	21	5	56	14	34	14	7	2	40
8	11	27	14	21	8	1	1	2	4	8	0	26	5	29	3	8	6	17	14	44	13	45	2	10
9	11	43	14	15	7	43	1	16	4	8	0	39	5	33	2	55	6	38	14	54	13	24	1	40
10	12	2	14	7	7	2	1	28	4	3	0	52	5	39	2	41	6	58	15	4	13	3	1	11
11	12	18	13	59	7	6	1	41	4	0	1	4	5	38	2	27	7	19	15	13	13	17	0	41
12	12	34	13	50	6	47	1	54	3	56	1	17	5	42	2	13	7	39	15	22	13	0	0	* 11
13	12	47	13	41	6	28	2	6	3	51	1	30	5	44	1	58	7	59	15	28	12	33	0	* 19
14	13	2	13	31	6	10	2	16	3	46	1	43	5	45	1	42	8	19	15	34	12	4	0	* 49
15	13	15	13	21	5	51	2	27	3	40	1	56	5	46	1	26	8	38	15	40	12	5	1	19
16	13	27	13	10	5	32	2	38	3	4	2	8	5	46	1	9	8	58	15	45	11	45	1	49
17	13	38	12	59	5	14	2	48	3	28	2	20	5	45	0	52	9	18	15	50	11	25	2	18
18	13	48	12	41	4	55	2	57	3	21	2	32	5	44	0	* 35	9	37	15	53	11	4	2	47
19	13	58	12	35	4	36	3	6	3	13	2	44	5	42	0	* 17	9	57	15	56	10	42	3	7
20	14	7	12	22	4	17	3	14	3	5	2	56	5	40	0	1	10	16	15	58	10	20	3	45
21	14	15	12	8	3	50	3	22	2	56	3	7	5	38	0	18	10	34	15	59	9	59	4	14
22	14	22	11	54	3	42	3	30	2	48	3	19	5	34	0	36	10	53	16	0	9	32	4	42
23	14	28	11	40	3	22	3	37	2	39	3	30	5	30	0	55	11	10	16	1	9	8	5	too
24	14	34	11	24	3	3	3	33	2	28	3	41	5	26	1	14	11	28	15	59	8	43	5	fast
25	14	38	11	9	2	45	3	49	2	19	3	51	5	20	1	34	11	45	15	57	8	17	6	4
26	14	42	10	54	2	26	3	53	2	9	4	1	5	14	1	53	12	2	5	55	7	51	6	32
27	14	45	10	38	2	9	3	57	1	59	4	11	5	8	2	12	12	18	15	51	7	25	6	57
28	14	47	10	21	1	51	4	1	1	48	4	20	5	2	2	32	12	33	15	47	6	59	7	33
29	14	48			1	34	4	4	1	37	4	29	4	54	2	52	12	49	15	41	6	31	7	48
30	14	49			1	17	4	7	1	25	4	37	4	46	3	43	13	4	15	35	6	3	8	12
31	14	49			1	01			1	14			4	37	3	33			15	29			8	25

The Second after Leap-Year.

	Jan.		*Febru.*		*March.*		*April.*		*May.*		*June.*		*July.*		*Auguſt.*		*Septem.*		*October*		*Novem.*		*Decem.*	
	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.
1	8	59	14	48	10	8	0	49	4	9	1	5	4	43	4	30	3	48	13	14	15	2	5	4
2	9	21	14	47	9	55	0	32	4	11	0	53	4	51	4	23	4	9	13	28	15	1	5	too
3	9	43	14	45	9	34	0	* 16	4	12	0	40	4	58	4	10	4	29	13	42	15	0	4	slow 4
4	10	5	14	42	9	17	0	* 1	4	13	0	28	5	5	4	0	4	50	13	56	14	56	4	16
5	10	26	14	38	8	53	0	14	4	12	0	16	5	11	3	49	5	10	14	8	14	44	3	47
6	10	45	14	38	8	41	0	29	4	11	0	3	5	14	3	37	5	31	14	20	14	32	3	17
7	11	5	14	28	8	24	0	44	4	10	0	* 10	5	23	3	24	5	51	14	31	14	2	2	47
8	11	24	14	23	8	5	0	58	4	8	0	* 23	5	28	3	11	6	12	14	41	14	0	2	17
9	11	40	14	14	7	47	1	12	4	6	0	36	5	32	2	58	6	33	14	51	13	57	1	47
10	11	57	14	9	7	29	1	26	4	4	0	49	5	35	2	44	6	53	15	1	13	38	1	18
11	12	14	14	1	7	10	1	38	4	1	1	1	5	38	2	30	7	14	15	11	13	21	0	38
12	12	30	13	52	6	52	1	51	3	57	1	14	5	41	2	16	7	34	15	20	13	4	0	* 18
13	12	44	13	43	6	33	2	3	3	52	1	27	5	43	2	2	7	54	15	28	12	47	0	* 12
14	12	58	13	34	6	15	2	14	3	47	1	40	5	45	1	46	8	14	15	32	12	28	0	42
15	13	12	13	24	5	59	2	24	3	41	1	53	5	46	1	30	8	33	15	38	12	9	1	12
16	13	24	13	13	5	37	2	35	3	35	2	5	5	46	1	13	8	53	15	44	11	50	1	42
17	13	35	13	2	5	18	2	46	3	29	2	17	5	45	0	56	9	13	15	49	11	33	2	11
18	13	46	12	50	5	0	2	56	3	23	2	29	5	44	0	39	9	32	15	52	11	9	2	40
19	13	56	12	37	4	14	3	4	3	15	2	41	5	42	0	21	9	52	15	55	10	47	3	9
20	14	5	12	25	4	25	3	12	3	7	2	53	5	40	0	* 3	10	11	15	57	10	25	3	38
21	14	13	12	12	4	3	3	20	2	58	3	4	5	38	0	* 14	10	30	15	59	10	2	4	7
22	14	20	11	57	3	41	3	28	2	50	3	1	5	35	0	31	10	48	16	1	9	38	4	too
23	14	27	11	45	3	20	3	35	2	41	3	27	5	31	0	too	11	6	16	0	9	14	5	2
24	14	32	11	28	3	8	3	42	2	31	3	38	5	27	1	9	11	24	15	59	8	49	5	fast
25	14	37	11	13	2	49	3	47	2	21	3	48	5	22	1	29	11	41	15	57	8	2	5	29
26	14	41	10	58	2	31	3	52	2	11	3	59	5	16	1	slow 49	11	58	15	55	7	57	5	57
27	14	44	10	42	2	13	3	56	2	1	4	9	5	10	2	7	12	14	15	52	7	31	6	23
28	14	47	10	25	1	55	4	0	1	51	4	18	5	3	2	27	12	29	15	48	7	5	6	50
29	14	48			1	38	4	3	1	40	4	27	4	56	2	47	12	45	15	43	6	38	7	16
30	14	49			1	22	4	6	1	28	4	35	4	48	3	8	13	0	15	37	6	10	7	41
31	14	49			1	5			1	17			4	39	3	28			15	31			8	6

The Third after Leap-Year.

	Jan.		*Febru.*		*March.*		*April.*		*May.*		*June.*		*July.*		*Auguſt.*		*Septem.*		*Octob.*		*Novem.*		*Decemb*	
	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.
1	8	53	14	49	10	10	20	53	4	9	1	8	4	41	4	32	3	43	13	11	15	28	5	49
2	9	15	14	47	9	54	0	36	4	10	0	56	4	39	4	23	4	4	13	25	15	17	5	too 20
3	9	37	14	45	9	38	0	20	4	12	0	43	4	57	4	13	4	24	13	39	15	8	4	52
4	9	59	14	42	9	21	0	* 4	4	13	0	31	5	4	4	2	4	45	13	53	14	58	4	slow 23
5	10	20	14	39	9	4	0	* 11	4	12	0	19	5	10	3	51	5	5	14	5	14	47	3	54
6	10	41	14	34	8	46	0	26	4	12	0	* 6	5	13	3	40	5	26	14	17	14	35	3	25
7	11	00	14	29	8	28	0	41	4	11	0	* 7	5	22	3	27	5	46	14	28	14	23	2	55
8	11	Watch 18	14	Watch 24	8	Watch 10	0	Watch 55	4	Watch 9	0	20	5	Watch 27	3	too faſt 14	6	Watch 7	14	Watch 39	14	Watch 10	2	25
9	11	36	14	18	7	52	1	9	4	7	0	33	5	31	3	1	6	28	14	49	13	50	1	55
10	11	54	14	11	7	34	1	22	4	4	0	46	5	35	2	48	6	48	14	59	13	41	1	25
11	12	10	14	3	7	15	1	35	4	1	0	58	5	38	2	34	7	9	15	9	13	25	0	56
12	12	too 26	13	too 54	6	too 56	1	too 48	3	too 58	1	Watch 11	5	too 41	2	20	7	too 29	15	too 18	13	too 8	0	26
13	12	41	13	45	6	38	2	0	3	53	1	24	5	43	2	5	7	49	15	25	12	51	0	* 14
14	12	faſt 55	13	faſt 36	6	faſt 19	2	ſlow 11	3	ſlow 48	1	Watch 27	5	faſt 45	1	50	8	ſlow 9	15	ſlow 31	12	ſlow 33	0	* 34
15	13	9	13	26	6	0	2	22	3	43	1	30	5	46	1	34	8	29	15	37	12	14	1	4
16	13	21	13	15	5	41	2	33	3	37	2	2	5	46	1	17	8	48	15	43	11	55	1	34
17	13	23	13	4	5	23	2	43	3	31	2	too 14	5	45	1	0	9	8	15	48	11	35	2	Watch 4
18	13	43	12	53	5	4	2	52	3	24	2	faſt 26	5	44	0	43	9	28	15	52	10	14	2	ſlow 33
19	13	53	12	41	4	45	3	1	3	17	2	38	5	43	0	26	9	47	15	55	10	53	3	2
20	14	3	12	28	4	26	3	10	3	9	2	50	5	41	0	* 9	10	7	15	57	10	31	3	31
21	14	11	12	15	4	7	3	18	3	0	3	2	5	39	0	* 9	10	27	15	59	10	8	4	0
22	14	18	12	1	3	49	3	26	2	52	3	13	5	36	0	27	10	43	16	0	9	44	4	too 26
23	14	25	11	47	3	31	3	33	2	43	3	25	5	32	0	46	11	1	16	1	9	20	4	50
24	14	31	11	32	3	13	3	41	2	34	3	36	5	28	1	5	11	19	16	0	8	55	5	faſt 23
25	14	3	11	16	2	54	3	4	2	24	3	40	5	23	1	24	11	37	15	58	8	30	5	50
26	14	40	11	1	2	31	3	51	2	14	3	57	5	17	1	44	11	54	15	56	8	4	6	17
27	14	43	10	46	2	17	3	55	2	4	4	7	5	11	2	3	12	10	15	33	7	38	6	44
28	14	4	10	30	1	42	3	59	1	53	4	16	5	5	2	22	12	26	15	49	7	12	7	10
29	14	47			1	25	4	3	1	42	4	25	4	58	2	42	12	41	15	44	6	45	7	36
30	14	48					4	6	1	31	4	33	4	50	3	3	12	57	15	38	6	17	8	0
31	14	49			1	9			1	19	4	37	4	14	3	23							8	24

EQUATOR: See *Equinoctial.*

EQUICRURAL: See *Iſoſceles.*

EQUICULUS, or *Equus minor*, a Conſtellation in the Northern Hemiſphere, conſiſting of 4 Stars.

EQUILATERAL *Triangle*: See *Triangle.*

EQUILIBRIUM, in Mechanicks, is when the two Ends of a Balance hang ſo exactly even and level, that neither doth aſcend or deſcend, but do both keep in a Poſition parallel to the Horizon; which is occaſioned by their being both charged with an equal Weight.

EQUIMULTIPLES, are Numbers or Quantities multiplied by one and the ſame Number or Quantity: See *Propoſition*, N°. 13.

EQUINOCTIAL, (in the Heavens) or Equator on the Earth, is a great Circle, whoſe Poles are the Poles of the World. It divides the Globe into two equal Parts; that is, the Northern and Southern Hemiſpheres. It paſſes through the Eaſt and Weſt Points of the Horizon: and at the Meridian is raiſed as much above the Horizon, as is the Complement of the Latitude of the Place.

Whenever the Sun cometh to this Circle, it maketh equal Days and Nights all round the Globe, becauſe he then always riſes due Eaſt, and ſets due Weſt, which he doth at no other time of the Year, whence it hath its Name. All Stars alſo which are under this Circle, or which have no Declination, do always riſe due Eaſt, and ſet full Weſt, &c.

All People living under this Circle, (which, in Geography, is called the Line) have their Days and Nights equal: At Noon the Sun is in their Zenith, or directly over their Heads, and caſts no Shadow.

From this Circle (on the Globes) is the Declination or Latitude accounted on the Meridian.

And the Circles which run through each Degree of Latitude or Declination, are called Parallels of Latitude or Declination.

Through this Equinoctial all the Hour-Circles are drawn at Right Angles to it, and through the Poles of the World, at every 15th Degree, on the Celeſtial Globe.

And the Equator on the Terreſtrial Globe is divided by the Meridians into 36 equal Parts.

The Natural Day is meaſured by the Revolution of the Equator, and is ended when the ſame Point of the Equator comes again to the ſame Meridian, which is in 24 Hours.

Wherefore ſince the Equator (as all great Circles are) is divided into 360 Degrees, each Hour muſt be $\frac{1}{24}$ of that Number, or 15 Degrees; therefore 1 Degree of the Equator will contain 4 Minutes of an Hour; and 15 Minutes of a Degree, will make a Minute of an Hour, or 60 Seconds; and conſequently 4 Seconds anſwer to one Minute of a Degree.

Hence the following Tables are made for converting Degrees and Minutes, &c. of the Equinoctial into Time, and *Vice verſa.*

TA-

TABLE I.

To convert Parts of the Equinoctial into Time.

Degrees.	Hours.	1
Minutes.	1	2
Seconds.	2	3
Thirds.	3	4
1	0	4
2	0	8
3	0	12
4	0	16
5	0	20
10	0	40
15	1	0
30	2	0
60	4	0
90	6	0
180	12	0
360	24	0

Whose Use is this:

Suppose you would readily know how many Hours, Minutes and Seconds, *&c.* there are in 19 Degrees, 13 Minutes, 7 Seconds of the Equator.

	H.	′	″	‴
Against 15 Degrees, in the first Table, you find	1	0	0	0
Against 4 Degrees	0	16	0	0
Also against 10 Minutes you will find	0	0	40	0
And against 3 Minutes	0	0	12	0
Then against 5 Seconds you will find	0	0	0	20
And against 2 Seconds you have	0	0	0	8
Add all up together, and it makes	1	16	52	28

TABLE II.

To convert Time into Parts of the Equinoctial.

Hours	Degr.	Minut.	Degr.	1
		Second	1	2
		Thirds	2	3
		Fourth	3	4
1	15	1	0	15
2	30	2	0	30
3	45	3	0	45
4	10	4	1	0
5	75	5	1	15
6	90	6	1	0
9	135	10	2	30
12	180	20	5	0
15	225	30	7	30
18	270	40	10	0
21	315	50	12	30
24	630	60	15	0

Again, for the Use of this Table.

Suppose you would find how many Degrees, Minutes, Seconds, *&c.* of the Equator, answer to 23 Hours, 25 Minutes, 17 Seconds, and 9 Thirds.

	H.	′	″	‴
Against 21 Hours, in the Table, you find	315	0	0	0
Against 2 Hours	30	0	0	0
Against 20 Minutes you have	5	0	0	0
And against 5 Minutes	1	15	0	0
Then against 10 Seconds you find	0	2	30	0
And against 5 Seconds	0	1	15	0
Against 2 Seconds	0	0	30	0
Then against 6 Thirds there is	0	0	1	30
And against 3 Thirds you have	0	0	0	45
All which added rightly together, make	351	19	17	15

EQUINOCTIAL *Colure*: See *Colure*.

EQUINOCTIAL *Dial*, is that whose Plane lies parallel to the *Equinoctial*.

To make this Dial, is no more than with 60 Degrees of your Line of Chords to describe a Circle, wherein draw two Diameters crossing each other at Right-Angles; then divide this Circle into 24 equal Parts or Hours, which subdivide as you please.

Note, That every Hour is 15 Degrees, therefore the Half-hour will be 7 Degrees, 30 Minutes, and the Quarter 3 Degrees, 45 Minutes.

That being done, ſet up a ſtraight Pin perpendicular to the Plane in the Center of the Circle, and place the Plane parallel to the Equinoctial, and the Meridian Line true North and South, and the Dial is fitted.

Theſe Dials are commonly ſet up in a Frame to be elevated to any Latitude.

EQUINOCTIAL *Orient*: See *Orient*.

EQUINOCTIAL *Occident*: See *Occident*.

EQUINOXES, are the preciſe Times in which the Sun enters into the firſt Point of *Aries* and *Libra*; for then moving exactly under the *Equinoctial*, he makes our Days and Nights equal. This he doth twice a Year, about the 10th of *March*, and 12th of *September*; which therefore are called the *Vernal* and *Autumnal Equinoxes*.

It is found by Aſtronomical Obſervation, That the Equinoctial Points (which are the firſt Points of the Signs *Aries* and *Libra*,) go backward every Year 50 Seconds.

And our admirable Sir *Iſaac Newton*, taking the Matter into Conſideration according to his Principles, found, by Calculation, That they muſt recede 49 Minutes, 58 Seconds, which is ſurprizingly near the Truth.

The Space from the *Vernal* to the *Autumnal Equinox*, is 8 or 9 Days longer than from the *Autumnal* to the *Vernal*, by reaſon of the Poſition of the *Perihelion* of the Earth's Orbit near the *Winter* Solſtice.

EQUINUS *Barbatus*, a kind of Comet, called alſo *Equinus Ellipticus*, *Equinus Quadrangularis*: See *Hippeus*.

EQUIPOLLENCE, in Logick, is when there is an *Equivalence* or Agreement, either as to the Nature of the Thing, or as to the Grammatical Senſe of any two, or more Propoſitions; or in plain Words, when two Propoſitions ſignify one and the ſame thing, tho' they expreſs it after different manners, they are properly ſaid to be *Equipollent*.

EQUITY, is the Virtue of treating all other Men according to common Reaſon and Juſtice, or as we would be gladly treated our ſelves, when we underſtand rightly what is our due.

EQUITY, in the Law, uſually ſignifies the *Court of Chancery*, where Controverſies are ſuppoſed to be determined according to the exact Rules of *Equity* and Conſcience, by mitigating the Rigor of the Common Law, tho' even by the Common and Statute Law there is alſo an *Equity*. *Æquitas ſequitur Legem*, is an old Maxim in Law; but from the great Increaſe of Suits in *Chancery*, ſome have thought fit to give it this Conſtruction, That in all Cauſes after a Man has been at Law, he muſt go into *Equity*.

EQUIVALENCE *in Things*, is that which expreſſes an Agreement in Nature or Circumſtances, between any two Things propoſed.

EQUIVOCAL, in Logick, is that which hath a doubtful or double Signification.

Any Equivocal Word, is that which contains more Significations than one, or that which ſerves for ſeveral Notions: See *Homonymous*.

EQUIVOCAL Generation, is the Production of Plants without Seed: Inſects or Animals without Parents in the Natural Way of Coition between Male and Female.

The Learned World begins now to be ſatisfied, that there is nothing like this in Nature; and ſince the Uſe of Microſcopes, and a more particular Application to Enquiries of this Kind, a prodigious Number of Plants have been diſcovered to have *Seeds*; and of Animals (*Inſects*) have been found to be produced Univocally, or in the ordinary way of Generation, which before were thought to be Equivocally produced. See *Vol.* II.

ERASED, the Herald's Word, expreſſing any thing violently torn off from its proper Place; and 'tis uſed in Contradiſtinction to Couped, which ſignifies a Thing clean cut off.

ERECT Declining Dials, are thoſe whoſe Planes are not directly oppoſite to any of the four Cardinal Points, but Decline from the Meridian or Prime Vertical Circle.

For the drawing of the Hour-Lines on theſe Dials, there is given the Latitude of the Place, and the Declination of the Plane, in order to find,

Firſt, The Height of the Style above the Plane.

Secondly, The Diſtance of the Subſtyle from the Meridian.

Thirdly, The Inclination of the Meridians, or Difference of the Meridians; which are all the Requiſites neceſſary to be known before the Dial can be deſcribed.

1. To find the Style's Height above the Plane, ſay,

As the Radius is to the Co-ſine of the Plane's Declination:
So is the Co-ſine of the Elevation of the Pole, to the Sine of the Style's Height.

2. To find the Subſtyle's Diſtance from the Meridian, ſay,

As the Radius is to the Sine of the Plane's Declination:
So is the Co-Tangent of the Elevation of the Pole, to the Tangent of the Subſtyle's Diſtance.

3. To find the Inclination of the Meridians, ſay,

As the Radius is to the Co-Tangent of the Declination:
So is the Sign of Elevation of the Pole, to the Co-Tangent of the Inclination of the Meridians.

Theſe being found; Then with a Line and Plumet, let fall a Perpendicular to the Horizon, and that ſhall be the Meridian or Hour Line of 12.

Then if your Plane decline {Weſtward, / Eaſtward,} place the Subſtyle's Diſtance (from the Line of Chords) to the {Right / Left} Hand of the Meridian.

Alſo having found the Inclination of the Meridians, find what Angle each Hour makes at the Pole with the Subſtyle, by ſubſtracting 15 Degrees for each Hour that is between the Subſtyle and Meridian, as long as it can be done from the Inclination of the Meridians; and by adding 15 Degrees for the other Hours.

And with the Hour-Angles at the Pole, find the Hour-Arches by this Proportion.

As the Radius: Is to the Sine of the Style's Height :: So is the Tangent of the Hour-Angle: To the Tangent of the Hour-Arch.

Of theſe Hour-Angles and Hour-Arches frame a Table, as was ſhewed in making a Horizontal-Dial.

Example

Example.

A *South Erect Dial, Declining Eaſtward* 45 Degrees, 00 Minutes. Latitude 51 Degrees, 32 Minutes.

The Requiſites may be found by the foregoing Canons, *viz*

The Height of the Style,	26	06
Subſtyle's Diſtance from the Meridian,	29	21
Inclination of Meridians,	51	57

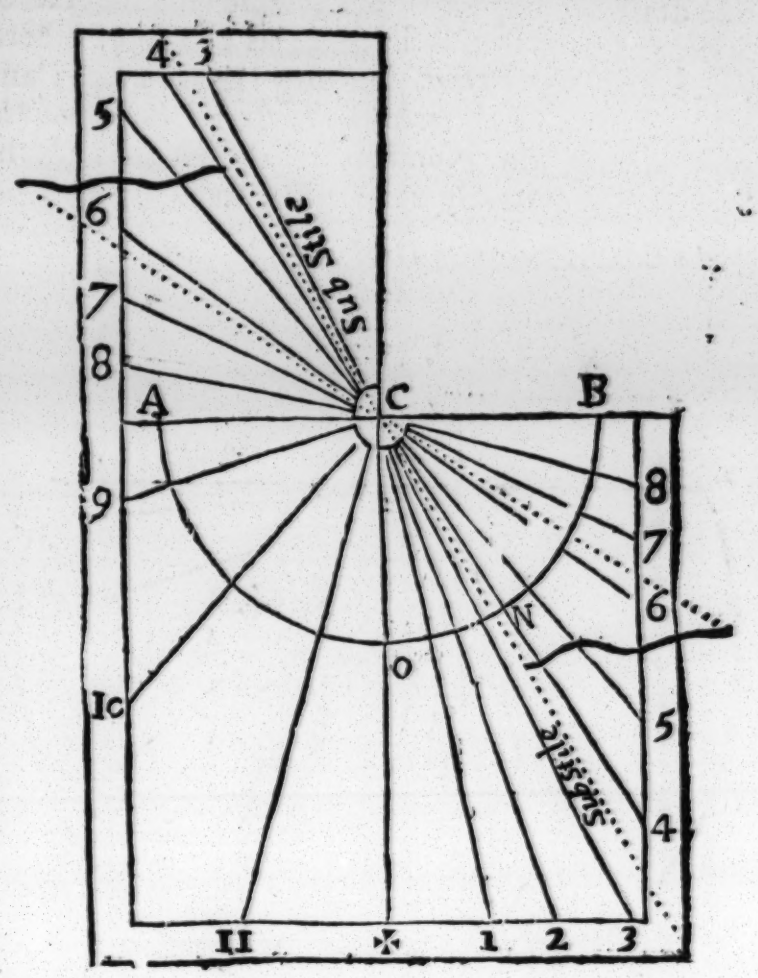
Now, ſince the *Inclination of Meridians* is leſs than 60 Degrees, and greater than 45 Degrees, 'tis certain the *Subſtyle* muſt be between 8 and 9 of the Clock.

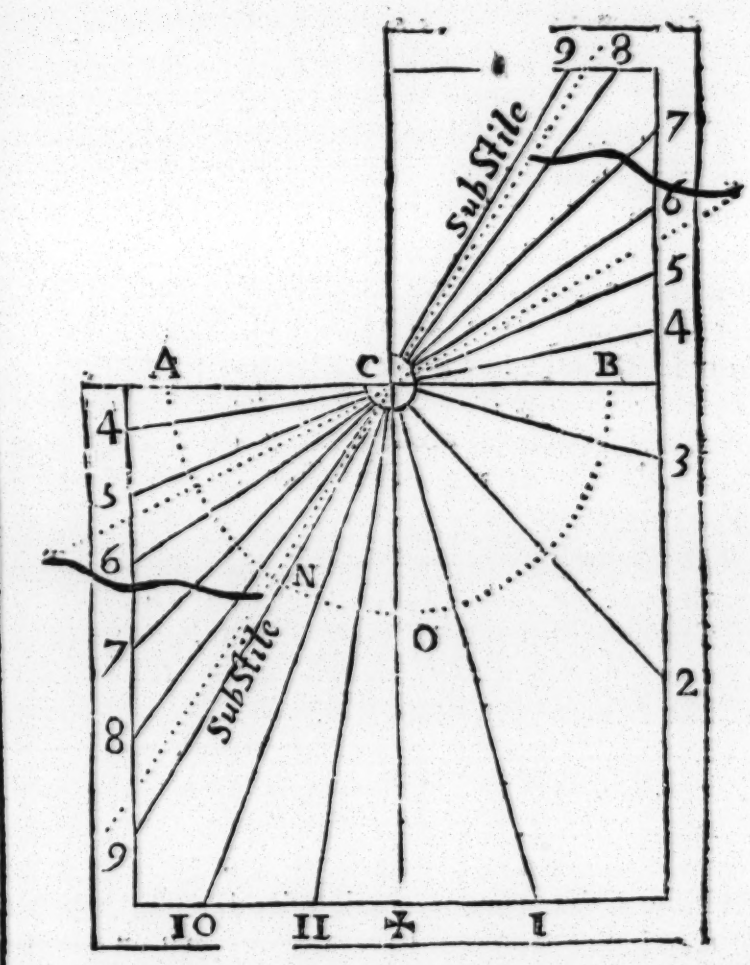
Then the *Hour-Angles at the Pole* are alſo found by ſubducting 15 Degrees from the *Inclination of Meridians* (ſuppoſed to be ſet againſt 12) the Remainder will be for the Hour 11; and from that Angle againſt 11, ſubſtract 15 Degrees, the Remainder ſet againſt 10; and from that Remainder ſubduct 15 Degrees, the Reſidue ſet againſt 9; and that becauſe 'tis leſs than 15 Degrees, take the Difference to 15 Degrees, which ſet againſt 8; then by continual Addition of 15 Degrees, you'll have the Numbers againſt the remaining Hours.

Laſtly, Find the *Hour-Arches* according to the Canon given for that Purpoſe: *viz.* by the continual Addition of the Sine of the *Style's Height*, 26 Degrees, 6 Minutes to the Tangent of every *Hour's Diſtance from the Subſtyle*, and that will give new Tangents of the *Hour-Arches*, as in the following Table.

The Eaſt Decliner.

Hurs	*Angles at Pole.* D.	M.	*Hour Arches.* D.	M.
3	83	3	74	31
4	68	3	47	31
5	53	3	30	20
6	38	3	19	01
7	23	3	10	37
8	8	3	3	34
Subſtyle	*Subſtyle*		*Subſtyle*	
9	6	57	2	26
10	11	57	10	3
11	36	57	18	19
12	51	57	29	21
1	66	57	45	58
2	81	57	72	27





To deſcribe the Dial.

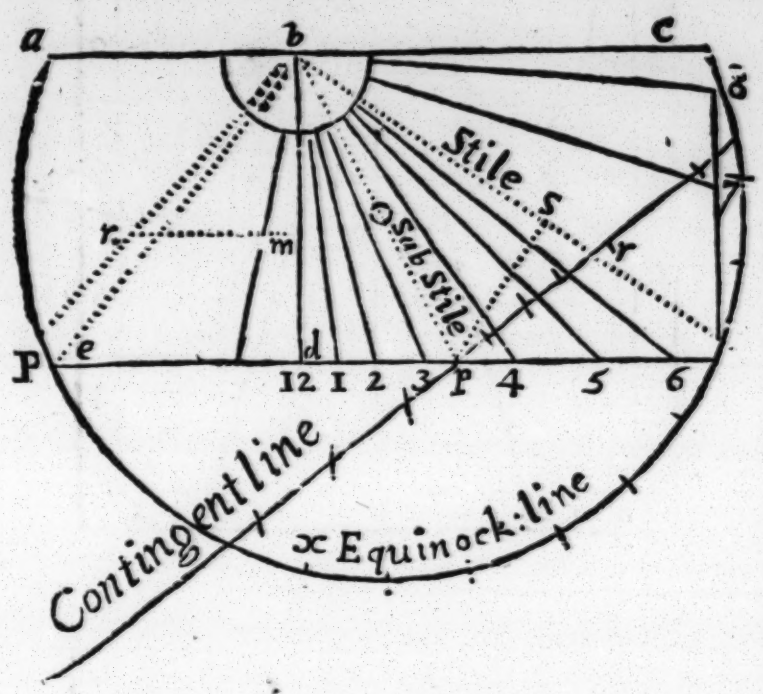
Firſt draw the *Horizontal Line ACB*, and at Right-angles to it the *Meridian CO* 12; then with 60 Degrees of your Line of Chords, from *C* deſcribe the Semi-circle *AOB*; and ſet off 29 Degrees, 21 Minutes (the *Diſtance of the Subſtyle from the Meridian*) from *O* to *N*, on the Weſt Side of the Meridian, becauſe the Plane declines Eaſt. Set off alſo the ſeveral Hour Arches (as) 10 Degrees, 37 Minutes for 7 and 5 a Clock, 18 Degrees, 19 Minutes for 11 and 1 a Clock, *&c.* both ways from the *Subſtyle* on the Circle *NRO*; and draw Lines from the Center *C* through theſe ſeveral Points: So you'll have the true Hour Lines deſired.

Then from your Chords, ſet off the *Style's Height* 26 Degrees, 6 Minutes from *N* to *R*; and a Right-line

line drawn through *R* from *C*, repreſents the Axis or Sryle, and your *Dial* is finiſhed; as alſo three others, *viz.* a *South Erect Dial, declining Weſt* as much; and a *North Erect Dial, declining Eaſt and Weſt* as much, only placing the Numbers of the Hours and the Style repreſentatively upon each Plane.

An Erect Declining Dial may be Geometrically made thus:

Having given the Elevation of the Pole, and Declination of the Plane;



Firſt draw two Lines interſecting each other at Right-angles: From the Point of Interſection, ſuppoſe *b*, make the Angle *e b d* equal to Elevation of the *Equator*; make another *n b d* equal to the Declination of the Plane. Draw *d e* perpendicular to the Meridian; from any Point taken at pleaſure, ſuppoſe *d*, make *b n = d e*; from *n* let fall a Perpendicular to the Meridian *n m*; let this Perpendicular *n m* be transferred, and ſet upon the former Perpendicular on the other Side of the Meridian equal to *d p*.

Let the *Subſtyle* be drawn through *b* and *p*; unto which, in the point *p*, draw a Perpendicular for the *Contingent*, as *p r*: Then from *b*, through *r*, draw the Style, whoſe Altitude above the Subſtyle ſhall be equal to the Angle *p b r*.

From *p* to the Style, let fall the Perpendicular *p s*; make *p o* on the Subſtyle equal to *p s*: From *o*, at any Diſtance, deſcribe the Equinoctial Circle, which divide into 24 or 48 parts, beginning your Diviſion in that part of the Circle, *W*, which is cut by the Ruler applied to *o* and *x*, which is the point of Interſection of the *Contingent* and the *Meridian*.

Make points in the *Contingent*, where 'tis cut by a Ruler applied to the Center *o*, and every Diviſion; through which points, from the Center *b*, draw the Hour-Lines.

ERECT *Declining Planes*: See *Dial Planes*.

ERECT *Direct Planes*: See *Dial Planes*.

ERECT *Direct Eaſt or Weſt Dials*: See *Direct Erect Eaſt or Weſt Dials*.

ERECT *Direct South or North Dials*: See *Prime Vertical*.

ERECTORES *Penis*, by ſome called *Erigentes*, by others *Directores*, by *Spigelius*, *Collaterales Penis*; are a pair of Muſcles ariſing Fleſhy from the outward Knob of the *Os Iſchium*, below the Beginning of the Cavernous Bodies of the *Penis*, in whoſe thick Membranes they are inſerted: Their Uſe is to help to erect the *Penis*, which they do by pulling towards the *Oſſa Pubis*, whereby its greateſt Vein is compreſt, and the refluent Blood denied its paſſage under thoſe Bones, and therefore the *Penis* muſt ſwell.

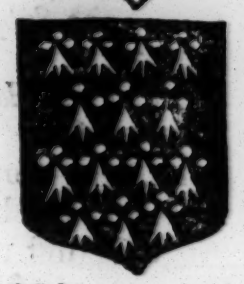
ERICHTHONIUS: See *Auriga*.

ERIDANUS, or *Radus*, a Southern Conſtellation conſiſting of 28 Stars.

ERMENOIS, is when the Field is Or, and the Powdering is Sable.

ERMIN, in Heraldry, ſignifies a Coat where the Field is Argent, and the Powdering is Sable.

And on the contrary,



ERMINES, is when the Field is Sable, and the Powdering Argent.

ERODENTIA, are Medicines which grow and prey upon the Fleſh with their Acute Particles. *Blanchard.*

ERPES: See *Herpes*.

ERRHINES, are Medicines deſigned to purge away pituitous Humours from the Head, without making the Patient ſneeze, tho' to be taken up the Noſe. They are either *Liquid*, *Soft*, or *Solid*.

The *Liquid* are made of the Juices of *Cephalick*, cleanſing Herbs, extracted by Wine or other Liquors; to which Spirit of Wine is ſometimes added; or of a Decoction of fit Simples, to which are added ſometimes Juices, Honey, Syrup, and Powders too.

The *Soft* is made of Powders, with Honey, Oil, or Juices, boiled to a kind of Ointment.

The *Solid* is given either in form of a Powder, and that has place eſpecially in Medicines which provoke Sneezing; or in form of a Pellet, and it is called *Naſale*, and is prepared of fit Powders mixed with viſcid Extractions from Seeds, Gums, Roots, *&c.* with Wax, or with Turpentine. *Blanchard.*

ERRONES, or *Erratick*, or *Wandring Stars*; the ſame with the *Planets*.

ERROR, in Law, ſignifies a Fault in pleading, or in the Proceſs, and thereupon the *Writ of Error* is brought to remedy this Overſight; which *Writ* is that which lieth to redreſs falſe Judgments given in any Court of Record.

There is likewiſe a *Writ of Error* to reverſe a Fine or Recoveries; and for redreſſing and preventing *Errors* in Fines and Recoveries: *Vide* the Statute 23 *Car.* 1. *C.* 3. for inrolling them; and *vide* 16th of *Car.* 2. *C.* 4.

ERYSIPELAS, is a Swelling of a bright yellowiſh Colour, inclining to Red (whence its Name is derived) poſſeſſing the Skin, and going no deeper, attended with a pricking Pain, but not beating; it hath a Sympatomatick Fever accompanying it uſually; it is apt to ſpread, and ſometimes bliſters the Skin: If the Skin be preſſed with the Finger, it yieldeth, and the Redneſs vaniſhes for a time.

ERYSIPELATODES, is a Swelling like the former, tho' with eaſier Symptoms; and therefore may be taken for a kind of *Baſtard Eryſipelas*; in it the Skin is of a more dark Colour.

ERYTHREMATA, are red Spots like Fleabites, commonly in Peſtilential Fevers. *Blanchard.*

ERYTHROIDES, is the Red Membrane of the Teſticles, the firſt of the proper Tunicks. *Blanchard.*

ESCALADE, or *Scalade*, is a furious Attack upon a Wall,

Wall, or a Rampart, carried on with Ladders to mount up upon it, without going on in form, breaking Ground, or carrying on of Works to ſecure the Men.

ESCARP: See *Scharp*.

ESCHAR, is a Cruſt, or hard Skin, Rind, or Shell brought over any Ulcer, or raiſed with a red hot Searing-Iron.

ESCHAROTIE, is a Searing-Iron, actual Fone, a Cautery, or the like, which burns the Skin and Fleſh into a cruſty Subſtance. *Blanchard.*

ESCHEAT, in Law, ſignifies any Lands or other Profits that fall to a Landlord within his Manor by way of Forfeiture, or the Death of his Tenant, dying without Heir General or Special, or leaving his Heir within Age, and Unmarried. *Mag. Charta, Chap.* 31.

ESCHEATOR, is an Officer who takes notice of the King's Eſcheats in the Country, and certifies them into the Exchequer.

ESCOCHEON *of Pretence*, is an Ineſcocheon, or little Eſcocheon, which a Man that hath married an Heireſs, and hath Iſſue by her, may bear over his own Coat of Arms, and in it the Arms of his Wife; and the ſurviving Iſſue will beat both Coats Quarterly.

ESCOUADE, is uſually the third part of the Company of Foot; 'tis ſo divided for mounting of Guards, and for the more convenient relieving one another: 'Tis equivalent to a *Brigade* of a Troop of Horſe.

ESCUTCHEON (from *Scutum* a Shield) is the Coat or Field on which any Arms are born in Heraldry; 'tis uſually of this Form: And in it the Heralds give divers Names to ſeveral Points or Places: Thus, the Point D, they call the *Dexter Chief*; C, is the *Middle Chief*; and S, the *Sinifter Chief Point*; H, is called the *Honour Point*; and F, the *Feſſe Point*; N, is called the *Nombril Point*; and *d*, the *Dexter-Baſe*; B, the *Middle*; and *s*, the *Sinifter Baſe-Point*.

ESPAULEMENT, the ſame with *Epaulement*, a Work in Fortification made on the Side of a Baſtion, of either Earth thrown up, Gabions, Faſcines, &c. And thoſe Epaulements which are for the Places of Arms for the Cavalry behind the Trenches, are uſually made only of Faſcines and Earth. This Word ſignifies alſo ſometimes a *Demi-Baſtion*; and ſometimes 'tis uſed for a Square Orillon, or a Square Maſs of Earth, faced or lined with a Wall, deſigned to cover the Cannon of a *Cazemate*.

ESPAUL, or *Epaule*; (which ſee in Fortification, the ſame with the Shoulder of a Baſtion, or the *Angle of the Shoulder*; which ſee.

ESPLEES, a Term in Law, ſignifying the full Profit that the Ground or Land yieldeth.

ESPLENADE, a Term in Fortification, the ſame with the Glacis of the Counterſcarp originally; but now 'tis uſually taken for the empty Space between the Glacis of a Cittadel, and the firſt Houſes of the Town.

ESSENCE, is that which conſtitutes the peculiar Nature of any thing, and makes it be what it is. Thus the Eſſence of a Circle is, that its Radii, or Semi-diameters be all equal; the Eſſence of a Square is, that it have 4 Right-angles, and 4 equal Right-lined Sides.

ESSENCE alſo, in Chymiſtry, ſignifies the *Balſamick* part of any thing ſeparated from the thicker Matter, ſo that whenever this is done by means of Extraction, the *Balſamick* part is called *Eſſence*, by way of Eminence; ſometimes thickned Juices are called *Eſſences*: But 'tis better to call theſe by their own Name, to avoid Confuſion. Some call Compounds of Oil and Sugar *Eſſences*; but it is an Abuſe of the Word. *Blanchard.*

ESSENDI *quietum de Tolonia*, is a Writ that lieth for Citizens and Burgeſſes of any City or Town, that hath a Charter or Preſcription, to exempt them from Toll through the whole Realm, if the ſame happen to be any where exacted of them.

ESSENTIAL *Properties*, are ſuch as neceſſarily depend on the Nature and Eſſence of any thing. Thus 'tis the Eſſential Property of every Rectilineal Triangle, to have the Sum of its 3 Angles equal to 2 Right ones. And of every Rectangled Triangle to have the Square of the Hypotenuſe equal to the Sum of the Squares of the Legs.

ESSENTIAL *Salt* of Plants is thus drawn: The Plant is pounded in a Mortar, and its Juice extracted and filtrated, which after that is ſet in a Cellar, or ſome ſuch cool Place to Cryſtallize, and the Salt will ſhoot out into Cryſtals every way. This Salt is the true or *Eſſential Salt* of the Plant: for here is no change at all made in it by the force of Fire, but the means of drawing it are eaſy and natural.

ESSERE, *Sora*, and *Sare*, are little Puſhes or Wheals, ſomething red and hard, which quickly infect the whole Body with a violent itching, as if one were ſtung with Bees, or Waſps, or Flies, or Nettles; yet they vaniſh after a little time, and leave the Skin as ſmooth and well colour'd as before. It differs from an *Epinychis* in this, that an *Epinychis* ſweats out Matter, but an *Eſſere* does not. *Blanchard.*

ESSOYNE, in Law, ſignifies the Allegation of an Excuſe from him that is ſummon'd to appear, and anſwer to an Action Real, or to perform Suit to a Court Baron upon juſt Cauſe of Abſence. This the *Civilians* call *Excuſatio.*

The Cauſes that ſerve to *Eſſoyne* any Man ſummon'd, are divers; but drawn chiefly to 5 Heads: Whereof

The Firſt is, *Ultra Mare*, whereby the Defendant ſhall have 40 Days.

The Second, *De Terra Sancta*, where the Defendant ſhall have a Year and a Day, and theſe muſt be laid in the beginning of the Plea.

The Third is called, *Malo Veniendi*, call'd alſo *Common Eſſoyne.*

The Fourth is, *De malo lecti.*

The Fifth, *De Servitio Regis.*

ESSONIO *de malo lecti*, is a Writ directed to the Sheriff, for the ſending of 4 lawful Knights to view one that hath *Eſſoyn'd* himſelf, *De malo lecti.*

ESTIVAL *Occident*: See *Occident.*

ESTIVAL *Orient*: See *Orient.*

ESTIVAL *Solſtice.*

ESTOPPEL, (in Law) ſignifies as much as an Impediment, or Bar of an Action, growing from his own Fact, that hath, or otherwiſe might have had this Action.

ESTREAT, in Law, is uſed for the true Copy or Duplicate of an Original Writing.

For Example, Of Amerciaments or Penalties ſet down in the Rolls of a Court, to be levied by the Bayliff, or other Officer, of every Man for his Offence.

ESTREPE, in Law, is to make Spoil by a Tenant for Life in Lands, or Woods, to the Prejudice of him in Reverſion.

And

And *Eſtrepament* ſignifies the Spoil made by Tenant for Life upon any Lands or Woods, to the Prejudice of the Reverſioner.

ESURINE *Salts*, are ſuch as are of a corroding, fretting, and eating Nature; they abound in the Air of Places ſituate near the Sea ſide, and where great Quantities of Coal are burnt; as appears from the ſpeedy ruſting of the Iron-Bars in the Windows, *&c.* of Houſes built in ſuch Places.

ETAPPE, in the Art of War, is the Allowance of Proviſions and Forage, which Soldiers have in their March thro' the Kingdom to or from Winter-Quarters. Wherefore the

ETAPPIER, is he that contracts with any Country, or Territory, for furniſhing Troops in their March with Proviſions and Forage.

ETATE *probanda*: See *Ætate probanda*.

ETCHING, is a way uſed in making Prints, by drawing with a Needle upon a Copper-plate covered over with a Ground of Wax, *&c.* and well blacked with the Smoke of a Link, that it may take off the Figure of the Drawing or Print, which having its back-ſide Tinctured with white Lead, will by running over the ſtrucken-out Lines with a *Stift*, impreſs the exact Figure on the Black or Red Ground; which Figure is afterwards with Needles, drawn deeper quite thro' the Ground, and all the *Shadows* and *Hatchings* put in: and then a Wax Border being made all round the Plate, there is poured on a ſufficient Quantity of well-tempered *Aqua-Fortis*, which inſinuating into the Stroaks, made by the Needles in the *Ground*, eats the Figure of the Print or *Drawing* into the Copper-Plate. There is no certain Time in which this is done, but uſually the *Aqua-Fortis* will eat deep enough in about half an Hour. *Brown's Ars Pictoria.*

ETHERIAL *Oil*, ſo the Chymiſts call a very fine or exalted Oil, or rather Spirit that is inflammable; as *Oil of Turpentine*, *&c.*

ETHICKS, is that Art which teaches us to ſeek out thoſe Rules and Meaſures of Human Actions, that lead to true Morality and Happineſs; and which acquaints us with the Means to practice them.

The Writers upon it uſually divide it into two Parts;

The First contains an Account of the Nature of Moral Good and Evil. And

The other Enumerates the ſeveral Virtues in which the Practice and Exerciſe of Morality conſiſts; and which are the proper Means for us to obtain true Felicity, the End of all Moral Actions.

ETHMOIDALIS, is a Suture that ſurrounds a Bone of that Name, and ſeparates it from the Bones which are about it.

ETHMOIDES, is a Bone which reſembles a Sieve, placed above the inner part of the Noſe, and full of little Holes to receive the Serous and Pituitous Humours from the ſoft Pappy Proceſſes of the Brain. *Blanchard.*

ETYMOLOGY, is that part of *Grammar*, which teaches the Original of Words, in order the better to diſtinguiſh and eſtabliſh their true Signification.

EVANID, ſo ſome call thoſe Colours which are not of very long duration, as thoſe in the Rainbow, in Clouds before and after Sun-ſet, *&c.* Theſe alſo are called *Fantaſtical* and *Emphatical* Colours; which ſee.

EVAPORATION, in Chymiſtry, is when any Liquor is ſet over a gentle Heat, that the Fire may gently carry off ſome of the Moiſture, and yet not leſſen the Quantity of the Matter the Liquor is impregnated with; to *Evaporate to a Pellicle*: See *Pellicle*.

EUCHYMIA, is a good Temper of the Blood, or other Juices, or Fluids in an Animal Body.

EUCRASIA, is a good Temper of the Parts of the Body.

EVECTION, or *Libration* of the Moon, is an Inequality in her Motion, by which, at or near the Quarters, ſhe is not in that Line which paſſeth thro' the Center of the Earth to the Sun, as ſhe is at her Syzygies, or Conjunction and Oppoſition, but makes an Angle with that Line of 2 Degrees 50 Minutes, according to the Obſervation of *Tycho* and *Bullialdus*.

The Moon revolving uniformly about her Axis, in a Month's time, makes her Day to be of a Month in length; and her Face always is turned the ſame way towards the lower *Umbilicus* of her Orbit; and for that Reaſon, and the Poſition of the *Umbilicus*, deviates this way and that way a little from the Earth: which is her *Libration in Longitude*: But her Libration in Latitude, is occaſioned by the Inclination of the Moon's Axis to the Plane of the Orbit.

EVEN *Number*, is that which may be divided into two Parts; as 4, 10, 40, *&c.* are *Even Numbers*, foraſmuch as each of them may be divided into two equal Parts.

EVENLY *Even*, is that which an *Even Number* doth meaſure by an *Even* one; as 32 is ſaid to be a Number *Evenly Even*, becauſe 8, an *Even Number*, doth Meaſure it by 4, which is likewiſe an *Even Number*.

EVENLY *Odd*, is that which an *Even Number* doth meaſure by an *Odd* one; as 30, which 2 or 6, *Even Numbers*, do meaſure by 15 or 5 *Odd Numbers*.

EUEXIA, is a good ſound Habit of Body.

EVOLUTION, is uſed by Dr. *Pell*, and others, for the Extraction of Roots out of any Powers; and ſo is directly contrary to Involution; which ſee.

EVOLUTION, in *Tacticks*, is the Motion made by a Body of Men in changing their Poſture, or Form of drawing up; either to make good the Ground they are upon, or to poſſeſs themſelves of another; that ſo they may attack the Enemy, or receive his Onſet more advantageouſly: And theſe *Evolutions*, are *Doubling of Ranks, or of Files, Countermarches*, and *Wheelings*.

EUPEPSIA, a good and eaſy Digeſtion.

EUPHORIA, is the well-bearing of the Operation of a Medicine; that is, when the Sick Perſon finds himſelf eas'd or reliev'd by it; then they ſay it wrought upon the Patient *cum Euphoria*.

EUPNOEA, is a right natural Reſpiration.

EUPORIA, is an eaſy Preparation of Medicines, or the Eaſineſs of their Operation. *Blanchard.*

EURYTHMY, in Architecture, ſignifies the exact Proportion between all the Parts of a Building.

EUSARCOS, is one that is well fleſhed. *Blanchard.*

EUSTOMACHUS, is a good Stomach; as alſo Meat convenient for it.

EUSTYLE, in Architecture, is a kind of Edifice where the Pillars are placed at a moſt convenient diſtance one from another; the *Intercolumniations* being all juſt two Diameters and a quarter of the Pillar, except thoſe in the middle of the Face before and behind, which are in diſtance three Diameters.

EUTHANASIA, is a ſoft quiet Death, or an eaſy Paſſage out of this World.

EUTROPHIA, is a due Nouriſhment of the Body.

EXACERBATIO: See *Paroxyſmus*.

EXA-

EXACTION, in Law, is a Wrong done by an Officer or one pretending to have Authority in taking a Reward or Fee for that which the Law allows not. The Difference between *Exaction* and *Extortion* is this:

Extortion, is where an Officer extorts more than his Due.

Exaction, is where he wrests a Fee or Reward where none is due.

EXÆRESIS, is an Extraction of things out of the Body, that are hurtful to it.

EXAGOON, the same with *Hexagon*.

EXAMINERS *in Chancery*, are two Officers that *Examine*, upon Oath, Witnesses produced on either side, upon such Interrogatories as the Parties to any Suit do exhibit to that purpose; and sometimes the Parties themselves are by particular order examined also by them.

EXANASTOMOSIS, is an opening of the Extremity of the Vessels. *Blanchard.*

EXANTHEMA, is a certain Efflorescence upon the Skin of the Head, like those which appear in the Skin of the whole Body. It is described two ways by *Sennertus*; one is, that at least it changes the colour of the Skin, as in continued malignant Fevers, wherein the Skin is spotted as with Flea-bites; the other is, when certain little Swellings break out of the Skin, which may be call'd *Papillæ*. *Blanchard.*

EXARTHREMA, the same with *Luxatio*.

EXARTICULATION: See *Dislocation*.

EXCENTRICK, the same with *Eccentrick*.

EXCEPTIO, is the incorporation or mixture of dry Powders with some Moisture or other. Thus Electuaries are made, Powders and Pulps are mixt with Honey or Syrup; and the Powder of Pills with Syrup, Honey, Wine or Juice.

EXCEPTIVE *Propositions*, are those where a Thing is affirmed of the whole Subject, except some one of the Inferiors of the Subject, by adding a Particle of Exception, which denotes that what is predicated does not agree with that Inferior, which visibly includes two Judgments, and renders those Propositions composed in Sense. As if one should say, None of the Sects of the ancient Philosophers, except that of the *Platonic*, have acknowledg'd God to be Incorporeal. The Covetous Man does nothing well, but when he dies.

EXCHANGE, in Common Law, is as much as *Permutation* with the *Civilians*. It hath a peculiar Signification, and is used for that Compensation which the Warranter must make to the Warrantee, Value for Value, if the Land warranted be recovered from the Warrantee.

EXCHEQUER, is the Court or Place to which are brought all the Revenues belonging to the Crown.

This Court consists, as it were, of two Parts, whereof one dealeth Specially, in the hearing and deciding of all Causes appertaining to the Prince's Coffers: The other is called, *The Receipt of the Exchequer*, which is properly employ'd in the receiving and paying Money. It is also a Court of Record, wherein all Causes touching the Revenues of the Crown are handled.

EXCISION, the cutting out, or cutting off of any part of the Body.

EXCLAMATION, is a violent Extension of the Voice, when the Mind comes to be disturbed and agitated with some furious Impulse or Passion.

EXCLUSIVE *Propositions*, are those which denote, that a Predicate so agrees with its Subject, as to agree with that alone, and no other: Whence it follows, that they include two various Judgments, and by consequence are composed in Sense. Which is expressed by the Word (*only*) or some such like Words: Thus, *Virtue only makes Nobility, nothing else renders a Man truly Noble.*

EXCOMMUNICATO *Capiendo*, is a Writ directed to the Sheriff, for the Apprehension of him who standeth obstinately excommunicated Forty Days; for such a one not seeking Absolution, hath, or may have, his Contempt certified into the *Chancery*; whence issueth this Writ for the laying of him up without Bail or Mainprise, until he conform himself.

EXCOMMUNICATO *Deliberando*, is a Writ to the under Sheriff, for the Delivery of an Excommunicate Person out of Prison, upon Certificate of the Ordinary of his Conformity to the Jurisdiction Ecclesiastical.

EXCOMMUNICATO *Recipiendo*, is a Writ whereby Persons excommunicated being for their Obstinacy committed to Prison, and unlawfully delivered thence before they have given Caution to obey the Authority of the Church, are commanded to be sought for, and laid up again.

EXCORIATION, is when the Skin is rubb'd or torn off, or fretted away from any part of the Flesh.

EXCORTICATION: See *Decortication*.

EXCREMENTS, of an Animal Body, are whatsoever is separated from the Aliments after Concoction, and is to be thrown out of the Body; as the Moisture of the Mouth, Spittle, Snot, Milk, Bile, Sweat, the Wax of the Ears, the Excrements of the Belly and Bladder. *Blanchard.*

EXCRESCENCE, any sort of Swelling, and more particularly a Fleshy Tumour.

EXCRETION, the separating of Excrements or Excrementitious Humours from the Aliments and Blood.

EXECUTION, in Common Law, signifies the last Performance of an Act: As of a *Fine*, or of a *Judgment*, that of a *Fine*, is the obtaining Possession actually of things contained in the same by vertue thereof, which is either by Entry into the Lands, or by Writ.

There are two sorts of *Executions*, one *Final*, another with a *Quousque* tending to an End.

An *Execution Final*, is that which maketh Money of the Defendant's Goods, or extendeth his Lands, and delivereth them to the Plaintiff; for this the Party accepteth in Satisfaction, and this is the End of the Suit, and all that the King's Writ commandeth to be done.

The other Sort with a *Quousque* is tending to an End, and not Final, as in the Case of a *Capias ad Satisfaciendum*, &c. This is not Final, but the Body of the Party is to be taken, to the intent and purpose to satisfy the Defendant; and his Imprisonment is not absolute, but until the Defendant do satisfy: So that the Body is but a Pledge for the Debt.

EXECUTIONE *facienda*, is a Writ commanding Execution of a Judgment.

EXECUTIONE *facienda in Withernamium*, is a Writ that lieth for the taking of his Cattle, who formerly hath convey'd out of the Country the Cattle of another; so that the Bayliff having Authority from the Sheriff to replevy the Cattle so convey'd away, could not execute his Charge.

EXECUTOR, is he that is appointed by any Man in his Last Will and Testament, to have the disposing of all his Substance, according to the Contents of the said Will. This *Executor* is either *Particular* or *Universal: Particular*, as if this or that thing

tendinous, but chiefly fleshy Origination from the *Ulna*, immediately below the beginning of the *Extensor primi Internodii*, or between it and the Indicator; as also from the Ligament between the last named Bone and the *Radius*, whence descending obliquely, becoming Tendinous as it marches in a proper *Sinus* on the inferior *Appendix* of the *Radius*, wherein it's enclosed by its Annular Ligament, and passes over the two Tendons of the *Radialis extensor*, to its Insertion at the superior part of the third Bone of the Thumb. When this acts, it does not only extend the Thumb, but brings it somewhat backwards, insomuch that some Persons can place it on the superior and back part of the *Ossa Metacarpi*.

EXTENSOR *minimi digiti*, is a Muscle which arises partly Tendinous at the Extremity of the external *Apophysis* of the *Os Humeri*; and partly Fleshy from the superior part of the *Ulna*, between the *Extensor Communis Digitorum*, and *Musculi Ulnaris Extensor*, and becoming Tendinous as it passes under the *Ligamentum Annulare* at the *Carpus*, it is there divided into two, sometimes three Tendons, which are united in one at its Insertion to the superior part of the third Bone of the Little Finger. Its Name declares its Action.

EXTENSOR *Pollicis Pedis Brevis*, is a Muscle of the great Toe, arising Fleshy from the fore part of the *Os Calcis*, being dilated into a Belly, soon becomes a long slender Tendon, passing obliquely over the upper part of the Foot, and is inserted to the superior part of the second Bone of the great Toe, which it extends or pulls upwards.

EXTENSOR *Pollicis Pedis Longus*, is a Muscle of the great Toe, which takes its Beginning large and fleshy, from the fore part of the *Fibula*, from immediately below its superior *Appendix*, to four Finger's Breadth above the inferior one, and descending under the *Ligamentum Annulare* of the *Tarsus*, between the Tendon of the *Tibialis Anticus* and those Tendons of *Extensor Pedis Longus*, and marching along the superior part of the Foot, is inserted to the upper part of the second Bone of the Great Toe. Its Name intimates its Use to be, to extend the Toe.

EXTENT, in Law, hath two Significations, sometimes signifying a Writ or Commission to the Sheriff for the valuing of Lands or Tenements; sometimes the Act of the Sheriff upon this Writ. But it frequently signifies the Estimate or Valuation of Lands, which, when done to the utmost Value, was said to be in the full *Extent*.

EXTERGENT *Remedies*: See *Abstergent*.

EXTERIOR *Polygon*: See *Polygon exterior*.

EXTERIOR *Talus*: See *Talus*.

EXTERNAL *Angles*: See *Angles external*.

EXTERNUS *Auris, vel Luxator externus*, is a Muscle which lies in the upper part of the *Meatus Auditorius*, having a short fleshy Body, with a long slender Tendon. It arises from the external and superior Margin of the *Meatus Auditorius*, soon becoming a slender Tendon, passes directly to the upper part of the *Membrana Tympani*, on which it descends for some space to its Insertion in the long Process of the *Malleus*, where it is contiguous to the said Membrane. This draws the *Manubrium* of the *Malleus*, together with the *Membrana Tympani*, forwards.

EXTIRPATIONE, is a Writ Judicial that lyeth against him, who, after a Verdict found against him for Land, &c. doth maliciously overthrow any House upon it, &c. And 'tis either *ante Judicium*, or *post Judicium*.

EXTINGUISHMENT, in Law, is an Effect of Consolidation; as if a Man have a Yearly Rent due to him out of any Lands, and afterwards purchase the same Lands; now both the Property and Rent are consolidated or united into one Possessor, and therefore the Rent is said to be *extinguished*. Also, where a Man hath a Lease for Years, and afterwards buyeth the Property; this is a Consolidation of the Property and the Fruits, and is an *Extinguishment* of the Lease. So if a Man have a High-way Appendant, and after purchase the Land whereon the High-way is, then the High-way is *extinct*; and so it is of Common Appendant.

EXTIRPATION, is the cutting off, or out of the Body any Part; tho' cutting off a Part is more properly called *Amputation*.

EXTORTION, a Law Term, signifying an unlawful or violent wringing of Money, or Money-worth from any Man: As also, the Exaction of unlawful Usury, winning by unlawful Games, and all taking more than is due.

EXTRACT, is that pure, unmix'd, and efficacious Substance, which, by the help of some Liquor, is separated from the duller and more unactive parts of Plants, &c. This Extract is usually of the Consistence of a stiff Electuary. All Extracts of Vegetables are made after the following manner.

Bruise the Body, or powder it grosly, and then let it steep warm a convenient while in some proper Water, as from 12 Hours a Day, &c. according to the Nature of the Plant; at least, let the Liquor just boil, and then press it hot thro' a Cloth; after this evaporate the filtered Liquor to its due Consistence.

Thus are the Extracts of Rhubarb, Gentian, Wormwood, &c. made.

EXTRA *Judicial*, in Law, is when Judgment is given in a Cause or Case not depending in that Court where such Judgment is given, or wherein the Judge has not Jurisdiction.

EXTRACTION, is a separating of the subtle Part of a mixed Body, from the more gross: For Example, when the Strength of any Medicine is extracted by Spirit of Wine, that which is left after the Evaporation of the *Menstruum*, is called the *Extract*.

EXTRACTION *of Roots*, in Mathematicks, is the Method of finding out the true Root of any Number of Quantity given: See *Square Root*, *Cube Root*, &c.

In Philos. Trans. N°. 240. *the Ingenious Mr.* Abr. de Moivre *gives the following Method of Extracting the Root of an Infinite Equation.*

THEOREM.

If $az + bz^2 + cz^3 + dz^4 + ez^5 + fz^6$, &c. $= gy + by^2 + iy^3 + ky^4 + ly^5 + my^6$, &c.

Then will z be $= \frac{g}{a}y + \frac{h - bAA}{a}y^2 + \frac{i - 2bAB - cA^3}{a}y^3 + \frac{k - bB^2 - 2bAC}{a}y^4 + \frac{l - 2bBC - 2bAD - 3cAB^2 - 3cA^2C - 4dA^3B - eA^5}{a}y^5 + \frac{m - 2bBD - bCC - 2bAE - cB^3 - 6cABC - 3cA^2D - 6dA^2B^2 - 4dA^3C - 5eA^4B - fA^6}{a}y^6$, &c.

For

For the understanding of this Series, and in order to continue it as far as we please, it is to be observed,

1. That every Capital Letter is equal to the Coefficient of each preceding Term: Thus, the Letter B is equal to the Coefficient $\frac{b - b A^2}{a}$.

2. That the Denominator of each Coefficient is always a.

3. That the first Member of each Numerator, is always a Coefficient of the Series $g y + b y^2 + i y^3$, &c. *viz.* The first Numerator begins with the Coefficient g, the second Numerator with the second Coefficient b, and so on.

4. That in every Member after the first, the Sum of the Exponents of the Capital Letters is always equal to the Index of the Power to which this Member belongs: Thus, considering the Coefficient $\frac{k - b B^2 - 2 b A C - 3 c A^2 B - d A^4}{a}$ which belongs to the Power y^4, we shall see that in every Member $b B^2$, $2 b A C$, $3 c A^2 B$ d, A^4 the Sum of the Exponent of the Capital Letters is 4. (Where it may be taken notice of, that by the Exponent of a Letter, is meant the Number which expresses what Place it has in the Alphabet: Thus 4 is the Exponent of the Letter *D*.) Hence is derived this Rule for finding Capital Letters of all the Members that belong to any Power.

Combine the Capital Letters as often as you can make the Sum of the Exponents equal to the Index of the Powers to which they belong.

5. That the Exponents of the same Letters which are written before the Capitals, express how many Capitals there are in each Member.

6. That the Numeral Figures or *Uncia* that occur in these Members, express the Number of Permutations, which the Capital Letters of each Member are capable of.

For the Demonstration of this,

Suppose $z = Ay + By^2 + Cy^3 + Dy^4$, &c. Substitute this Series in the room of z, and the Powers of this Series in the room of the Powers of z; there will arise a new Series: Then take the Coefficients which belong to the several Powers of y, in this new Series, and make them equal to the corresponding Coefficients of the Series $g y + b y^2 + i y^3$, &c. and the Coefficients A, B, C, D, &c. will be found much as is determined in the *Theorem*.

This *Theorem* might have been made much more general, by supposing

$$a z^{n} + b z^{n+1} + c z^{n+2,} \text{ \&c.} = g y^{m} + h y^{m+1} + i y^{m+2,} \text{ \&c.}$$

Then all the Powers of the Series $Ay + By^2 + Cy^3$, &c. designed by the universal Indices, must have been taken successively.

This *Theorem* may be applied to what is called *the Reversion of Series*; such as finding the *Number* from its *Logarithm* given; the *Sine* from its *Ark*; the *Ordinate* of an Ellipsis from an *Area*, given to be cut from any Point in the Axis.

But to make a particular Application of it, we'll suppose this Problem was to be solved, *viz.* The Chord of an Ark being given, to find the Chord of another Ark that shall be to the first as n to 1.

Let y be the Chord given, z the Chord requir'd: Now the Ark belonging to the Chord y, is $y + \frac{y^3}{6 d d} + \frac{3 y^5}{40 d^4} + \frac{y y^7}{112 d^6}$; and the Ark belonging to the Chord z, is $Z + \frac{z^3}{6 d^2} + \frac{3 z^5}{40 d^4} + \frac{5 z^7}{112 d^6}$, &c. The first of these Arks is to the 2d, as i to n; therefore multiplying the Extremes and Means together, we shall have this Equation, $Z + \frac{z^3}{6 d^2} + \frac{3 z^5}{40 d^4} + \frac{5 z^7}{112 d^6}$, &c. $= n y + \frac{n y^3}{6 d^2} + \frac{3 n y^5}{40 d^4} + \frac{5 n y^7}{112 d^6}$, &c.

Compare these Two Series with the Two Series of the *Theorem*, and you'll find $a = 1$, $b = 0$, $c = \frac{1}{6 d^2}$, $d = 0$, $e = \frac{3}{40 d^4}$, $f = 0$, $g = n$, $h = 0$, $i = \frac{n}{6 d^2}$, $k = 0$, $l = \frac{3 n}{40 d^4}$ $m = 0$, &c.

Hence $z = n y + \frac{n - n^3}{6 d^2} y^3$, &c. Or $n y + \frac{1 - n^2}{2 \times 3 d^2} y^2 A$, &c. supposing A to denote the whole preceeding Term, which will be the same Series as Sir *Isaac Newton* has first found.

On the same Method this general Problem may be solved.

The Abscissa corresponding to a certain Area in any Curve being given, to find the Abscissa, whose corresponding Area shall be to the first in a given Ratio.

The Logarithmetick Series might also be found, without borrowing any other Idea, than that Logarithms are the Indices of Powers.

Let the Number, whose Logarithm we imagine, be $1 + z$; suppose its Logarithm to be $a z + b z^2 + c z^3$, &c.

Let there be another Number $1 + y$: Therefore its Logarithm will be $a y + b y^2 + c y^3$, &c.

Now if $1 + 2 = \overline{1 + y}^{n}$, it follows,

That $a z + b z^2 + c z^3$, &c. : $a y + b y^2 + c y^3$, &c. :: n : 1.

That is, $a z + b z^2 + c z^3$, &c. $= n a y + n b y^2 + n c y^3$, &c.

Therefore we may find the Value of z, expressed by the Powers of y.

Again, since $1 + z = \overline{1 + y}^{n}$; therefore $z = \overline{1 + y}^{n} - 1$.

That is, $z = n y + \frac{n}{1} \times \frac{n - 1}{2} y^2 + \frac{n}{1} \times \frac{n - 1}{2} \times \frac{n - 2}{3} y^3$, &c.

Therefore z is doubly expressed by the Power of y: Compare these Two Values together, and the Coefficients a, b, c, &c. will be determined, except the first (a) which may be taken at Pleasure, and gives accordingly all the different Species of Logarithms.

The

The following Converging Series for the Extracting of the Roots *of all* Equations, *whether Simple or Adfected, the late Mr.* Waſtel *of the* Navy-Office *ſent me, and deſired me to Publiſh.*

Let $\begin{cases} A = \text{to any Abſolute Number.} \\ N = \text{to any Number aſſumed.} \\ n = \text{to the Exponent of any Power.} \\ l, p, q, r, s, \&c. \text{ the ſeveral Coefficients in any Equation.} \end{cases}$

Then, in any Equation, it will be

$$\pm 1 \times x^{n \pm} \quad p \times x^{n-1 \pm} \quad q \times x^{n-2 \pm} \quad r \times x^{n-3 \pm} \quad S, \&c. = A.$$

And we have univerſally,

$$x = \frac{A + 1 \times n-1 N^{n \pm} \quad p \times n-2 N^{n-1 \pm} \quad q \times n-3 N^{n-2 \pm} \quad r \times n-4 N^{n-3 \pm}, \&c.}{\pm 1 \times N^{n-1 \pm} \quad p \times n-1 N^{n-2 \pm} \quad q \times n-2 N^{n-3 \pm} \quad r \times n-3 N^{n-4 \pm}, \&c.}$$

In which Series obſerve,

I. That the ſame Sign in the given Equation, muſt be in the *Theorem* or *Series* reſpectively.

II. Any Term which is wanting in the Equation, muſt be omitted in the Series.

III. The Quotient at every Operation muſt be made a new *N*.

IV. That it terminates in the Root, or falls into a Series, if it be a *Surd*.

V. Such Series will be produced (in Number of Places) by a Geometrical Progreſſion from Unity, (whoſe Ratio is two) each Operation.

VI. The nearer *N* is taken to the true Root, the ſooner it will converge to it.

And in his Edition of *Parſon's Arithmetick*, *Book* 2. *Chap.* 21. you may ſee a further Account of this Series, and the ſame exemplified in Numbers.

EXTRAMUNDANE *Space*, is the infinite, empty, void Space, which is by ſome ſuppoſed to be extended beyond the Bounds of the Univerſe, and conſequently, in which there is really nothing at all.

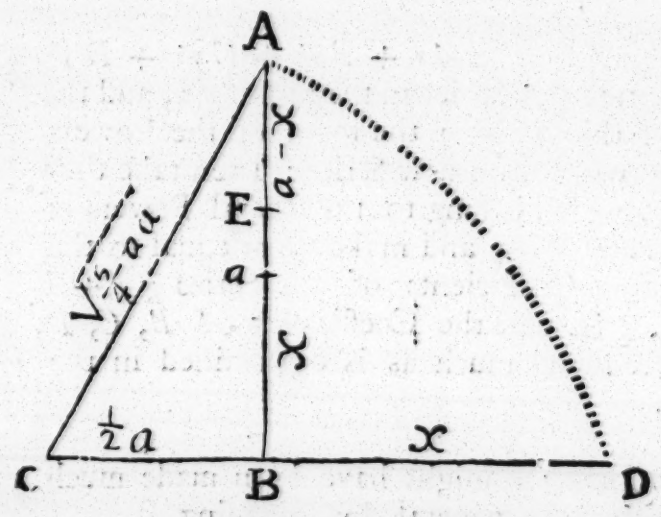
EXTRAVASATED, in Anatomy, is whatever is put or let forth out of the Veſſels, as Blood out of the Veins or Arteries, into the Cavities of the Body, &c.

EXTREME *and mean Propartion*, in Geometry, is when a Line is ſo divided, that the whole Line is to the greater Segment, as that Segment is to the other.

Or, as *Euclid* expreſſes it, when 'tis ſo divided, that the Rectangle under the whole Line, and the leſſer Segment, ſhall be equal to the Square of the greater Segment.

The Invention whereof is as follows.

Let the given Line be $AB = a$, and for the greater Segment put x; the leſſer will be $a - x$.



Then by the Hypotheſis

$$a : x : a - x \div.$$

Therefore $aa - ax = xx$, conſequently $aa = zx + ax$.

And by adding $\frac{1}{4}\,aa$ on each Side, to make $xx + ax + \frac{1}{4}\,aa$ a compleat Square,

The Equation will ſtand thus;

$$\frac{5}{4}\,aa = xx + xa + \frac{1}{4}\,aa.$$

Now

Now ſince the latter is exactly a Square, its Root $x + \frac{1}{2}a = \sqrt{\frac{5}{4}aa}$; and by Tranſpoſition it will be $\sqrt{\frac{5}{4}aa} - \frac{1}{2}a = x$; which laſt Equation is a Canon to find x.

For at the Foot of $AB = a$, ſet at Right Angles $CB = \frac{1}{2}a$: Then draw CA, the Square of which is equal $ABq + CBq = \frac{5}{4}aa$. And therefore $AC = \sqrt{\frac{5}{4}aa}$; make $CD = CA$.

From whence $CB = \frac{1}{2}a$ being taken as the Caſe requires, there remains $BD = x$; which transfer into AB, it ſhall find the Point E, where AB is cut according to *Extreme and Mean Proportion.*

The Synthetical Demonſtration *whereof*, Euclid *gives in the* 11. *e.* 2.

This cannot be done exactly in any Numbers; but if you would have it tolerably near, add together the Square of any Number, and the Square of its half, and extract as near as you can the Square Root of the Sum; from whence taking half the whole Number, the Remainder is the greater Part.

EXTUBERANCES, are Swellings forth, or Riſings up in the Fleſh, or other Parts of the Body.

EXULCERATION, is a Solution of Continuity, proceeding from ſome gnawing Matter, and in ſoft Parts of the Body is attended with a loſs of their Quantity; it differs from an Abſciſſe which commonly follows a Criſis.

EXUVIÆ, the Shells, and other Marine Bodies, which are found every where in the Bowels of the Earth, and which were certainly left there at the Univerſal Deluge, becauſe they are now proved by Dr. *Woodward* and others, to be the Real Spoils of once living Animals, and not Stones, or Natural Foſſils; he very properly calls them the *Exuviæ* of Animals.

EYE, is the wonderful Organ of Sight: The Eyes are placed in two large Cavities, which they call *Orbitæ*, hollowed out of the Bones of the Skull on each Side of the Noſe; which *Orbitæ* are inveſted on their Inſide with their *Pericranium*, and to it the Feet and Origines of the Muſcles adhere firmly. Theſe are the firſt containing Part of the Eye; the next are the *Palpebræ*, or Eye-lids; which ſee under *Palpebræ.*

The Eye hath four Tunicles; of which one is called *Common*, and the other Three *Proper.*

The Common Tunicle is called *Adnata*, and this ſprings from the *Pericranium*, and is ſpread over all the White of the Eye, above the *Sclerotica*, reaching as far as the *Iris.* By this the Eye is kept firmly within its Orbit, from whence it is alſo called *conjunctiva.* It is of very exquiſite Senſe, and has many Capillary Veins and Arteries creeping through it, which are moſt conſpicuous in an Opthalmy, or Inflammation of the Eye. Under this Tunicle are Tendons of the Muſcles extended and expanded to the Circumference of the *Iris*, which increaſes its Whiteneſs; and ſome take them for a ſecond Tunicle, calling it *Innominata.*

The *Proper* Tunicles of the Eye are Three, according to the threefold Subſtance of the Optick-Nerve. For this Nerve (as all the other) conſiſts of Two Tunicles ſpringing from this, the *Dura* and *Pia Mater*, and an inner Marrowy Subſtance.

From the *Dura Mater* ſpringeth the utmoſt Coat of the Nerve; and from the Tunicle that is ſpread next under the *Adnata*, called *Sclerotica* from its Hardneſs; but in its fore Part where it covereth the *Iris* and *Pupilla*, it is named *Cornea*, from its tranſparency, tho' ſometimes this latter Name includes the whole Tunicle, as well behind and on the Sides, as before.

That which lieth next under the *Cornea*, is much thinner than it, and is called *Choroides*, from its reſembling the Membrane *Chorion*, wherein the *Fœtus* is included in the Womb. Its forepart is otherwiſe called *Uvea*, becauſe it is ſomewhat of the Colour of a Grape. This ſprings from the *Pia Mater*, and is ſpread from the Bottom or Center of the Eye behind, all over the Eye to the *Pupilla*; to whoſe Circumference when it is come, it becomes double, making with one Part the *Iris*, with the other the *Ligamentum ciliare.*

On the Inſide it is of a duſkiſh Colour (in Man) but blacker on the Outſide. But where it makes the *Iris*, it is of divers Colours, reſembling the Rainbow, from whence it borrows its Name: Yet in ſome it is more Blue, in others Black, in others Grey.

This Tunicle is perforated before as wide as the *Pupilla* (or Sight of the Eye) to permit the Rays of viſible Species to paſs into the Cryſtalline Humour.

Next unto which Cryſtalline Humour lies the *Ligamentum ciliare*, the ſecond Part of the duplicated *Uvea.* This conſiſts of ſlender Filaments, or Fibres (like the Hairs of the Eye-lids) running like ſo many Black Lines from the Circumference of the *Uvea* to the Sides of the Cryſtalline Humour, which they encompaſs and widen, or conſtringe as there is Occaſion, by contracting or opening the *Foramen* of the *Uvea.*

The third Tunicle is made of the Medullar Subſtance of the Optick Nerve, and is called *Retina*, or *Retiformis*, (Net-like:) This ſeemeth to be the principal Organ of Sight. For as Dr. *Briggs* well argues, neither the Cryſtalline Humour, through which the Rays paſs much refracted, nor the Tunicle *Choroides*, are at all fit for this Uſe: For this latter Part (as riſing from the *Pia Mater*) cannot communicate the Impreſſions of the Rays to the Medullar Part of the Brain, which it does not at all touch: Whereas the Medullar Fibres of the *Retina* have Communication therewith, as ſpringing therefrom, and therefore can well perform that Office. The Fibres of this Tunicle are extended from the Bottom or inner Center of the Eye, where the Optick Nerve enters it, as far as the *Ligamentum ciliare*, (to which it affords Animal Spirits for the Continuance of its Motion.) If one take this *Tunica Retina*, and put it into warm Water, ſhaking it a little, to waſh off the mucous Subſtance that cleaves to it, and then hold it up to the Light, theſe Filaments will appear very numerous, like the Threads of the fineſt Lawn.

Next to the Tunicles of the Eyes, are the Humours contained in them to be conſidered; and theſe are in Number Three, *viz. Aqueus*, *Cryſtallinus*, and *Vitreus.* The ſecond weighs as much again as the firſt, and yet not ſo much as the third by a ſixth Part. The Cryſtalline is the moſt denſe of Conſiſtence by much; and the Glaſſy more denſe than the Watry.

The *Aqueous* Humour is outermoſt, being pellucid and of no Colour (as neither are the other Two.) It fills up that Space that is betwixt the *Cornea* and the Cryſtalline Humour before. If any thickiſh Particles ſwim in it, then Gnats, Flies, Spiders-Webs, and the like, will ſeem to be flying before the Eyes: But if thoſe Particles grow ſtill thicker, and cloſe together, ſo as to make a Film, and this be ſpread before the Hole of the *Pupilla*, then is the Sight quite taken away, which Diſeaſe is call'd a Cataract.

This

This Humour is very clear and thin, and therefore eaſily diſſipable; but by which way its Expence ſhould be ſupplied, is difficult to determine. Some think it is fed by the Arteries, out of which this Water iſſues through I know not what Glands; others derive it from the Nerves, and a third Sort from the Lympheducts.

But Dr. *Anthony Nuck* refutes all theſe Opinions.

The firſt, from the Non-appearance of any Glands.

The ſecond, from the no (or at the moſt a very ſmall quantity of) Liquor that at any time can be obſerved in the Nerves; whereas if the *Tunica cornea* be prick'd, and all or the greateſt Part of this Aqueous Humour be let out, he has found by repeated Experiments, that it will be recruited again in Six Hours Space.

The third Opinion he refutes from the general Office of Lympheducts; which is, to bring back from the Circumference to the Center, and not contrarily, becauſe the Valves wherewith they every where abound, cannot admit of that Motion. Wherefore exploding all theſe Opinions, he eſtabliſhes a new one of his own, upon the Score of the new Veſſels that he has obſerved to terminate in the *Tunica cornea*, (which he calls *Ductus Oculorum aquoſi*, which we ſhall deſcribe from him by and by) affirming, That theſe Ducts are the Conduits by which this Humour is fed, and that they ſupply it ordinarily with ſeveral Drops daily, becauſe of the continual Tranſpiration of it, by Pores looking from within outwards. As to the Particles of this Humour, from ſeveral Experiments he has made, he thinks it is demonſtrable:

1. That it contains in it a very limpid and pellucid Water.

2. Viſcid and Tenacious Particles.

3. A Salt and an Acid.

4. Earthy Particles.

5. That it wants not alſo its Volatile Spirit.

The *Cryſtalline Humour* (ſo called from its being as clearly tranſparent as Cryſtal) is placed betwixt the Aqueous and the Vitreous, but not exactly in the Middle or Center of the Eye, but rather towards its Fore-part. It is incloſed in the Boſom, as it were, of the Vitreous Humour, and is flattiſh on the Fore-ſide, but rounder behind. It is more bright and thick than either of the other two.

It has been the common Opinion, That it has been incloſed in a proper Membrane, which is called either *Cryſtallina* from its Tranſparency, or *Aranea* from its moſt fine Contexture. But Dr. *Briggs*, a very accurate Anatomizer of the Eye, denies any ſuch Tunicle, affirming, That it is meerly adventitious when the Humour is expoſed for ſome time to the Air, or is gently boil'd.

As to the Collection or Reception of the Rays of things viſible, this Humour is the primary Inſtrument of Sight; tho', as was ſaid before, the *Tunica Retina* is the Principal as to Perception, becauſe through it the Rays are communicated to the common Senſory.

The Third and laſt Humour of the Eye is the *Vitreous*, ſo called, becauſe it is the like to molten Glaſs. This is thicker than the Aqueous, but thinner than the Cryſtalline, and much exceeds them both in Quantity, for it fills up all the inner or hinder Hemiſphere of the Globe of the Eye, and a pretty deal towards the lateral Superficies of the former. It is round behind, but hollow in the middle forwards, to receive the Cryſtalline into its Boſom. This Humour is alſo ſaid to be ſeparated from the other Two by a proper Tunicle called *Vitrea*, which the aforeſaid Ingenious Author likewiſe denies.

The Eyes have Arteries from the *Carotides*, which beſtow Twigs on their Muſcles, and on their Tunicles: and theſe are accompanied with Veins ſpringing from the Branches of the Jugulars. As for their Nerves, they either aſſiſt the Senſe of Seeing, and are called the Optick Nerves, which we have reckon'd from the Second Pair; or ſerve for the moving of them, being inſerted into their Muſcles; and to this Purpoſe ſerve the third and fourth Pair, as ſome Twigs of the Fifth.

As to the Lympheducts, beſides theſe Veſſels, Dr. *Anthony Nuck*, whom we cited but juſt now, has diſcovered a fifth Sort of Veſſel, called by him, *Ductus oculorum aquoſi*, which he believes to recruit the continual Conſumption of the watry Humour of the Eye.

He ſays, They are of an uncertain Number, and may be plainly diſcern'd to run along the *Tunica Sclerotica*, and to penetrate at length the *Cornea*, where their Orifices have ſuch a Valve as the Ureters have in the Urinary Bladder, or the *Porus bilarius* in the *Veſica fellea*.

In the *Tunica Sclerotica*, and *Cornea*, they are of a duſky Colour, but not before they arrive thereat. They admit of a Probe of a pretty Bigneſs, and are of a ſtronger Make than Lympheducts.

He has taken great Pains to trace them to their Origin, but has not yet been able to follow them farther than the Optick Nerve: So that he knows not whether their Riſe may be from ſome Gland not yet diſcovered, or whether the *Glandula pituitaria* may not ſend forth ſome Shoots that conſtitute theſe Ducts.

The Action of the Eyes is *Viſion:* (See that Word) Which is very well defined by *Diermerbroek*, *viz.* That it is a Senſe whereby from the various Motion of viſible Rays collected in the Cryſtalline and Vitreous Humours, and darting upon the *Tunica Retina*, the Colours of viſible Objects are perceived, with their Site, Diſtance, Greatneſs, Figure, and Number; the Medium of which Perception is the Light.

EYE, in a Ship; the Hole wherein the Ring of the Anchor is put into the Shank, is called the *Eye of the Anchor*; and the Compaſs, or Ring, which is left of the *Strap* to which any *Block is ſeized*, is called alſo the *Eye of the Strap*.

EYE, in Architecture, is the middle of the *Voluta* of the *Ionick* Chapiter, which is cut in the Form of a little Roſe.

EYE-LIDS: See *Palpebræ*.

FACE, in Architecture, is a flat Member, which hath a great Breadth, and ſmall Projecture; as in Architraves, &c. It is alſo taken for the Front, or Exterior part of a great Building, which immediately preſents it ſelf to view.

FACE *of a Baſtion*, or *of the Bulwark*, is the moſt advanced Part of a Baſtion toward the Field, or the Diſtance comprehended between the Angle of the Shoulder, and the flanked Angle.

FACE *of a Place*, is the Curtain together with the two Flanks raiſed above it, and the two Faces of the Baſtion that look towards one another, and flank'd the Angle of the Tenacle.

FACIES *Hypocratica*, is when the Noſtrils are ſharp, the Eyes hollow, the Temples low, the Laps of the Ears contracted, and the Lobes inverſed, the Skin above the Forehead hard and dry, the Complexion pale, livid, of a leaden Colour, or black. *Blanchard.*

FACTITIOUS, ſignifies made by Art, and is uſually taken in oppoſition to the Word Natural: Thus Soap is a factitious Body, or Concrete, made by Art; but *Fullers-Earth* is a natural Concrete, form'd in the Bowels of the Earth by the Author of Nature.

FACTORS: In Multiplication the Multiplicand and Multiplicator are often called *Factors*, becauſe they do *Facere Productum*, make or conſtitute the Product.

FACULÆ, are certain bright or ſhining Parts, which the Modern Aſtronomers have ſometimes obſerved upon, or about the Surface of the Sun; but they are but very ſeldom ſeen.

FACULTY, in Law, is uſed for a Privilege or Special Power granted unto a Man by Favour, Indulgence, and Diſpenſation, to do that which by the Common Law he cannot do.

FACULTY is a Power or Ability to perform any Action. The Ancients uſually reckon three ſorts of Faculties, *Natural*, *Vital*, and *Animal*; and according to their Doctrine, the

Natural Faculty, is that by which the Body is nouriſhed and augmented, or another like it generated: So that it may be diſtinguiſh'd into the three Faculties that perform their Functions of *Nutrition*, *Growth*, and *Generation*: And the firſt of theſe was alſo ſubdivided into the *Attractive*, *Retentrix*, *Concoctrix*, and *Expultrix Faculty*.

Vital Faculty, is that which preſerves Life in the Body, and performs the Functions of *Pulſe* and *Reſpiration*.

Animal Faculty, is that by which the Soul performs the Functions of *Imagination*, *Reaſoning*, *Memory*, *Senſe*, and *Motion*.

But theſe, like moſt other Diſtinctions of the Ancient Philoſophers, are both uſeleſs and ill grounded.

FÆCES: See *Excrements*. 'Tis alſo taken for the groſs Subſtance that ſettles after Fermentation, or remains after Diſtillation.

FAINT, or *Feynt Action*, is as much as *Feigned Action*, *viz.* ſuch an Action, as though the Words of the Writ be true, yet for certain Cauſes he hath no Title to recover thereby; whereas in a falſe Action the Words of the Writ are falſe.

FAINT *Viſion*: See *Viſion*.

FAIT (in Law) a Deed, which is a Writing ſealed and delivered, to prove and teſtify the Agreement of the Parties whoſe Deed it is; and conſiſts of three principal Points, *Writing*, *Sealing*, and *Delivery*.

By *Writing* is ſhew'd the Parties Name to the Deed, their Dwelling-places, Degrees, Thing granted, upon what Conſideration, the Eſtate limited, the Time when granted, and whether Simply, or upon Condition, &c.

Sealing, is a further Teſtimony of their Conſents, as appears by theſe Words, *In witneſs whereof*, &c. *In cujus rei teſtimonium*, &c. without which the Deed is inſufficient.

Delivery, tho' it be ſet laſt, it is not the leaſt; for after a Deed is Written and Sealed, if it be not Delivered, it is to no purpoſe: And therefore in all Deeds care muſt be taken, that the *Delivery* be well proved.

FAKE, is one Round or Circle of a Cable quoiled up out of the way: The Seamen will ask (as a Cable is veered out) how many *Fakes* there are left, that is, how much is behind unveered out.

FALCATED, the Aſtronomers ſay the Moon, or any Planet appears *falcated*, when the enlightned Part appears in the Form of a Sickle, or Reaping-hook; which is while ſhe is moving from the Conjunction to the Oppoſition, or from New Moon to Full; but from Full to a New again, the enlighten'd part appears *gibbous*, and the Dark *falcated*.

FALCON: See *Faucon*.

FALCONET: See *Fauconet*.

FALL, the Seamen call that part of the Rope of a Tackle which is haled upon, the *Fall*. Alſo a Ship is ſaid to

FALL *off*, when being under Sail, ſhe keeps not ſo near the Wind as ſhe ſhould do. They ſay alſo that a Ship hath

FALLS when ſhe is not *Fluſh*, but hath Riſings of ſome Parts of her Decks more than others.

FALLING-SICKNESS: See *Epilepſy*.

FALLOPIAN *Tubes*, or the *Tubæ Fallopianæ* in Anatomy, are two ſlender Veſſels ſituated on each ſide the *Uterus*, whoſe uſe is to afford a Paſſage to a more ſubtil part of the *Genitura Maſculina* towards the *Ovaria*, to impregnate the Eggs that afterwards are to drop into them from thence; and when they are, as it were, ripen'd, to convey them along their inner Cavity to the *Uterus*.

Theſe *Tubæ* are about four or five Fingers breadth long, and their Subſtance is compoſed of two Membranes which come from the external and internal ones of the Womb; they have the ſame Arteries, Veins, Nerves, and Lymphatick, as the *Ovaria* have. They take their Name from their firſt Diſcoverer *Fallopius*.

FALSE *Attack*: See *Attack*.

FALSE BRAYE, in Fortification, is a ſmall Mount of Earth four Fathom wide, erected on the Level round the Foot of the Rampart, on that ſide towards the Field, and ſeparated by its Parapet from the *Berme*, and the Side of the Moat. 'Tis made uſe of to Fire upon the Enemy, when he is already ſo far advanced, that you cannot force him back from off the Parapet of the Body of the Place: And alſo to receive the Ruins which the Cannons make in the Body of the Place.

FALSE *Claim*, (in Law) is where a Man claims more than his due.

FALSE *Impriſonment*, is a Treſpaſs committed againſt a Man, by *Impriſoning* him without lawful Cauſe.

FALSO *Judicio*, is a Writ that lieth for *falſe Judgment*, given in the County, Hundred, Court-Baron, or other Courts, being no Courts of Record, be the Plea Real, or Perſonal.

FALSE *Poſition*: See *Poſition*.

FALSO *retorno brevium*, is a Writ which lies againſt the Sheriff, for Falſe returning of Writs.

FALX, in Anatomy, is one of the three Proceſſes made by the doubling of the *Dura Mater*; it riſes by a narrow Beginning from the *Criſta Galli*, to which it is faſtned; and as it approaches the Hinder part of the Head, it grows broader and broader, till it terminate where the *Longitudinal Sinus* ends. It divides the *Cerebrum* into two Hemiſpheres, near as deep as the *Corpus Calloſum*. 'Tis called *Falx* from its reſembling a Sickle.

FAMES *Canina*: See *Cynodes Orexis*.

FANCY: See *Phantaſy*, or *Imagination*.

FANTASTICAL *Colours*, the ſame with thoſe called *Emphatical*; which ſee.

FARCIMINALIS *Tunica*, the ſame with the *Allantoides*.

FARTHELL; *Farthelling* is the ſame with what the Seamen now call *Furl* or *Furling*; which is taking up their Sails and binding them cloſe to the Yards.

FASCIA *Lata*, vid. *Membranoſus Muſculus*.

FASCIA, a Term in Architecture, as the *Faſcia's* of the Architrave; which are the three Bands of which it is compoſed.

Vitruvius admits no *Faſcia*'s in the *Tuſcan* or *Dorick* Orders; but is not imitated by any in that particular Circumſtance.

FASCIÆ, in the Planet *Mars*, are certain rows of Spots parallel to the Equator of that Planet, which look like Swathes or Fillets wound round about his Body.

FASCIALIS, a Muſcle ſo called: See *Sartorius*.

FASCIATION, is a binding of Swathes about a Limb that is to be cured.

FASCICULUS: See *Manipulus*.

FASCINES, or *Faggots*, in Fortification, are ſmall Branches of Trees, or Bavins bound up in Bundles; which being mix'd with Earth, ſerve to fill up Ditches, to make the Parapets of Trenches, &c. Some of them are dipt in melted Pitch or Tar, and being ſet on fire, ſerve to burn the Enemies Lodgments or other Works.

FASHION-PIECES, are thoſe two Timbers which deſcribe the Breadth of the Ship at the Stern, and are the outermoſt Timbers of the Stern, on each ſide, except aloft, where the Counters are.

FASTIDIUM *Cibi*, the ſame with *Anorexia*.

FASTIGIUM, the ſame with *Fronton*; which ſee.

FATT of Animals, the learned Dr. *Grew* takes to be a curdling or coagulating of the Oily Parts of the Blood, either by ſome of its own Saline Parts; or by the Nitrous Parts of the Air mingled therewith: And hence it is, that ſome Animals, as Coneys, and Field-Hares, grow fat in Froſty Weather, the Oily Parts of the Blood being then ordinarily coagulated with a greater Abundance of Nitrous Parts received from the Air into their Bodies; and for the ſame Reaſon it is, that the Fat of Land Animals is hard; whereas that of Fiſhes is ſoft, and runs all to Oil, becauſe the Water in which they live, hath but few Nitrous Parts in it, in compariſon of Air.

And that which induced him to make theſe Concluſions, was this Experiment:

He took Oil-Olive, and poured upon it highly rectified Spirit of Nitre, and then digeſted them together for ſome Days: By degrees the Oil became of the Colour and Conſiſtence of Marrow, and at laſt *congealed*, or hardned into a white Fat or Butter, which would diſſolve only by the Fire like the Fat of Animals: And he obſerved, that this Oil hardned into Fat moſt, upon the Exhalation of ſome of the Sulphureous Parts of the Spirit of Nitre; which Exhalation was effected by unſtopping the Glaſs, after ſome time of Digeſtion, and ſuffering the Oil to diſſolve and thicken divers times by ſucceſſive Heat and Cold. And from hence he infers, That the *true congealing Principle, is a Spirit of Nitre ſeparated from its Sulphur*: And he ſays, If we would get this, we might congeal Water in the midſt of Summer. *Power of Mixture, Lect.* 1. p. 233.

FAT, in the Sea Phraſe, is the ſame with Broad. Thus, if the *Truſſing in*, or *Tuck* of a Ships Quarter under Water be deep, they ſay ſhe hath a *Fat Quarter*.

FACUS and *Frumen*, the ſame that *Pharynx*.

FAUCON, a ſort of Cannon, whoſe Diameter at the Bore is $5\frac{1}{4}$ Inches, Weight 750 Pound, Length 7 Foot, Load $2\frac{1}{4}$ Pound, Shot $2\frac{1}{2}$ Diameter, and $2\frac{1}{2}$ Weight.

FAUCONET, a ſort of Ordnance, whoſe Diameter at the Bore is $4\frac{1}{2}$ Inches, Weight 400 Pounds, Length 6 Foot, Load $1\frac{1}{4}$ Pound, Shot ſomething more than two Inches Diameter, and $1\frac{1}{4}$ Pound weight.

FAVUS: See in *Achor*.

FAYLING *of Record*, is when an Action is brought againſt one who pleads any Matter or *Record*, and avers to prove it by Record; and the Plaintiff ſaith, *Nul tiel Record*, whereupon the Defendant hath a Day given him to bring it in, at which Day he fails, or brings in ſuch a one as is no bar to this Action; this is ſaid to be *failer of Record*.

FAYNT-PLEADER, in Law, ſignifies a Falſe, Covenous, or Colluſory Manner of Pleading, to the Deceit of a third Party.

FEALTY, in Law, ſignifies an Oath taken at the Admittance of every Tenant, to be true to the Lord of whom he holdeth his Land.

FEAVER, is a Fermentation, or inordinate Motion of the Blood, and a too great Heat of it, attended with Burning, Thirſt, and other Symptoms, whereby the Natural Oeconomy or Government of the Body is variouſly diſturb'd.

Feavers, in general, may be divided into two ſorts, *viz. Continual*, or *Intermittent*: *Continual Feaver* is that whoſe Fit is continued for many Days, having its Times of Remiſſion, and of more Fierceneſs, but never of Intermiſſion.

Intermittent Feavers, commonly called *Agues*, have certain Times of Intermiſſion, beginning, for the moſt part, with Cold or Shivering, ending in Sweat, and returning exactly at ſet Periods.

As for the ſeveral Subalteran Spices of *Continual* and *Intermitting Feavers*, you will find them particularly enumerated in the Books of Phyſicians.

FEAZING, at Sea, is the ravelling out of the Cable or any great Rope at the Ends.

FEBRIFUGE, is a Medicine which will cure an intermitting Feaver: Thus we ſay the *Cortex Peruvianus*, or *Jeſuits-Bark*, rightly given, is the moſt certain *Febrifuge*.

FECULÆ, are Dregs that ſubſide in the Squeezing of certain Vegetables; as in *Briony*, &c.

FEE, *Feudum vel Feodum*, in Common Law, ſignifies, as Sir *Henry Spelman* defines it, a Right which the Vaſſal hath in Land, or ſome immoveable thing of his Lord's, to uſe the ſame, and take the Profits thereof Hereditarily, rendring unto his Lord ſuch Feudal Duties and Services as belong to Military Tenure, the meer Propriety of the Soil always remaining to the Lord.

This Word *Fee* is ſometimes uſed with us for the Compaſs or Circuit of a Manor or Lordſhip; alſo for a Perſonal Right Incorporeal, as to have the keeping of Priſons in *Fee*. And 'tis taken for a Reward or Wages given to one for the Execution of his Office: As alſo, for that Conſideration given a Serjeant at Law, or Counſellor, or a Phyſician, for their Counſel and Advice in their Profeſſion.

FEE-ABSOLUTE, or *Fee-ſimple*, is that of which we are ſeized in theſe general Words, *To us and our Heirs for ever.*

FEE-CONDITIONAL, or *Fee-Tail*, is that whereof we are ſeized to us and our Heirs with Limitation; that is, the Heirs of our Bodies, &c. And this *Fee-Tail* is either *General* or *Special:*

General, is where Land is given to a Man, and the Heirs of his Body.

Fee-Tail Special, is that where a Man and his Wife be ſeized of Lands, to them and the Heirs of their Bodies.

FEE-FARM, in a Legal Senſe, ſignifies Lands held of another in *Fee*, that is, in Perpetuity to himſelf and his Heirs, for ſo much Yearly Rent as it is reaſonably worth, more or leſs, ſo it be the Fourth Part of the Worth: *Old Tenures.*

FEE-SIMPLE: See *Fee-Abſolute.*

FEE-TAIL: See *Fee-Conditional.*

FIELD, in Heraldry, is the whole Surface of any Eſcutcheon or Shield, being ſuppoſed to be overſpread with ſome Metal, Furr, or Colour, and containing the Charge, if there be any. In Blazoning a Coat, you muſt always begin with the Field: See *Blazon.*

FELLOWSHIP, or *Partnerſhip*, in Arithmetick, is a Rule of very great Uſe to balance Accounts amongſt Merchants and Owners of Ships; for when any Number of Perſons put together a general Stock, ſo that it be required to give to every one his proportional Share of the Loſs or Gain:

The *Golden Rule* ſeveral ways repeated, will fully anſwer ſuch Queſtions.

For, *As the whole Stock* (or general Antecedent): *Is to the Total thereby gain'd or loſt* (which is the general Conſequent) :: *So each Man's particular Share: Is to his proper Share of Loſs or Gain.*

Wherefore let the ſeveral Moneys of every Partner be gathered into one Sum, which makes the Firſt Term, the common Gain or Loſs the Second; every Man's particular Share the Third; working the *Golden Rule* ſo many ſeveral times as there are Partners.

There be two Parts of this Rule, *without Time*, and *with Time.*

Fellowſhip without Time.

Example I.

A, B, *and* C *freight a Ship with Wine*; viz. A *lays out* 1342 l. B, 1178 l. C, 630 l. *the whole* 212 *Tun of Wine is ſold at* 32 l. *a Tun. What ſhall each Man receive?*

Firſt find out the Price received, by multiplying 212 by 32, which makes 6784: Then add up the ſeveral Stocks, 1342 *l.* 1178 *l.* and 630 *l.* which makes 3150 *l.* and the Work ſtands thus;

3150 : 6784 ::
- 1342 : Anſwer 2890,1994
- 1178 : Anſwer 2537,0014
- 630 : Anſwer 1356,800

Proof 3150 — 6784

Example II.

A *hath Half a Ship*, B *a Quarter*, C *one Sixteenth, and* D *three Sixteenths: The Maſter of the Ship brings an Account, and clears* 120 l. *How much muſt each Perſon have?*

Account the Ship is 16, and the Gain 120 *l.*

16 : 120 ::
- 8 : Anſwer 60
- 4 : Anſwer 30
- 1 : Anſwer 7, 5
- 3 : Anſwer 22, 5

16 — 120

Fellowſhip with Time.

Example I.

A Ship's Company take a Prize of 300 l. *which is to be divided amongſt them, according to their Pay and Time they have been on Board: The Officers and Midſhip-men* 5 *Months, and the Sailors* 3 *Months: The Officers one with another,* 40 s. per *Month*; *the Midſhip-men* 30 s. per *Month*; *and the Sailors* 22 s. per *Month: There were* 6 *Officers,* 12 *Midſhip-men*, 84 *Sailors: What muſt each Party have of the Prize?*

For a general Stock I begin firſt with the Officers, which are 6, and that multiplied by the Rate of 40 *s.* gives 240, which multiplied by 5 Months, make 1200 *s.*

After the ſame Faſhion I find the Midſhip-men's Stock 1800 *s.* and the Sailor's 5544 *s.* All added together make 8544 *s.* for the whole Stock, and the Work ſtands thus:

8544 : 300 ::
- 1200 : Anſwer 42,1232
- 1800 : Anſwer 63,2029
- 5544 : Anſwer 194,6629

} 299,999 = 300

Which Decimals reduced, give for

Officers	42	2	2
Midſhip-men	63	4	1/4
Sailors	194	13	5

Example II.

A, B, C *enter into Partnerſhip, the Firſt of* January, *for a whole Year*; A *the ſame Day diſburſed* 100 l. *whereof he received back again upon the firſt of* April 20 *l.* B *payeth on the firſt of* March 60 l. *and more the firſt of* Auguſt 100 l. C *payeth the firſt of* July 140 l. *but the firſt of* October *withdraweth* 40 l. *At the Year's End their clear Gain is* 142 l. *How much therefore ought every particular Perſon to have?*

Anſwer.

A 51 *l.* B 55 *l.* C 36 *l.* which makes the whole Gain 142 *l.* without Conſideration of Intereſt. For A 100 into 3, is 300 *l.* and 80 into 9 = 720, in all 1020 *l.* for A: For B, 60 into 10, is 600, and 100 into 5, is 500, in all 1100 for B: For C, 140 into 3, is 420, and 100 in 3, is 300; into all 720 for C.

Now 1020 + 1100 + 720 = 2840 for the General Antecedent, and the Gain 142 for the General Conſequent; then the Rule ſtands thus;

$$2840 : 142 :: \begin{cases} 1020 : \text{Anſwer } 51 \\ 1100 : \text{Anſwer } 55 \\ 720 : \text{Anſwer } 36 \end{cases}$$

142 *l.*

FELO *de ſe*, is he that commits Felony by Murthering of himſelf.

FELONY, in Common Law, is accounted any Offence, that is in Degree next *Petit-Treaſon*, and compriſeth divers Particulars, as Murther, Theft, killing of a Man's Self, Sodomy, Rape, wilful burning of Houſes, and ſuch like.

The Difference between *Felony* and lighter Offences, is this, That the Puniſhment thereof is Death; yet not in all Caſes: For *Petit-Larceny*, which is the ſtealing of any Thing under Value of Twelve Pence, is *Felony*, becauſe the Indictment againſt ſuch a one muſt have theſe Words *Felonice cepit*; and yet this is not puniſhed by Death, though it be loſs of Goods. Any other Exception I know not, but that a Man may call that Felony, which is under Petit-Treaſon, and puniſhed by Death. And of this may be reckon'd two ſorts, one lighter, that for the firſt time may have the benefit of the Clergy, another that may not.

FEMOREUS: See *Crureus*.

FEMUR, and *Femen*, the Thigh, the Part from the Buttocks to the Knee; it is ſo called *à ferendo* from bearing, becauſe it holds up, and ſuſtains an Animal. It conſiſts but of one Bone, but that the greateſt and longſt in the whole Body, whoſe external and fore Part is gibbous or riſing, but the internal hinder Part flat and bending. Grammarians make *Femen* to be the hinder fleſhy Part; and *Femur* the former outward Part. *Blanchard*.

FEND, (for defend) is the Sea Word for ſaving a Boat from being daſh'd againſt the Rocks, Shore, or Ship's Sides. This they call *Fending the Boat*; and accordingly

FENDERS with them ſignifies any Pieces of old Cable Ropes or Billets of Wood, which they hang over the Ship's Side to keep other Ships from rubbing againſt her: Boats have the ſame, as alſo little ſhort Staves, called by this Name of Fenders, with which they keep the Boat from beating and ſtaving againſt the Ship's Side.

FENESTRA *Ovalis*, is a Hole in the Barrel of the Ear, whereon the Baſis of the *Stapes* ſtands: It is the Entry to the *Veſtibulum*.

FENESTRA *Rotunda*, is a Hole in the Barrel of the Ear, which leads to the *Cochlea*, and is covered by a fine Membrane, inchaſed in a Rift of this Hole.

FEOD: See *Fee*.

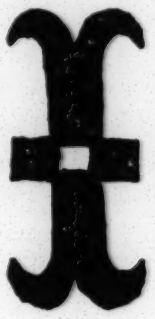
FEODARY.

FEOFFEE, is he that is infeoffed, or to whom the Feoffment is ſo made.

FEOFFMENT, in Common Law, ſignifies any Gift or Grant of any Honours, Caſtles, Manors, Meſſuages, Lands, or other corporeal and immoveable Things of like Nature unto another in *Fee-Simple*; that is, to him and his Heirs for ever, by the Delivery of Seiſin, and the Poſſeſſion of the Thing given, whether the Gift be made by Deed or Writing: And when it is in Writing, 'tis called, *The Deed of Feoffment*; and in every *Feoffment*, the Giver is called the *Feoffer*, or *Feoffator*.

And the proper Difference between a Feoffer and a Donor, is, that the Feoffer gives in Fee-Simple, the Donor in Fee-Tail.

FEOFFOR, is he that Infeoffs, or makes a Feoffment to another, of Lands or Tenements in Fee-Simple.



FERDEMOULIN, a Bearing in Heraldry of this Figure. It repreſents the Iron-Ink, or Ink of a Mill; and is born by the Name of *Bevertham*, and alſo by the Name *Turner*.

FERMENTATION, is an eaſy, gentle, ſlow Motion of the Inteſtine or inward Particles of a mix'd Body, ariſing uſually from the Operation of ſome Active Acid Matter which rarifies, exalts, and ſubtilizes the ſoft and ſulphureous Particles, as when *Leaven* or *Yeaſt* rarifies, lightens, and ferments *Bread*, or *Wort*, &c. And this Motion differs much from that uſually called *Ebullition* or *Effervеſcence*, which is a violent boiling and ſtruggling between an Acid and an Alkali, when mix'd together.

Hence any gentle Motion of the Parts of the Blood, or Juices in the Body, occaſioned by ſomething which helps to *clarify*, exalt, and ſubtilize them, and to reduce them into an Healthful and Natural State, is called by this Name of *Fermentation*, as well as in the expreſſed Juices of Fruits, &c. *Lemery* confounds Efferveſcence and Fermentation together, but I think erroneouſly.

FERRUGINOUS, that which hath in it ſomething of the Nature of Iron; as thoſe Waters have which are otherwiſe called *Chalybeate*, ſuch as thoſe of *Tunbridge Wells*, &c.

FERULÆ, which the Surgeons call *Splinters*, are little Chips or Planes, which are made of differrent Matter, according to the Nature and Neceſſities of the Places to which they are applied, as of Barks of Trees, of the Bark of the Herb *Sagapene*, in Latin, *Ferula*; whence they have their Name: They are made of Firr, Paper glew'd together, Leather, &c. which are apply'd to Bones that have been looſened or disjointed, after they are ſet again. *Blanchard*.

FESSE,

FESSE, one of the Honourable Ordinaries in Heraldry, repreſenting a broad Girdle, or Belt of Honour, which Knights at Arms were anciently girded withal: It poſſeſſeth the Center of the Eſcutcheon, and contains in Breadth one third part thereof; thus.

He beareth *Azure*, a *Feſſe Or*, by the Name of *Eliott*.

The *Feſſe* is divided into the *Barr*, and the *Claſett* of the *Barrulet*; which ſee.

Feſſe Point, is the very middle Point: See the Word *Eſcutcheon*.

FEUDE. *Littleton* makes a *Feude* a Tenure: The *Civilians* define it to be a Grant of Lands, Honours or Fees made either to a Man at the Will of the Lord, or Sovereign, or for the *Feudatory*'s (*i. e.* the Perſon to whom the Grant is made) own Life, or to him and his Heirs for ever; upon Condition that he and his Heirs (in Caſe where the *Feude* is perpetual) do acknowledge the Giver and his Heirs to be their Lord and Sovereign, and ſhall bear Faith and true Allegiance to him and his for the ſaid *Tenure*, and ſhall do ſuch Service to him and his for the ſame, as is between them covenanted, or is proper to the Nature of a *Feude*.

And hence the laſt Volume or Tome of the Civil Law, is called the

FEUDES: That is, the Books of Cuſtoms and Service that the Subject or Vaſſal doth to his Prince or Lord for the Lands, Tenures, or Fees that he holdeth of him.

This Part of the Civil Law was not much in uſe in the Old Emperors Time; but it ſeems to be acknowleged by *Juſtinian* in his Novels; where he calls them : Some derive them from the ancient *Clienteles* among the *Romans*, before Chriſt's Time, as *Badæus* in particular: Others bring them from the Practice of *Alexander Severus*, who to encourage them to perpetual Service in his Wars, divided the Lands of the Enemy amongſt his Soldiers. So *Lampridius* in the Life of *Alexander Severus*.

But others refer it to the Time of *Conſtantine the Great*, who ſettled the Lands out of which the Soldiers had formerly their Wages, on them and their Heirs for ever, provided they found and maintained for ever ſuch a Number of Soldiers.

But let its Original be what or when it will, it came but late into the Body of the Civil Law, and to conſtitute, as it doth now, a particular Volume of it.

The Compilers or Collectors of it, were *Obertus de Horto*, and *Giraldus Compagiſtus*, two Senators of *Milan*, who drew it partly from the *Civil Law*, and partly from the ancient Cuſtoms of *Milan*, but without any good Form or Order. For the Original of *Feudes*, ſee *Cujacius*, and Sir *Henry Spelman*'s *Gloſſary*.

FIBRA *Auris*, the ſame with *Lobus Auris*.

FIBRÆ, *Fibres*, by the Anatomiſts are accounted little round oblong Veſſels, and are either *Muſculous* or *Nervous*.

The *Nervous*, are ſuch as have no Valves, and by which the Spirits flow conveniently from the Nerves to the ſeveral Parts.

The *Muſculous* Fibres receive the Blood from the Arteries, and diſcharge themſelves into the Veins, and have a great many Valves: They are called Long, Round, or Oblique, from their Form and Situation. Some ſmall Threads interwoven with Trees and Leaves, are called Fibres too; and ſo are the ſmall Threads which ſtick to their Roots, and which faſten the ſmall Roots to the Earth: Alſo, thoſe Strings which go from the bottom of the bulbous Roots are called by this Name; and in general, it ſignifies any ſmall Strings which compoſe the Texture of any Part of an Animal or Vegetable Body.

FIBULA, a Term in Surgery, as the Ancients mention it; for if there be a Wound in the Fleſh, ſays *Celſus*, that gapes, and cannot eaſily be cloſed, it is improper to ſew it, you muſt apply a *Fibula*: But becauſe this way of cloſing the gaping of Wounds by *Fibula*'s was uſual amongſt the Ancients, they have not been at all ſolicitous in deſcribing either their Matter or Form. *Guido* tells us, That they made theſe *Fibula*'s of Iron Circles as it were, or Semicircles crooked backward on both ſides; the Hooks whereof being faſtned on both ſides to the gaping Wound, anſwered exactly one another; but ſince this muſt be an inſupportable Pain to the poor Patient, it is hardly credible, that they meant any ſuch thing by their *Fibula*'s.

The Opinion of *Fallopius* is more probable, who tells us, That it was only ſewing up the Wound with a Needle and Thread, which is commonly uſed at this Day.

Sanctorius writes thus, We need not diſcourſe much of *Fibula*'s, ſince the uſe of them is almoſt out of doors; and tho' the Ancients have not deſcrib'd them, yet they forbear not to acquaint us how to uſe them, as *Argenterius* falſly imagines: For not only Phyſicians, but ſome of the Ancients knew the Form of them, ſince *Corn. Celſus* has inform'd us, That *Fibula*'s as well as *Sutures*, were made of a Needleful of ſoft untwiſted Silk or Thread, wherewith they ſewed the gaping Lips of the Wound together.

Some call *Acia*, or this Needleful of Thread, *Vinculum*, *Ligatura*, *Colligatio*, *Obligatio*, *Ligamentum*; all which ſignifies tying or binding. Whoever would be further inform'd in this Particular, may conſult the Incomparable *Rhodius*, in his Diſcourſe about *Acia*. *Blanchard*.

FIBULA, or *Focile minus*, in Greek περόνη, is the leſſer and outer Bone of the Leg; it ſeems to join the Muſcles of the Leg like a Button or Claſp, in Latin *Fibula*; it is the hinder Bone betwixt the Knee and the Feet, ſmaller than the other Bone called *Tibia*, and faſtened outwardly to it, as the Bone called *Radius* in the Arm is to the Cubit; its round Head does not extend as far as the Knee upward, but receives the lateral Knob of the *Tibia* in a ſmall Sinus which it hath in its inner Side; downwards it goes farther than the other Bone called *Tibia*, and therefore is altogether as long a Bone as that, tho' much ſmaller. They part in the Middle, becauſe the Muſcles that extend the Feet and Toes are placed there; in which Interval a ſlender, broad, membranous Ligament joins them together lengthways: It is joined likewiſe to the *Tibia*, by its lower End, which is received into a ſmall Sinus of it; and then it extends into a large Proceſs which forms the outward Ankle, embracing the external Side of the *Aſtragalus*.

FICHANT *Flank*: See *Flank*.

FICHANT *Line of Defence*: See *Fixed Line of Defence*.

FICUS,

FICUS, are the external Protuberances of the *Anus*, otherwiſe called the *Piles*. They are alſo ſometimes called *Mariſcæ*, and *Sycoſes*.

FIDD, an Iron Pin uſed at Sea to ſplice or faſten Ropes together. 'Tis made tapering and ſharp at one end. There are alſo Fidds of Wood, which are much larger than the Iron ones. The Pin alſo in the Heel of the Topmaſt, which bears it upon the Cheſs-trees, is called a Fidd. There is alſo a *Fidd Hammer*, whoſe Handle is a *Fidd*, or made tapering into that form.

FIELD-*Fort*: See *Fortin*.

FIERI *facias*, is a Writ Judicial that lieth at all times within the Year and Day, for him that hath recovered in an Action of Debt or Damages, to the Sheriff, to command him to levy the Debt or the Damages of his Goods againſt whom the Recovery was had.

FIFTH, a term in Muſick, the ſame with *Diapente*; which ſee.

FIGHTS, in a Ship, are the waſte Cloths which hang round about her in a Fight, to hinder the Men from being ſeen by the Enemy; and they call thoſe Bulkheads afore or abaft the Shift which are put up for Men to ſtand ſecure behind and Fire on the Enemy in caſe of Boarding, *Cloſe Fights*.

FIGURAL, or *Figurate Numbers*, are ſuch as do or may repreſent ſome Geometrical Figure, in relation to which they are always conſidered; and are either *Lineary*, *Superficial*, or *Solid*; which ſee.

FIGURATE *Deſcant*: See *Deſcant*.

FIGURATIVE *Speeches*, are ways of expreſſing our ſelves, in which we uſe an improper Word, which Cuſtom has applied to another Subject.

FIGURE, in Phyſicks or Natural Philoſophy, is the Surface or terminating Extreams of any Body.

FIGURE, in Conicks, according to *Apollonius*, is the Rectangle made under the *Latus Rectum* and *Tranſverſum* in the *Hyperbola* and *Ellipſis*.

FIGURE, in Geometry, is a Space compaſſed round on all Sides, and are either *Rectilineal*, *Curvilineal* or *Mixt*.

FIGURES, in Arithmetick, are the 9 Digits or Numeral Characters, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0.

FIGURES in Diſcourſe, are extraordinary ways of Speaking, different and remote from ſuch as are Ordinary and Natural, and they are either *Grammatical* or *Rhetorical*.

FIGURES *Curvilineal*, are ſuch as have their Extremities crooked, as *Circles*, *Ellipſis*'s, &c.

FIGURES *Grammatical*, are uſed in Conſtruction, when we digreſs from the common and ordinary Rules, as by omitting ſome Word; and leaving it to thoſe to whom we ſpeak, to ſupply it.

FIGURES *Mixt*, are ſuch as are bounded partly by right Lines, and partly by crooked ones, as a *Semicircle*, *Segment of a Circle*, &c.

FIGURES *Plane*, (or *Plane Surfaces*) are ſuch as are terminated and bounded by right Lines only.

FIGURES *Rectilineal*, are thoſe that have their Extremities all right Lines, as *Triangles*, *Quadrilaterals*, &c. *Polygons* Regular, Irregular, &c.

FIGURES *Rhetorical*, ſerve ſometimes to expreſs the Commotions and violent Agitations of the Mind in our Paſſions or warm eager Diſcourſes; and ſometimes only to embelliſh and adorn our Speech, or to move the Audience the more pathetically.

FILACER, is an Officer in the *Common-Plea's*, ſo called, becauſe he Files thoſe Writs whereon he makes Proceſs. There are fourteen of them in their ſeveral Diviſions and Counties. They make out all original Proceſs, as well Real, as Perſonal and Mixt; and in Actions merely Perſonal, where the Defendants be Return'd or Summon'd, there goeth out the Diſtreſs infinite until Appearance: if he be Returned *nihil*, there Proceſs of *Capias* infinite, if the Plaintiff will; or after the third *Capias* the Plaintiff may go to the *Exigenter* of the Shire, where his Original is grounded, and have an Exigent or Proclamation made.

FILAMENTS, little, thin, ſlender Rags like Threads, ſuch as ſometimes appear in Urine: Alſo the ſmall Fibres or Threads which compoſe the Texture of the Muſcles, &c. or other Parts of any Animal or Vegetable Body, are ſometimes called by this Name.

FILE, or *Label*, in Heraldry is of this Form, tho' ſometimes of more and ſometimes of fewer Points. 'Tis ſometimes born as a Charge in a Coat Armour, of which *Guillim* gives many Inſtances: But 'tis uſually the difference or mark of Diſtinction which the Elder Brother bears in his Coat during his Father's Life.

Some diſtinguiſh *File* and *Label*; calling the File the upper Horizontal Line, and the Label the Point that iſſues from it.

FILE, in Military Language, is a row of Men ſtanding one behind or below another from the Front to the Rear.

FILET, a little Member in Architecture, which appears in the Ornaments and Mouldings, and is otherwiſe called *Liſtel*.

FILLET, in Heraldry, is a 4th part of the Ordniary called a *Chief*, and is placed in the chief Point of the Eſcutcheon.

FILTRATION, is the paſſing a Liquor (in order to its Purification) through a woollen Cloth, or uſually through a Coffin of brown Paper; and this the Chymiſts mean when they direct you to *Filtrate* any thing.

The moſt exact way of Filtration, is to take a long piece of linnen or woollen Cloth, and dipping one end of it in the Liquor to be Filtrated, hang the other (which muſt be the longer end) over the brims of the Veſſel, and you will ſee the Liquor riſe up and run over the brims through the Body of the *Filtre*; and it will do ſo very pure, and free from all Dregs.

The Cauſe of the aſcent of Liquors in the *filtre*, is generally ſaid to be, that the Liquor ſwelling thoſe parts of the *filtre* that touch it, by entring into the Pores of the Threads of which it is compoſed, doth raiſe them up, make them touch, and wet thoſe that are next above them; and theſe again the next Threads, and ſo on till you come to the brims of the Veſſel, and then the Liquor runs over and deſcends in the other part of the Filtre, which hangs down, by its own natural Gravity.

But 'tis certain that in very ſlender glaſs Pipes, whoſe Cavities are not much larger than Hairs, Water or any Fluid (but Quickſilver) will aſcend in them to a conſiderable height, as ſoon as ever you dip their ends into it; and in Pipes or Tubes of much larger Bores, the Liquor will be higher (ſomething) within the Tube than without it. And yet here the ſwelling of the parts of the glaſs Pipe cannot be urged as the Reaſon for the aſcent of the Water in them.

If alſo you fill a Pipe of a moderate Bore with the powdered *Calx* of a Metal, (as Mr. *Boyle* tried it with *Minium* or Lead) and then immerſe the lower end of this Tube in Water, the Water ſhall gradually ariſe in the Tube till it attain the height of 30 or 40 Inches; and yet it cannot be ſaid that any of the Particles of this Metalline Powder, are ſwelled at all by the Water.

Therefore

Therefore the true Cauſe of the aſcent of Water in a Philtre, is probably this: That every Philtre being compoſed of a great Number of long ſmall ſolid Bodies, which lie very cloſe together, the Air getting in between them, loſes much of its preſſure, and cannot gravitate there ſo ſtrongly as it doth on the Fluid without them: Wherefore the Parts of the Water between the Threads of the Filtre muſt be preſſed upwards, and aſcend till they come ſo high, as by their Weight to counter-balance the general preſſure on the other Parts of the Surface of the Water.

FIMBRIATED, a Term in Heraldry, ſignifying that an Ordinary is edged round with another of a different Colour, as thus.

He beareth *Or*, a *Croſs*, *Patee Gules Fimbriated Sable.*

FINAL *Cauſes*, are ſuch great, wiſe, and good Ends as God Almighty, the Author of Nature, had in Creating and Proportioning, in Adapting and Diſpoſing, in Preſerving and Continuing, all the ſeveral Parts of the Univerſe. On this Subject the Honourable Mr. *Boyle* hath a very good Diſcourſe: And that good Mathematician Mr. *Keil* of *Oxford*, in his Refutation of *Burnet*'s *Theory of the Earth*, ſhews that Final Cauſes are the beſt Principles for Men to regulate their Philoſophical Theories and Speculations by.

FINE, in common Law, hath divers Applications; for ſometimes 'tis uſed for a formal or ceremonious Conveyance of Lands or Tenements, or of any Things inheritable, being *in eſſe tempore finis*, to the end to cut off all Controverſies. Others define it to be a *final* Agreement had between Perſons concerning any Lands or Rent, or other thing whereof any Suit or Writ is between them hanging in any Court. A Fine hath in it five eſſential Parts.

1. The Original Writ taken out againſt the Cogniſor.

2. The King's Licence, giving the Parties Liberty to accord · for which he hath a *Fine* called *the King's Silver*, being accounted a Part of the Revenue of the Crown.

3. The Concord it ſelf, which thus beginneth *Et eſt concordia talis*, &c.

4. The Note of the *Fine*, which is an abſtract of the original Concord, and beginneth in this manner: *Scil. Inter R. Querentem* & S. & E. *uxorem ejus, deforciantes*, &c.

5. The Foot of the *Fine* which beginneth thus: *Hæc eſt* finalis *concordia facta in curia Domini Regis apud* Weſtmonaſterium *a die Paſchæ in quindecim dies, anno*, &c. So as the Foot of the *Fine* includeth all, containeth the Day, Year, and Place, and before what Juſtice made.

This Word *Fine* ſometimes ſignifies a Sum of Money paid for an Income to Lands or Tenements let by Leaſe; and ſometimes, an Amends, Pecuniary Puniſhment or Recompence upon an Offence committed againſt the King and his Laws, or againſt the Lord of the Mannor.

FINE *adnullando levato de Tenemento quod fuit de antiquo domenico:* Is a Writ to the Juſtices for the diſanulling of a *Fine* levied of Lands holden in Ancient Demeſne to the Prejudice of the Lord.

FINE *capiendo pro terris*, &c. Is a Writ lying for one that upon Conviction by a Jury, having his Lands and Goods taken into the King's Hands, and his Body committed to Priſon, obtaineth Favour for a Sum of Money, &c. to be remitted his Impriſonment, and his Lands and Goods to be re-delivered unto him.

FINE *force*, ſignifies an abſolute Neceſſity or Conſtraint not avoidable; as when a Man is conſtrained to do that which he can no way avoid, we ſay, He doth it *de fine force.*

FINE *levando de Tenementis tentis de Rege in Capite*, &c. is a Writ directed to the Juſtices of the *Common Pleas*, whereby to licence them to admit of a *Fine* for Sale of Lands holden *in Capite.*

FINE *non capiendo pro pulchre placitando*, is a Writ to inhibit Officers of Courts to take *Fines* for fair Pleading.

FINE *pro rediſſeiſina capienda*, &c. is a Writ that lieth for the Releaſe of one laid in Priſon for a *Reſeiſin*, upon a reaſonable *Fine.*

Fines *for Alienation*, are reaſonable Fines paid to the King by his Tenants in Chief, for Licence to *Alien* their Lands.

FINITE, is what hath fix'd and determined Bounds or Limits ſet to its Power, Extent or Duration.

FINITOR, the ſame with *Horizon*; and 'tis ſo called, becauſe the Horizon finiſhes or terminates your Sight, View, or Proſpect.

FIRMAMENT, by ſome Aſtronomers is taken for the Orb of the Fixed Stars, or an Eighth Heaven: But more properly, 'tis that Space which is expanded or arched over us above in the Heavens.

FIRMNESS or *Solidity*, Mr. *Boyle* deſcribes to conſiſt principally in this, that the Particles compoſing ſuch Bodies as we call Firm or Solid, are pretty groſs; and either are *ſo much at Reſt*, or are ſo *Intangled* one with another, that there is a mutual Cohæſion of their Parts; and that they cannot flow from, ſlide over one another, or diffuſe themſelves every way from one another, as the Parts of Fluid Bodies can; and conſequently the Figure of Firm or Solid Bodies, ought rather to be attributed to the Connexion of the Parts that compoſe them, than to the Impreſſions of outward Bodies.

And in his Hiſtory of Firmneſs, he proves by Experiments, and good Conſiderations upon them, the ſeveral Parts of the above given Deſcription. As,

1. He ſhews the *Groſſneſs* of *Parts* are (*cæteris paribus*) requiſite to Firmneſs or Solidity, becauſe *Minuteneſs* he had before proved, was neceſſary to the Parts of Fluid Bodies.

2. Reſt alſo, and *juxta Poſition* of Parts, he demonſtrates by many Experiments, are in a Degree abſolutely requiſite to produce this Effect. And,

3. The Preſſure and Weight of the Incumbent Atmoſphere he judges contributes much toward it, becauſe of the ſtrong Adherence of two Pieces of Poliſhed Glaſs, or Marble together, in the open Air, which will immediately ſeparate in the exhauſted Receiver.

4. The Texture of the Bodies, and the Figures of their Parts many contribute much to this Effect; as if they be of an hooked Form, or any way entangled one in another, they muſt be disjoined with difficulty, and conſequently will be in the Form of a Solid.

And 'tis a very ſurprizing Experiment, that two Parts of Spirit of Wine, mixed with one of Spirit of Hartſhorn, or Urine (both highly rectified) will, in a Minute, unite into a conſiſient Body, or white *Coagulum*; which ſome call *Offa alba.*

FIRST MOVER: See *Primum Mobile.*

FISHES, are Pieces of Timber uſed to ſtrengthen the Maſts or Yards aboard of a Ship, when they begin to fail in a Streſs of Weather. They both nail the Fiſhes on with Iron Spikes, and alſo *wou'd* them, as they call it; that is, winding Ropes hard round about

about them. There is also a Tackle called *The Fish*, which hangs at the End of the *David* by the *Strap* of the *Block*, in which is the Runner of the Fish-hook; by which Means the Fluke of the Anchor is haled up to the Ship's *Bow*, or *Chainwaile*. Perhaps this Tackle was called a Fish, from that which the Ancients called the *Dolphin*, which was a pointed and vastly heavy Piece of Iron, and which they used to heave up by a Tackle to a good Height, and then, when they come near enough to the Enemy's Ship, let it fall at once, which would break or pierce a Hole through the Bottom of the Enemy's Vessel, and sink her.

FISSURA *Ossis*, is the Term for a Cleft or a Fracture of a Bone lengthways.

FISSURES, the several *Layers* or *Strata*, of which the Body of our Terrestrial Globe is composed, are distinguished from one another, and divided Horizontally or Parallelly by some Interruptions which they call *Fissures*; and these are intersected again by other Fissures, which, by reason of their Situation, are called *Perpendicular Fissures*: See *Woodward's Nat. Hist. of Earth*, P. 10.

FISTULA, is a long Cavity, strait or winding about, in any Part of the Body, being a narrow and callous Ulcer of difficult Cure, proceeding usually from an Apostеme. *Blanchard.*

Fistula's differ from winding Ulcers in this, that *Fistula's* are callous and hard, but Ulcers are not. *Blanchard.*

FISTULA *Lachrymalis*, is when the *Punctum Lachrymale*, the little Hole in the Bone of the Nose, through which the Liquid Matter of the Tears passes to the Nostrils, is grown hard and callous from an Ulcer of the *Caruncula* (which are *Glandules* placed at the greater Corners of the Eye) by which means there happens a continual Defluxion of Tears. *Blanchard.*

FISTULA *Pulmonis*, in some Writers, is the same with the *Aspera Arteria.*

FISTULA *Sacra*, is that Part of the Back-bone which is perforated. *Blanchard.*

FISTULA *Urinaria*, the same with the *Urethra.*

FITCHEE, the Term in Heraldry, when the lower Part of any Cross is sharpened into a Point, thus.

Azure a *Cross Potent Fitchee.*

FIXED *Line of Defence*, in Fortification, is drawn along the Face of the Bastion, and terminates in the *Courtine.*

FIXED *Signs* of the Zodiack, according to some, are *Taurus*, *Leo*, *Scorpio*, and *Aquarius*. And they are so called, because the Sun passes them respectively in the Middle of each Quarter, when that particular Season is more settled and fixed than under the Sign that begins or ends it.

FIXITY, or *Fixtness*, is the opposite Quality to *Volatility*; and the Excellent Mr. *Boyle* reckons these Qualifications following to be the most conducing for the rendring of a Portion of Matter Fixt.

1. That its Corpuscles be singly of a proportionate large Bulk or Grossness, so as to be too big and unweildy to be carried up by Heat, or to be buoyed up in the Air.

2. That these Corpuscles have also a proportional Degree of Ponderousness or Solidity.

3. That their Figure and Make also be such as renders them unfit for Avolation, either from their Shape, being branched, crooked, hooked, *&c.* so that they be entangled one with another, and cannot easily be extricated, loosened, or separated: And therefore whatever will produce these three Requisites in any Body, will render it of a fixt Nature.

4. To these may be added also the bringing the Corpuscles or Particles of any Body to touch one another in a considerably larger Part of their Surface.

FIXT *Nitre*, is Salt-petre melted in a Crucible, and then made to flame, by throwing in a Spoonful of Powder of Coals; and this is repeated till no Flame nor Denotation arise: After this 'tis cooled, powdered, and dissolved in Water, and then evaporated into a fine white Salt. 'Tis a Salt much like that of Tartar, and is used, like it, to help draw Tinctures out of Vegetables. Some Chymists give it the Name of *Alkahest*, because 'tis, as they say, a kind of Universal Dissolvent. If this Salt be exposed to the Air in a cool Place, it will all dissolve into a Water, or as they say, run *per Deliquium*; and this is called, *The Liquor of Fixt Nitre.*

FIXED *Stars*, are such as do not, like the Planets or *Erratick Stars*, change their Positions or Distances in respect of one another.

Because these *Fixed Stars* have no sensible Parallax arising from the Annual Motion of the Earth, they are justly esteemed to be at such an immense Distance, as to have no sensible Effect on our Earth.

The Honourable Mr. *Roberts* hath a pretty Discourse about the Distance of the *Fixed Stars*, which is published in *Philos. Transf. N.* 209. The Substance of which is as follows.

Since the *Pythagorean System* of the World has been revived by *Copernicus*, (and now by all *Mathematicians* accepted for the *True one*) there seemed Ground to imagine, that the Diameter of the Earth's Annual Course (which according to our best Astronomers, is at least 40000 Times bigger than our Earth's) might give a sensible Parallax to the *Fixed Stars*, though the other could not, and thereby determine their Distance more precisely.

But though we have a Foundation to build on, so vastly exceeding that of the Ancients, there are some Considerations may make us suspect, that even this is not large enough for our Purpose.

Mr. *Hugens* (who was very exact in his Astronomical Observations) tells us, he could never discover any visible Magnitude in the *Fixed Stars*, tho' he used Glasses which magnify the apparent Diameter above a hundred Times.

Now, since in all likelihood the *Fixed Stars* are Suns (perhaps of a different Magnitude) we may, as a reasonable *Medium*, presume they are generally about the Bigness of our Sun.

Let us then (for Example) suppose the *Dog-star* to be so.

The Distance from us to the Sun being about a hundred Times the Sun's Diameter, it is evident, that the Angle under which the *Dog-star* is seen in Mr. *Hugens*'s Telescope, must be near the same with the Angle of its Parallax to the Sun's Distance, or Semidiameter of the Earth's Annual Course; so that the Parallax to the whole Diameter can be but double such a Quantity, as even to Mr. *Hugens*'s nice Observation, is altogether insensible.

The

The Diſtance therefore of the Stars ſeems hardly within the reach of any of our Methods to determine; but from what has been laid down, we may draw ſome Concluſions that will much illuſtrate the prodigious vaſtneſs of it.

1. That the Diameter of the Earth's Annual Orb (which contains at leaſt 160 Millions of Miles) is but as a Point in Compariſon of it; at leaſt it muſt be above 6000 Times the Diſtance of the Sun: For if a Star ſhould appear through the aforeſaid Teleſcope half a Minute broad (which is a pretty ſenſible Magnitude) the true apparent Diameter would not exceed 18 third Minutes, which is leſs than the 6000 Part of the apparent Diameter of the Sun, and conſequently the Sun's Diſtance not the 6000 Part of the Diſtance of the Stars.

2. That could we advance towards the Stars 99 Parts of the whole Diſtance, and have only $\frac{1}{100}$ Part remaining, the Stars would appear little bigger to us than they do here; for they would ſhew no otherwiſe than they do through a Teleſcope, which magnifies an hundred-fold.

3. That at leaſt Nine Parts in Ten of the Space between us and the *Fixed Stars*, can receive no greater Light from the Sun, or any of the Stars, than what we have from the Stars in a clear Night.

4. That Light takes up more time in travelling from the Stars to us, than we in making a *Weſt-India* Voyage (which is ordinarily performed in ſix Weeks:) That a Sound would not arrive to us from thence in 50000 Years, nor a Cannon Bullet in a much longer Time. This is eaſily computed by allowing (according to Sir *Iſaac Newton*) ten Minutes for the Journey of Light from the Sun hither; and that a Sound moves about 1300 Foot in a Second. But Sir *Iſaac Newton* doth not allow above 968 Feet for the Motion of Sound in a Second of Time: And the *Florentine* Academicks make it about 1000 Feet.

Our Learned and Accurate Mr. *Flamſtead* ſaith, he hath diſcovered a ſenſible Parallax of the Earth's Annual Orbit in reſpect of the *Fixed Stars*; of which he publiſhed an Account in a Letter to Dr. *Wallis*, in the Year 1698. which is Printed in the Third Volume of *Wallis*'s Mathematical Works in *Latin*.

FLAGS, on Board a Ship, are Colours, Ancients, or Standards which the Admirals of a Fleet bear on their Tops. The Admiral in Chief carries his on his *Main-Top*, the Vice Admiral his at the *Fore-Top*, and the Rere-Admiral his at his *Miſſen-Top*.

FLAIR, the Seamen ſay that the Work doth *flair over*, when a Ship being houſed in near the Water, a little above that the Work hangs over a little too much, and ſo is let out broader aloft than the due Proportion will allow.

FLAMMA *Vitalis*; ſome do ſuppoſe that there reſides in the Heart of Animals ſuch a fine and kindled, but mild Subſtance, as they call a *Vital Flame*; and to its Preſervation they judge the Air taken in by Reſpiration to be neceſſary, as it is to the Conſervation of ordinary Flame.

The Excellent Mr. *Boyle*, by ſeveral Experiments purpoſely made in his exhauſted Receiver, about the Relation between Flame and Air, found that the Vital Flame of Animals (if the Life may be ſo called) did ſurvive or outlaſt the Flame of Spirit of Wine, or of a Wax or Tallow Candle; ſince the Animals would remain alive and well for 3 or 4 Minutes after the Receiver was evacuated, whereas no common Flame would laſt there one Minute.

The Light of Glow-worms that Noble Gentleman found alſo would preſently be deſtroyed by the Exhauſting Motion of the Air, by his Engine, as it would be re-produced again by its Admiſſion into the Receiver.

FLANCH, an Ordinary in Heraldry, formed by an Arch-line, which begins at the Corners of the *Chief*, and ends in the *Baſe* of the Eſcutcheon, thus.

He beareth *Ermin*, two *Flanches Vert*.

Flanches are always born by Pairs: The *Flanch* bends in more than the Flaſk.

FLANK, in Fortification, is that Part of the Baſtion which reaches from the Courtine to the Face, and defends the oppoſite Face, the Flank, and the Curtain.

There is alſo the Oblique or Second Flank, which is that Part of the Courtine where they can ſee to ſcour the Face of the oppoſite Baſtion; and is the Diſtance between the Lines *Razant* and *Fitchant*.

The *Low*, *Covered*, or *Retired Flank*, is the Platform of the Caſemate, which lies hid in the Baſtion.

The *Flanks* of a Battalion, or an Army are its Sides.

They uſe alſo the Word *to Flank* an Army; that is, to diſcover and fire upon its Sides.

Any Fortification which hath no Defence right forwards, is on that Account Faulty and Defective; and to render it compleat, one Part muſt be made *to flank* another. The Courtine therefore is the ſtrongeſt Part of any Fortified Place, becauſe it is *flanked* by the two *Flanks* at its Ends.

FLANK, is alſo a Term of War, ſignifying one Side of a Battalion of an Army; as to attack the Enemy in Flank, is to diſcover and fire upon them on one Side.

FLANK *of the Courtine*, or *Second Flank*, is that Part of the Courtine between the Flank and the Point, where the *Fitchant Line of Defence* terminates.

To FLANK, in general, is to diſcover and fire upon the Side of any Place; but to

FLANK *a Place*, is to diſpoſe a Baſtion, or other like Work, in ſuch a manner, that there ſhall be no Part of it but what is defended; ſo as you may from thence play upon Front and Rear: For any Fortification that hath no Defence, but juſt right forwards, is Faulty; and to render it compleat, one Part ought to be made to Flank the other: Hence the Courtine is always the ſtrongeſt Part of any Place, becauſe 'tis *flanked* at each End.

Fitchant FLANK, is that from whence a Cannon playing, fireth its Bullets directly in the Face of the oppoſite Baſtion.

FLANK *Razant*, is the Point from whence the Line of Defence begins, from the Conjunction of which with the Courtine, the Shot only razeth the Face of the next Baſtion, which happens when the Face cannot be diſcovered but from the Flank alone.

Retired FLANK, or the *Lower* or *Covert Flank*, is that Exterior Part thereof which advanceth to ſecure the Innermoſt; which advanced Part, if it be rounded, is called the *Orillon*; ſo that this *Flank Retire*, as the *French* call it, is only the Platform of the *Caſemate*, which lies hid in the Baſtion.

Simple FLANKS, are Lines which go from the *Angle of the Shoulder* to the *Courtine*, and whoſe

principal Function is the Defence of the Moat and Place.

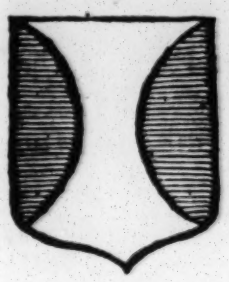
FLANK'D, or *Double Tenaille*: See *Tenaille*.

FLANKING *Line of Defence*: See *Rasant Line of Defence*.

FLANKING *Angle*: See *Angle*.

FLANK'D *Angle*, is the Angle formed by the two Faces of the Bastion, and so forms the Point of the Bastion.

FLASK, is in Heraldry an *Ordinary* made by one Arch-line drawn downwards to the *Base Point*: It seems to be the Representation of a Bow, when bended; and they are always born double, thus,



The Field is *Or*, Two *Flasks Azure*.

Some Heralds say, The *Flask* is a Reward for a Man of Virtue and Learning, who hath deserved well of his Prince in an Embassy.

FLAT; to *flat* a Ship, is to hale in the Fore-sail by the Sheet, as near to the Ship's Sides as may be, which is called, *Flatting in the Fore-sail*. This is done when a Ship will not fall off from a Wind without it, though the Fore-sheet was haled aft.

FLAT *Bastion*: See *Bastion*.

FLAT-BOTTOM'D *Moat*: See *Moat*.

FLAT *Crown*: See *Corona*.

FLATUS, are Effervescencies excited in the Body from Wind let in, or from Flatulent Meats, or from the Bile and Pancreatick Juice mixed together, whence Wind and Noise.

FLEDWIT, a Term in Law, signifying a Discharge or Freedom from Amerciaments, where one having been an Outlaw'd Fugitive, cometh to the Peace of our Lord of his own accord.

FLEMESWITE, in Law, signifies the Liberty to challenge the Cattel, or Amerciaments of your Man, a Fugitive.

FLESH, of any Animal Body, is by Anatomists defined to be a Similar and Fibrous Part, soft and thick: Of this they reckon five Kinds.

1. Musculous, Fibrous, or Fistular Flesh, such as is the Substance of the Heart, and other Muscles.

2. *Parenchymous* Flesh, as that of the Lungs, Liver, and Spleen was thought to be by the Ancients; but since the Use of Glasses 'tis plainly discovered that there is no such thing as a *Parenchyma*, properly speaking, but that all the *Viscera*, as well as other Parts of the Body, are *Vascular*, and nothing but *Plexus*, or Net-work of small Vessels and Canals.

3 *Viscerous*, such as the Flesh of the Stomach and Guts.

4. *Glandulous*, as that of the *Tonsils*, the *Pancreas*, the Breasts, &c.

5. *Spurious*, so they call the Flesh of the Lips, Gums, the *Glans* of the *Penis*, &c. because 'tis of a Constitution different from all the rest.

FLEXOR *Carpi Radialis*, is a Muscle of the Wrist, which ariseth Tendinous from the Internal Extuberance of the *Os Humeri*, becoming Fleshy, adheres strictly to the *Pronator Radij Teres*, and in half its Oblique Progress to the *Carpus* it becomes a flat Tendon, which passeth over the Annular Ligament, and is inserted to the upper Part of the *Os Metacarpi*, which sustains the Fore-finger: Its Name shews its Use.

FLEXOR *Carpi Ulnaris*, is a Muscle of the Wrist, which arises Tendinous from the same Tubercle of the Shoulder-bone, with the *Flexor Radialis*; as also from the superior and external Part of the *Ulna*, where the *Musculus Perforans* doth arise; and continuing Fleshy according to the length of the *Ulna*, is partly inserted by a short strong Tendon into the fourth Bone of the *Carpus*, and partly into the *Os Metacarpi*, which sustains the Little-finger. Its Name declares its Use.

FLEXOR *Secundi Internodii Digitorum Pedis*: See *Perforatus Pedis*.

FLEXOR *Tertii Internodii Digitorum Pedis*: See *Perforans*.

FLEXOR *Tertii Internodii*, or *Longissimus Pollicis*, is a Muscle of the Thumb, which is observed to have a *twofold* Beginning;

The First and Superior of which ariseth acutely from the Internal Extuberance of the *Os Humeri*, between the *Perforatus* and *Perforans*, becoming a Fleshy Belly, and then Tendinous, joins with the middle Tendon of its other larger Head.

The Second or Inferior Origin of this Muscle (is that Part of it which is commonly described) arising with a double Order of Fleshy Fibres for some space on the *Radius*, from immediately below its Superior Part, which uniting in a middle Line or Tendon (not unlike the *Fibrillæ* of a Feather, joining to their *Stamina*) which passing over the Articulation of the *Carpus*, becomes entirely Tendinous, as it runs over the *Flexor primi & secundi Internodii* to its Implantation at the Superior Part of the third Bone of the Thumb.

FLEXOR *Pollicis Brevis*, is a Muscle of the great Toe, which ariseth from the Superior Part of the *Os Cuneiforme Medium*, and running over the Termination of the *Musculus Peroneus*, is implanted into the *Ossa Sesamoidea* of the Great Toe, who are likewise tied to the Superior Part of the second Bone of the said Toe which bends it.

FLEXOR *Pollicis Pedis Longus*, is a Muscle of the Great Toe, which is a direct Antagonist to the *Extensor Longus*: It arises opposite to it from the Back-part of the *Fibula*, with a double Order of Fleshy Fibres, running to a middle Tendon (like the *Flexor tertii internodii Pollicis Manus*) which ceaseth to be Fleshy as it passes over the Juncture, and runs through a Channel on the Internal Part of the *Os Calcis*, under the Tendon of the *Musculus Flexor Digitorum Longus Perforans*, over the *Flexor Pollicis Brevis*, and is inserted to the upper End of the second Bone of the Great Toe: Its Use is to bend the Toe.

FLEXOR *primi & secundi Ossis Pollicis*, is a large disgregated Fleshy Muscle, arising from the *Ligamentum Transversale Carpi*, Bones of the *Carpus*, at the Basis of the *Mons Lunæ*, and *Os Metacarpi* of the Middle Finger, whence it passes to its Insertion partly to the *Ossa Sesamoidea* of the second Internode, and partly to the first Bone of the Thumb: This (as *Vesalius* writes) may be divided into Three. Its Actions are various, according to the Diversity of its *Series* of Fibres; so it bends the first or second Bones of the Thumb, either directly or obliquely towards the *Carpus* and *Vola Manus*.

FLIE, that Part of the Mariner's Compass on which the 32 Winds are drawn, and to which the Needle is fastened underneath, they call the *Flie*.

FLOATING-BRIDGE, is a Bridge made in form of a Redoubt, consisting of two Boats covered with Planks, which ought to be so solidly Framed, as to bear both Horse and Cannon.

FLOND, or *Figurative Descant*, a Term in Musick. See *Descant*.

FLOOR,

FLOOR, in a Ship, ſtrictly taken, is ſo much only of her Bottom as ſhe doth reſt upon when ſhe lieth on Ground; and therefore thoſe Ships that have long, and withal broad Floors, lie on the Ground with moſt Security, and are not apt to *Seel* (that is, to fall on the one Side;) whereas the other which are *Cranck by the Ground*, (as the Sea Phraſe is) that is narrow in the Floor, cannot be grounded without Peril either of being overthrown, or, at leaſt, of wronging her Sides. And note, the Word *Overthrown* is uſed when a Ship is brought to be *trimmed a-ground*, and ſo by ſome Miſchance doth fall over on her Side; but when a Ship at Sea is turned over on the one Side, ſhe is ſaid to be *Over-ſet*.

FLORY, a Term in Heraldry, when the Out-lines of any Ordinary are drawn, as if trimm'd with, or in the Form of Flowers.

Thus this Croſs they call a *Croſs-Flory*.

FLOTSON, or *Flotzam*, is a Word proper to the Sea, ſignifying any Goods loſt by Shipwreck, and floating and ſwimming upon the Top of the Water; which, with *Jetſon*, and *Lagon*, and others, are given to the Lord Admiral by his Letters Patent.

Jetſon, is a thing caſt out of the Ship, being in danger of Wreck, and beaten to the Shore by the Waters, or caſt on the Shore by the Mariners.

Lagon, or *Lagan*, or *Ligan*, is that which lieth in the Bottom of the Sea.

Shares, are Goods due to more by Proportion.

FLOWER *of a Plant*: According to Dr. *Grew*, the *Flowers of Plants* have commonly theſe three Parts;

The *Empalement*, the *Foliation*, and the *Attire*; which Words ſee.

And Mr. *Ray* reckons, that every perfect Flower muſt have the *Petala*, the *Stamina*, the *Apices*, and the *Stylus*: Wherefore whatever Flower wants any of theſe, is to be look'd upon as in that reſpect imperfect.

In moſt Plants there is a *Perianthium*, *Calix*, or Flower-Cup, of a ſtronger Conſiſtence than the Flower it ſelf, and deſign'd to ſtrengthen and preſerve it; it compaſſes the Flower about at the Bottom.

Mr. *Ray* divides alſo the perfect Flowers of Plants (now reckoning them perfect if they have the *Petala* without the *Stamina*) into Simple Flowers, which are not compoſed of other ſmaller ones, and which uſually have but one ſingle Style.

2. *Compounded*, *Aggregated*, or *Compoſite Flowers*, which are ſo compounded of many little *Floſculi*, as that they all make but *one Flower*.

Simple Flowers are *Monopetalous*, which have the Body of the *Flower* all of one entire Leaf, tho' ſometimes cut or divided a little way into many ſeeming *Petala* or Leaves, as in *Borage*, *Bugloſs*, &c. Or,

Polypetalous, which have diſtinct *Petala*, and thoſe falling off ſingly, and not altogether, as the ſeeming *Petala* of the *Monopetalous Flowers* always do.

And both theſe he divides into

Uniform and *Difform* } *Flowers*.

The former have the right and left Hand Parts, and the forward and backward Parts of the *Flower* all alike.

But thoſe he accounts to have a *Difform Flower*, which have no ſuch Regularity: as in the *Flowers* of *Sage*, *Dead-nettle*, &c.

A *Monopetalous Difform Flower* alſo, he divides into,

1. *Semifiſtular*; *i. e.* ſuch whoſe upper Part reſembles a Pipe cut off Obliquely, as in the *Ariſtolochia*.

2. *Labiate*, and this either with one Lip only, as in the *Acanthum* and *Scordium*: Or with two Lips, as in the far greateſt Part of the *Libiate Flowers*. And here the upper Lip of the Flower ſometimes is turned upwards, and ſo turns the Convex Part downwards, as in the *Chamæciſſus*, &c. But moſt uſually the upper Lip is Convex above, and turns the hollow Part down to its Fellow below, and ſo repreſents a kind of *Helmet* or *Monk's Head*. And from hence theſe are frequently called *Galleate*, *Cucullate*, and *Galericulate Flowers*, as you will find in Books of Botany: And in this Form are the *Flowers* of the *Lamium*, and moſt *Verticillate Plants*. Sometimes alſo the *Labium* is entire, and ſometimes jagged or divided.

3. *Corniculate*; *i. e.* ſuch hollow Flowers as have on their upper Part a kind of *Spur*, or *Little Horn*; as in the *Linaria*, *Delphinum*, &c. And the *Corniculum* or *Calcar* is always impervious at the Tip or Point.

Compounded Flowers are either,

1. *Diſcous*, or *Diſcoidal*, that is, whoſe little *Floſculi* are ſet together ſo cloſe, thick, and even, as to make the Surface of the Flower plain and flat; which therefore, becauſe of its round Form, will be like a *Diſcus*: Which Disk is ſometimes *Radiated*, when there are a Row of *Petala* ſtanding round in the Disk like the Points of a Star, as in the *Metricaria*, *Chamæmelum*, &c.

Sometimes *Naked*; *i. e.* having no ſuch radiating Leaves round the Limb of its Disk; as in the *Tanacetum*.

2. *Planifolious*, which is compoſed of plain Flowers ſet together in Circular Rows round the Center, and whoſe Face is uſually indented, notched, uneven, and jagged; as the *Hieracia*, *Sonchi*, &c.

3. *Fiſtular*, which is compounded of many long, hollow, little Flowers like Pipes, all divided into large Jaggs at the Ends.

Imperfect Flowers, becauſe they want the *Petala*, are called *Stamineous*, *Apetalous*, and *Capillaceous*.

And thoſe which hang pendulous by fine Threads like the *Juli*, are by *Tournefort* called *Amenta-ceous*, we call them Cat's-Tails.

The ſame Writer uſes alſo the Term *Campani-formis* for ſuch Flowers as are in the Shape of a Bell; and *Infundibuliformis* for ſuch as are in the Form of a Tunnel.

He diſtinguiſhes alſo ſome *Difform Monopetalous Flowers* by the Name of *Perſonati*; by which he means ſuch as expreſs the gaping Mouths of ſome *Animals*; and diſtinguiſhes *theſe* from what he calls *Labiati*, in that the *Stylus* or *Piſtillum* of theſe doth not end in a *Capſula Seminalis*, as it doth in *thoſe*.

FLOWER-DE-LIS, the Mark of Difference in *Heraldry* for the Sixth Brother of any Family: 'Tis alſo often born as Coat Armour.

FLOWER *of Sulphur or Brimſtone*, is made by putting the Sulphur groſly powdered into a Glaſs Body placed in a ſmall open Fire, and having put over, or into its Neck, another Veſſel of Earth of the ſame Form, but unglazed, the Fire will ſublime the Flowers, and make them adhere to the upper Veſſel, which muſt be changed every half Hour.

FLOWERS: That fine mealy Matter which in Sublimations in Chymiſtry is carried up into the Head and *Aludels*, and adheres to them in the Form of a fine Powder, the Chymiſts call *Flores* or Flowers: See *Aludels*.

FLOWN-SHEETS: The Seamen ſay a Ship ſails with *Flown-Sheets*, when her Sheets are not *haled home*, or cloſe to the Blocks: They ſay alſo, *Let fly the Sheet!* When in a great Guſt of Wind, for fear the Ship ſhould over-ſet, or *ſpend* her Top-maſts, they would have the Sheet *go a-main*, or as far as it will run, becauſe then the Sail will hold no Wind; and when the Sheets are thus let go, they ſay, *Her Sheets are Flown.*

FLUID *Body:* The Excellent Sir *Iſ. Newton* defines a *Fluid Body* to be that whoſe Parts eaſily give Place, and move out of the way on any Force impelled upon them, and by that means do ſo very eaſily move over one another; which is a much better Definition than that of *Des Cartes*, That a Fluid is a Body whoſe Parts are in continual Motion; becauſe 'tis neither apparent that the Parts of all Fluids are ſo; nor that the Parts of ſome Solid Bodies are not ſo.

FLUIDITY ſeems to conſiſt in this, That Parts of any Bodies being very fine and ſmall, are ſo diſpoſed by Motion and Figure, as that they can eaſily ſlide over one another's Surfaces all manner of ways: It ſeems requiſite alſo, as Mr. *Boyle* obſerves, That they ſhould be variouſly and ſeparately agitated to and fro, and that they ſhould touch one another but in ſome Parts only of their Surfaces: And that Excellent Gentleman, in his Hiſtory of Fluidity, intimates, That the Conditions requiſite to conſtitute a Fluid Body are chiefly theſe Three:

1. The *Littleneſs of its Parts:* Thus we ſee the Fire, by dividing Metal into Parts very fine and ſmall, will melt them, and make them Fluid. And Acid Menſtruums after the ſame manner diſſolve them and ſuſpend them in Liquor; and Fire will turn the hard Body of common Salt almoſt all of it into a Liquor, by Diſtillation; though 'tis not improbable, that the Shape and Figure of theſe ſmall Parts may conduce much towards producing this Quality of *Fluidity*: For we find in the Diſtillation of Oil Olive (which is a Fluid made only by Preſſure) that moſt of the Oil will by the Action of the Parts of the Fire, (note, it muſt be done in a Retort) be turned into a kind of conſiſtent Subſtance like Butter.

2. It ſeems requiſite to Fluidity, that there be ſtore of vacant Places interſperſed between the Corpuſcles of the Fluid Body; for elſe there will not be room for each Particle to continue its Motion and Agitation on the Surfaces of the neighbouring ones. For,

3. The chief Condition requiſite to conſtitute a Fluid Body, is, That its Particles be agitated variouſly, and apart, either by their own proper Motion, or by ſomething of Subſtance which tumbles them up and down by its Paſſage through them. That this Qualification chiefly is requiſite to Fluidity, you may gather from that common Experiment of putting Powder of Alabaſter, or of common Plaiſter of *Paris*, finely ſifted in a flat-bottom'd Veſſel over the Fire; for in a little time the dry Powder will boil like Water, and imitate all the Motions of a boiling Liquor; it will tumble variouſly over in great Waves like that, it will bear ſtirring with a ſtick or Ladle like that, without reſiſting, as it will do when cold; nay, if you ſtir it ſtrongly near the Side of the Veſſel, its Waves will apparently daſh up againſt the Sides; but yet if you take any of it out, and lay it ſpeedily on a Piece of White Paper, you will ſee 'tis nothing but a dry Powder.

So that from hence 'tis plain, there is a real Difference between a *Fluid Body* and a *Wetting Liquor*; for not only this boiling Powder, and melted Metals, but the Air, *Æther*, and even Flame it ſelf, are properly Fluid Bodies, though not moiſt Liquors.

This noble Gentleman found alſo, That by blowing the Smoak of Roſemary into a Glaſs Pipe, and then holding the Pipe (when filled) upright, the Surface of the Smoak would accommodate its ſelf to a level Situation; and which way ſoever you inclined the Tube, the Superficies of the Smoak would lie parallel to the Horizon; and when the Glaſs was much inclined, would run along it like Water.

Whence he infers, That in order to the rendring a Body Fluid, there is no need that its Parts ſhould be ſo cloſely condenſed as thoſe of Water are.

Dr. *Hooke*, in his *Micrograph. P.* 12. hath a pretty Experiment or Two to prove this Account of Fluidity, *viz.* that of a Diſh of Sand ſet on a Drum-head briskly beaten by the Sticks, or on the upper Stone of a Mill, turning ſwiftly round on the (empty) lower one; it will in almoſt all Reſpects emulate the Properties of a Fluid Body. For a heavy Body will immediately ſink in it to the Bottom, and a light one emerge to the Top: each Grain of Sand hath a conſtant vibrating and dancing Motion; and if a Hole be made in the Side of the Diſh, the Sand will ſpin out like Water: See *Vol.* II.

FLUOR *Albus*, or *Fluor Uterinus*, is a continual Evacuation of corrupt Humours from the Womb, or the Pores in the *Vagina*. *Blanchard.*

FLUORES, a Word uſed by the Modern Mineral Writers for ſuch ſoft tranſparent ſparry kinds of Mineral Concretions, as are frequently found

found among Oars and Stones in Mines and Quarries.

FLUSH; when the Deck of a Ship is even from Stem to Stern, without any Falls or Risings, they say her Deck lies *Flush* Fore and Aft.

FLUX and *Reflux* of the Sea: See *Tide*.

FLUX-POWDERS, or as the *French* call them, *Fondants*, are Powders prepared to facilitate the Fusion of the harder Metals, and to melt Oars in order to discover what Proportion of Metal they hold or contain.

Powder of Antimony alone is a very good Flux in many Cases, and by it you may readily melt Iron or Steel in a Crucible, with an ordinary Charcoal Fire.

Mr. *Boyle* gives an Account of a *Flux-Powder* he used which was composed of *Tartar*, *Sulphur*, and *Arsenick*.

FLUXION, the same with *Catarrh*.

FLUXIONS. Sir *Isaac Newton*, in his Admirable *Princip. Phil. Math. P.* 250. lays down this *Lemma*.

That the Moment *of any generated Quantity, is equal to the Moments of all the several generating Terms, multiplied into the Indices of their Powers, and into their Coefficients continually.*

Let a, b, c, &c. represent the Moments of any Quantities A, B, C, &c. increasing or decreasing by a perpetual *Fluxion*; then will the Moment or Mutation of the Rectangle AB be $Ab + aB$; and of the Content of ABC, the Moment will be $ABc + AbC + aBC$: and of the Powers A^2, A^3, A^4, the Moments will be $2aA$, $3aA^2$, $4aA^3$; and the Moments of $A^{\frac{1}{2}}, A^{\frac{3}{2}}, A^{\frac{1}{3}}, A^{\frac{2}{3}}, \frac{1}{A}, \frac{1}{A^2}, \frac{1}{A^{\frac{3}{2}}}$, will be $\frac{1}{2}aA^{-\frac{1}{2}}$, $2aA^{\frac{1}{2}}$, $\frac{1}{3}aA^{-\frac{2}{3}}$, $\frac{2}{3}aA^{-\frac{1}{3}}$, $-aA^{-2}$, $-2aA^{-3}$, and $-\frac{1}{2}A^{-\frac{3}{2}}$ respectively.

And generally, the Moment of any Power, suppose $A^{\frac{n}{m}}$, will be $\frac{n}{m}aA^{\frac{n-m}{m}}$, &c.

The Demonstration of which Lemma is this.

CASE I.

Suppose any Rectangle, as AB, made or increased by a perpetual Motion; and from the Sides AB, let there be subtracted the $\frac{1}{2}$ Moments, as $\frac{1}{2}a$ and $\frac{1}{2}b$: Then it will stand $A - \frac{1}{2}a$, and $B - \frac{1}{2}b$. Multiply them into each other, and there will arise $AB - \frac{1}{2}aB - \frac{1}{2}bA + \frac{1}{4}ab$.

Suppose also A and B increased by the half Moments, as $A + \frac{1}{2}a$, and $B + \frac{1}{2}b$; and that those thus augmented Quantities were multiplied by one another; then there will arise $AB + \frac{1}{2}aB + \frac{1}{2}Ab + \frac{1}{4}ab$ for the Product: From which subducting the former Rectangle $AB - \frac{1}{2}aB - \frac{1}{2}bA + \frac{1}{4}ab$, the Difference will be $aB + Ab$. Q. E. D. Which is the first Instance.

CASE II.

Let AB be $=$ to G: This multiplied by C, gives GC, or ABC; and its Moment, by the last *Case*, will be $gC + Gc$; that is, (if instead of G and g, you had put AB and $AB + Ab$) $aBC + AbC + ABc$. And thus it will ever be in the Quantities produced by continual Multiplication of unequal Factors.

CASE III.

Let A, B, and C, be all equal; and then the Moment of A^2, or of the Rectangle AB, will be $2aA = aB + Ab$; and the Moment of ABC or A^3, will be $3aA^2 = aBC + AbC + ABc$. And in the like manner if n represent the Index of any Power of A, the Moment of A^n will be naA^{n-1}. Q. E. D.

CASE IV.

Wherefore, since $\frac{1}{A}$ multiplied by $A = 1$, the Moment of $\frac{1}{A}$ multiplied by A, together with $\frac{1}{A}$ multiplied by a, will be the Moment of 1, that is, nothing.

Further, the Moment of $\frac{1}{A}$, or A^{-1}, is $-\frac{a}{A^2}$. And generally, since $\frac{1}{A^n}$ multiplied by $A^n = 1$, the Moments of $\frac{1}{A^n}$ multiplied by A^n, together with $\frac{1}{A^n}$ multiplied by naA^{n-1}, will be nothing. And consequently the Moment of $\frac{1}{A^n}$, or A^{-n}, will be $-\frac{a}{A^{n+1}}$. Q. E. D.

CASE V.

And since $A^{\frac{1}{2}}$ into $A^{\frac{1}{2}}$, produces A, the Moment of $A^{\frac{1}{2}}$ into $2A^{\frac{1}{2}}$, will be a (by *Case* 3.) and therefore the Moment of $A^{\frac{1}{2}}$ will be $\frac{a}{2A^{\frac{1}{2}}}$, or $2aA^{-\frac{1}{2}}$.

And generally, if $A^{\frac{m}{n}}$ be put equal to B, A^m shall be equal to B^n; and consequently $maA^{m-1} =$ to nbB^{n-1}, and maA^{-1} equal to nbB^{-1}, or $\frac{nb}{A^n}$: And therefore $\frac{m}{n}aA^{\frac{m-n}{n}}$ is equal to $\frac{b}{A^{\frac{m}{n}}}$; *i. e.* is equal to the Moment of $A^{\frac{m}{n}}$. Q. E. D.

CASE VI.

Wherefore the Moment of any generated Quantity $A^m B^n$, is the Moment of A^m multiplied by B^n, together with the Moment of B^n multiplied into A^m; that is, $maA^{m-1} + nbB^{n-1}$. And this whether the Indices of the Powers be Integers or Fractions, Affirmative or Negative.

And the same Reason holds in the Products of any Numbers multiplied by themselves continually as long as you please, or to as high Powers as you will. *Q. E. D.*

On which Foundations the Algorithm of Fluxions, according to our way of Notation, may be thus

thus eſtabliſhed; as I have before ſhewed in a good meaſure at the End of my *Algebra*, *Pag.* 115.

Where I ſhew, That by *the Doctrine of Fluxions*, we are to underſtand the Arithmetick of the *infinitely ſmall* Increments or Decrements of *indeterminate* or *variable Quantities*; or as ſome call them, the *Moments* or *infinitely ſmall Differences* of ſuch variable Quantities. Theſe infinitely ſmall Increments or Decrements our incomparable Sir *Iſaac Newton* calls very properly by this Name of *Fluxions*: For, as indeterminate and variable Quantities, *viz.* ſuch as in the Generation of Curvilineal and other Figures, by Local Motion, are continually increaſing or diminiſhing, he rightly denominates *Flowing Quantities*, as being ſuch as are perpetually augmented or leſſened, by the Flux or Motion of a *Line*, *Surface*, &c. So he calls the *Celerity* or *Velocity* of the Augmentation or Diminution of theſe *Flowing Quantities* by the Name of *Fluxions*. And becauſe all Figures may be conceived to be generated by Local Motion, as is now very commonly ſuppoſed among Geometers, therefore 'tis much more natural to conceive the infinitely ſmall Increments or Decrements of the variable and *flowing Quantities* under the Notion of *Fluxions*, than under that of *Moments*, or infinitely ſmall *Differences*, as *Leibnitz*, *Niewentiit*, and the Noble Author of *Analyſe des Infiniment Petits* chuſe rather to take them; though even that Way alſo is not without its Uſe in many Caſes.

The Excellent Sir *Iſaac Newton* ſuppoſes the *Abſciſſa* of a Curve, or any other flowing or variable Quantity to be uniformly augmented; and therefore for its *Fluxion* he puts 1 or Unity; and the other flowing Quantities he denotes uſually by the Letters v, x, y, z, and expreſſes their *Fluxions* by only repeating the ſame Letters with Points or Pricks over their Heads; thus, $\dot{v}$, $\dot{x}$, $\dot{y}$, $\dot{z}$, which are the Fluxions of the former flowing Quantities. And this Method is much more natural and ſhorter than *Niewentiit*'s, or the *French* one with the Differential d multiplied into the flowing Quantity, to denote the Fluxion.

And becauſe theſe *Fluxions* themſelves are alſo Indeterminate and Variable Quantities, and do continually increaſe or decreaſe, or grow greater or leſſer; therefore he conſiders the Velocities with which they do ſo increaſe or diminiſh, as the *Fluxions* of the former *Fluxions*: And thoſe may be called *Second Fluxions*, and are noted with Two Points over them; thus, $\ddot{y}$, $\ddot{x}$, $\ddot{z}$. And if you go on again, and conſider the perpetual Augmentation or Diminution of *theſe*, as their *Fluxions* alſo, you may make third, fourth, or fifth Fluxions, &c. which will be noted thus, $\dddot{y}$, $\dddot{x}$, $\dddot{z}$; $\ddddot{y}$, $\ddddot{x}$, $\ddddot{z}$; $\dddddot{y}$, $\dddddot{x}$, $\dddddot{z}$; and ſo on *ad Infinitum*. If the flowing Quantity be a Surd or a Fraction, he thus expreſſes its Fluxion; let the Surd be $\sqrt{:a-b}$, its Fluxion is $\frac{\dot{\sqrt{:a-b}}}{2\sqrt{:a-b}}$; and the Fluxion of the Fraction $\frac{xx}{d-y}$ is $\frac{\dot{x}x+x\dot{x}}{d-y}:\frac{xx}{d-y}$: See Dr. *Wallis*'s *Algebra*, *Lat. Edit. Pag.* 392.

The main Buſineſs of the Algorithm or Arithmetick of Fluxions conſiſts in theſe two Things:

I. *From the Flowing Quantity given, to find the Fluxion.*

II. *From the Fluxion, to find the Flowing Quantity.*

As to the former of theſe, the Learned Dr. *Wallis*, in the Place above-mention'd (from Sir *Iſaac Newton*'s Papers) gives this general Rule.

> *Let each Term of the Equation be multiplied ſeparately by the ſeveral Indexes of the Powers of all the Flowing Quantities contain'd in that Term: And in every ſuch Multiplication let one Root or Letter of the Power be changed into its proper Fluxion: So ſhall the Aggregate of all the Products connected together by their proper Signs, be the Fluxion of the Equation deſired.*

And all the Caſes of it are demonſtrated by Sir *Iſaac Newton* in the *Lemma* above delivered, which I ſhall exemplify by particular Inſtances.

I. In the General; To expreſs the Fluxions of ſimple variable Quantities, as was ſaid before, you need only uſe the Letter or Letters which expreſs them, with a ſmall Point over their Heads:

Thus, the Fluxion of x is $\dot{x}$, and the Fluxion of y is $\dot{y}$, and the Fluxion of $x+y+v+z$, is $\dot{x}+\dot{y}+\dot{v}+\dot{z}$, &c.

And (inverſely) the *Flowing Quantities* in this Caſe, will be eaſily had from the Fluxions, by only writing the Letters without the Points over them.

N. B. For the Fluxion of Permanent Quantities, when any ſuch are in the Equation, you muſt imagine o or a Cypher; for ſuch Quantities can have no Fluxions, properly ſpeaking, becauſe they are without Motion, or Invariable.

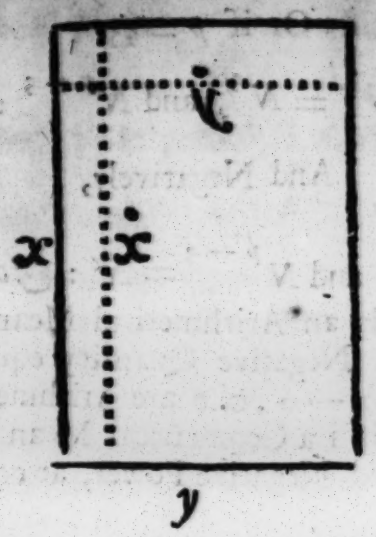
II. To find the Fluxions of the Products of two or more variable or flowing Quantities: *Multiply the Fluxion of each Simple Quantity by the Factors of the Products, or the Product of all the reſt, and connect the laſt Products by their proper Signs; the Sum or Aggregate is the Fluxion ſought.*

Thus, the Fluxion of xy is $\dot{x}y+x\dot{y}$; and the Fluxion of xyz, is $\dot{x}yz+x\dot{y}z+xy\dot{z}$; and the Fluxion of $xvyz$, is $\dot{x}vyz+x\dot{v}yz+xv\dot{y}z+xvy\dot{z}$; and the Fluxion of $a+x$ × by $b-y$ (the common Product being $ab+bx-ya-xy$) will be $b\dot{x}-y\dot{a}-x\dot{y}-\dot{x}y$.

Demonſtration of Rule 2.

Suppoſe xy = to any Rectangle made or increaſed by a perpetual Motion or Fluxions of either of the Sides x or y along the other; and let the Moments or Fluxions of the Sides be $\dot{x}$ and $\dot{y}$: By which we underſtand the *Velocity* with which either Side moves to form the Rectangle.

From



From the Sides ſubduct the half Fluxions of thoſe Sides, and it will ſtand thus; $x - \frac{\dot{x}}{2}$, and $y - \frac{\dot{y}}{2}$.

Multiply theſe one into another, and the Product will be $xy - \frac{y\dot{x}}{2} - \frac{x\dot{y}}{2} + \frac{\dot{x}\dot{y}}{4}$:

Then to the Sides add the half Moments or Fluxions, and it will be thus; $x + \frac{\dot{x}}{2}$, and $y + \frac{\dot{y}}{2}$: Which multiplied alſo into one another, will produce $xy + \frac{y\dot{x}}{2} + \frac{x\dot{y}}{2} + \frac{\dot{x}\dot{y}}{4}$

After which ſubſtract the former Product from this laſt, and the Difference will be only $x\dot{y} + \dot{x}y$, the Fluxion of xy, according to the Rule.

The Inverſe of this Rule finds alſo (in this Caſe) the *Flowing Quantity* from the *Fluxion*, *viz.* if each Member of the Fluxion be divided by the Fluxionary Quantity or Letter, or by changing the Fluxionary Letter into that proper Flowing Quantity of which it is the Fluxion; for then the Quotes connected by their proper Signs, will be the Flowing Quantities ſought: Only if the Letters be all exactly the ſame, the Flowing Quantity will be a Simple one, whoſe Parts are not to be connected together by the Signs + and —, as in the firſt three Examples of this Rule.

III. To find the Fluxion of any Fraction. *Multiply the Fluxion of the Numerator by the Denominator, and after it place (with the Sign —) the Fluxion of the Denominator to the Numerator, and divide the whole by the Square of the Denominator.*

Thus, the Fluxion of $\frac{x}{y}$ is $\frac{\dot{x}y - x\dot{y}}{yy}$; for ſuppoſe $\frac{x}{y} = z$, then will $x = yz$; which equal Quantities will have equal Fluxions; therefore $\dot{x} = \dot{y}z + z\dot{y}$, and $\dot{x} - z\dot{y} = z\dot{y}$; and dividing all by y $\frac{\dot{x} - x\dot{y}}{y} = \dot{z} =$ (becauſe $\frac{x}{y} = z$) $\frac{y\dot{x} - x\dot{y}}{yy}$: Wherefore this laſt is the Fluxion of the Fraction $\frac{x}{y} = z$; becauſe z being $= \frac{x}{y}$, $\dot{z}$ will be equal to the Fluxion of $\frac{x}{y}$. And the Fluxion of $\frac{a}{x}$ will be $\frac{-\dot{x}a}{xx}$; for the Permanent Quantity a having no Fluxion, there can be no Product of the Fluxion of the Numerator into the Denominator, as there would have been, had a been x, z, or any other Variable Quantity.

Alſo the Fluxion of $\frac{x}{a}$ will be $\frac{\dot{x}a}{aa}$, and the Fluxion of $\frac{x}{a+x}$, will be $\frac{\dot{x}a + \dot{x}x - \dot{x}a}{aa + 2ax + xx}$ or $\frac{\dot{x}a}{aa + 2ax + xx}$; becauſe $-\dot{x}x$ and $+\dot{x}x$ deſtroy one another: Alſo the Fluxion of $\frac{1}{x}$ or x^{-1}, is $\left(\frac{-\dot{x}}{x^2.}\right)$ Here alſo the Reverſe of the Rule ſerves to find the Flowing Quantity from the Fluxion: As if the Flowing Quantity of the Fraction were required, $\frac{\dot{x}y - x\dot{y}}{yy}$; Firſt multiply it by the Square of the Denominator, and it will be $\dot{x}y - x\dot{y}$; from which take away $-x\dot{y}$, which was placed after it, and it will be $\dot{x}y$; omit the Point and 'tis xy, which, becauſe y is the Denominator of a Fraction, will at laſt be $\frac{x}{y}$.

Before the Fluxions of any Power, whether perfect or imperfect, can be found, the following way of Notation muſt be well underſtood.

If a Series of Geometrical Progreſſionals be in this Order,

1. x. xx. x^3. x^4. x^5. x^6. x^7. &c.

Their Indexes or Exponents will be in Arithmetical Progreſſion, and ſtand thus;

0, 1. 2. 3. 4. 5. 6. 7.

But if they are Fractions, as

$\frac{1}{x}$ $\frac{1}{x}$ $\frac{1}{x^3}$ $\frac{1}{x^4}$ $\frac{1}{x^5}$ $\frac{1}{x^6}$ $\frac{1}{x^7}$.

Then their Exponents will be Negative, and ſtand thus, — 1. — 2. — 3. — 4. — 5. — 6. — 7.

For if you ſuppoſe $x = 2$, then will $\frac{1}{x} = \frac{1}{2}$, and $\frac{1}{xx} = \frac{1}{4}$, and $\frac{1}{x^3} = \frac{1}{8}$, &c.

Or if you expreſs the Geometrical Series by means of the Exponents, it will ſtand thus, x^{-1}, x^{-2}, &c. and if it were expreſſed thus, x^0, then it will be $x^0 = 1$; becauſe 2 is the Denominator of the Ratio, in which Unity is not affected. Thus alſo $\frac{1}{x^4} = x^{-4}$, and $\frac{1}{x^3} = x^{-3}$; and $1 = x^0$, $x^1 = x$, $x^2 = xx$, &c.

Alſo the Exponent of $\sqrt{:}\, x$ will be $\frac{1}{2}$, becauſe as $\sqrt{:}\, x$, is a Mean Proportional between 1 and x; ſo $\frac{1}{2}$, is an Arithmetical Mean between 0 and 1.

And the Exponent of $\sqrt[3]{:}\, x$ will be $\frac{1}{3}$, becauſe as $\sqrt[3]{:}\, x$ is the firſt of the two Mean Proportionals between 1 and x; ſo $\frac{1}{3}$ is the firſt of the two Arithmetical Means between 0 and 1.

For ſince 1. x. x^2. x^4. x^8. are continually Proportional, therefore their Cubes or any other Roots, will

will be alſo continually Proportional; that is, $\sqrt{}:1$ $(=1).\ \sqrt[3]{}x.\ \sqrt[3]{}:xx.\ \sqrt[3]{}xxx\ (=x)\ \&c.$

So alſo,

$1.\ x.\ xx.\ x^3.\ x^4.\ x^5.\ \&c.$: Wherefore the Roots of the 5th Power of thoſe Quantities will be $\&c.$;

That is,

$\sqrt[5]{}1.\ \sqrt[5]{}x.\ \sqrt[5]{}x^2.\ \sqrt[5]{}x^3.\ \sqrt[5]{}x^4.\ \sqrt[5]{}x^5\ (=x.)$

Alſo, for the ſame Reaſon, the Exponent of $\sqrt[5]{}:x^4$, will be $\frac{4}{5}$.

N.B. Always place the Index of the Letter (or Power) over that of the Radical Sign.

Thus, in Fractions, the Exponent of $\frac{1}{x}$ will be -1, of $\frac{1}{\sqrt{}:x^3}$ will be $-\frac{3}{2}$, of $\frac{1}{\sqrt[3]{}:x^5}$ will be $-\frac{5}{3}$, of $\frac{1}{\sqrt{}:x^7}$ will be $-\frac{7}{2}$, $\&c.$

N.B. $\sqrt{}:x$ and $x^{\frac{1}{2}}$, or $\sqrt[3]{}:x$ and $x^{\frac{1}{3}}$, or $\sqrt[5]{}:x^4$, and $x^{\frac{4}{5}}$, are only two different ways of Notation for one and the ſame thing, the former in the *old*, the latter in the *new* way.

So likewiſe $\frac{1}{x}$ and x^{-1} are all one; and $\frac{3}{x}$ is x^{-3}, $\&c.$

The way of reading or expreſſing Quantities ſo denoted is thus; x^{-3} is Unity divided by the Cube of x, and if it were $x^{-\frac{7}{3}}$, it muſt be read, Unity or One, divided by the Cube Root of the 7th Power of x.

Note alſo, That the Sum of any two Exponents of two Numbers or Quantities, in any Geometrick Progreſſion, makes the Exponent of the Product of thoſe two Terms.

Thus, $x^{\frac{1}{2}+\frac{2}{3}}$, or $x^{\frac{7}{6}}$, is the way of expreſſing the Product of $x^{\frac{2}{3}}$ into $x^{\frac{1}{2}}$, and $x^{-\frac{1}{3}+\frac{1}{5}}$, or $x^{-\frac{2}{15}}$, is the Product of $x^{-\frac{1}{3}}$ into $x^{\frac{1}{5}}$.

Alſo $x^{-\frac{1}{3}-\frac{1}{3}}$, or $x^{-\frac{2}{3}}$, is the Product of $x^{-\frac{1}{3}}$ into it ſelf, or the Square of $x^{-\frac{1}{3}}$.

And the Difference between the Exponents of any two Terms, is the Exponent of the Quotient ariſing by Diviſion of the greater by the leſs.

Thus, $x^{\frac{1}{2}-\frac{1}{3}}$ or $x^{\frac{1}{6}}$ is the Exponent of the Quotient of $x^{\frac{1}{2}}$ by $x^{\frac{1}{3}}$, $\&c.$

Let p repreſent the Exponent of N any Number at pleaſure; and let $p=1$.

Then will $N^p = N^1$, $N^{p+1} = N^2$, and $N^{p+2} = N^3$, $N^{p+3} = N^4$, $\&c.$

Or if $p=33$.

Then will $N^p = N^3$, and $N^{p+3} = N^6$, $\&c.$

And Negatively,

$N^{-p} = N^3$, and $N^{p+3} = N^6$: $\&c.$

Alſo, as 0 is an Arithmetical Mean between a Poſitive and a Negative Quantity equally diſtant from it; (*i. e.*) $-6.0.6$ are Arithmetically Proportional: So is 1 a Geometrical Mean between an Affirmative and Negative Power, at equal Diſtances from it.

That is, $N^{-p}.\ 1.\ N^p\ \&c.$

Wherefore $1 = N^{-p} \times N^p$. And dividing all by N^p, $\frac{1}{N^p} = N^{-p}$.

So that $\frac{1}{N^{2p}}$ is all one with N^{-2p}.

And to add ſome Examples of Multiplication and Diviſion in this way,

$\frac{1}{x} \times \frac{1}{\sqrt[3]{}x^5} = x^{-1} \times x^{\frac{5}{3}} = x^{-\frac{3}{3}} \times x^{\frac{5}{3}} = x^{-\frac{8}{3}}$

$= \frac{-1}{x^{\frac{8}{3}}} = \frac{1}{\sqrt[3]{}x^8}$, $\&c.$

And $\frac{1}{\sqrt[3]{}x^5}$ divided by $\frac{1}{x}$ will ſtand in this Notation; thus, $\frac{1}{x}) \frac{1}{\sqrt[3]{}x^5}\ (=x^{-1})\ x^{-\frac{5}{3}}\ (=x^{-\frac{1}{3}})$

$x^{-\frac{5}{3}} = (x^{-\frac{2}{3}} = \frac{1}{\sqrt[3]{}xx}$, $\&c.$

IV. This being well underſtood, there is this general Rule for the finding the Fluxion of any Power, whether Perfect or Imperfect, *viz. Multiply the Power (firſt brought one Degree lower) by the Index of that firſt Power; and then, that Product by the Fluxion of the Root.*

Thus the Fluxion of xx will be $2x\dot{x}$, for $xx = x \times x$; but the Fluxion of $x \times x = \dot{x}x + x\dot{x} = 2\dot{x}x$, $\&c.$ and the Fluxion of x^3 will be $3xx\dot{x}$. That of x^8 will be $8x^7\dot{x}$, $\&c.$ or if m expreſs the Index of any Power, as ſuppoſe x^n, then its Fluxion will be $mx^{m-1}\dot{x}$, or $m\dot{x}x^{m-1}$: For x^m brought one Degree lower (m being a general Index) muſt be x^{m-1}; then that $\times$ by m the Index, makes mx^{m-1}; and this laſt by the Fluxion of the Root produces $mx^{m-1}\dot{x}$.

If the Power be produced from a Binomial, $\&c.$ as ſuppoſe $xx + 2xy + yy$, its Fluxion will be $2x\dot{x} + 2\dot{x}x + 2\dot{x}y + 2y\dot{y}$, by working according to this Fourth and the Second Rules.

If the Exponent be Negative, as ſuppoſe x^{-m} or $\frac{1}{x^m}$, its Fluxion will be $-mx\dot{x} - m - 1$: Or if you would do it by way of Fraction, $\frac{-mx^{m-1}\dot{x}}{x^{2m}}$, for

(for the Square of x^m is as well x^{2m} as x^{m2}) or according to Sir *Is. Newton*'s Way, which is yet ſhorter, $\frac{-mx}{x^{m+1}}$: See *Caſe* 4. *P.* 252. of his *Principia*.

If the Power be Imperfect, *i. e.* if its Exponent be a Fraction, as ſuppoſe $\sqrt[n]{}: x^m$; or in the other Notation $x^{\frac{m}{n}}$, let us ſuppoſe $x^{\frac{m}{n}} = z$: Then if you raiſe up each Member to the Power of n, it will ſtand thus, $x^m = z^n$; the Fluxion of which will be, by this general Rule, $mx^{m-1}\dot{x} = nz^{n-1}\dot{z}$. Wherefore $\dot{z}$ will be $= \frac{m\dot{x}x^{m-1}}{nz^{n-1}}$ (by dividing both Parties by nz^{n-1};) and $\frac{m\dot{x}x^{m-1}}{nz^{n-1}} = \frac{m}{n}x^{\frac{m}{n}-1}\dot{x}$, or $\frac{m}{n}\dot{x}\sqrt[n]{}\, x^{m-n}$, by putting instead of nz^{m-1}, its Value $nx^{m\frac{m}{n}}$: So that to find the Fluxion of any kind of Power, you muſt proceed thus:

Multiply the Power given by its Index or Exponent, and then that Product by the Fluxion of the Root of the Power given; and after that, ſubduct One or Unity from the Index of the Power.

As for the Fluxions of *Surd Quantities*, Mr. *Hayes* gives the following Examples in his Treatiſe of Fluxions lately printed, which will make the thing plain to any one that will render himſelf ready at the Practice of this Art.

RULE V.

To find the Fluxions of Surd Quantities.

Let it be requir'd to find the Fluxion of $\sqrt{2rx - xx}$, or $\overline{2rx - xx}|^{\frac{1}{2}}$. Suppoſe $\overline{2rx - xx}|^{\frac{1}{2}} = z$; then is $2rx - xx = \dot{z}z$; and conſequently $r\dot{x} - x\dot{x} = z\dot{z}$; and by Diviſion, $\frac{r\dot{x} - x\dot{x}}{z} = \dot{z} =$ (by Subſtitution) $\frac{r\dot{x} - x\dot{x}}{\sqrt{2rx - xx}} =$ to the Fluxion of $\sqrt{2rx - xx}$

Let it be required to find the Fluxion of $\overline{ay - xx}|^3$; for $\overline{ay - xx}^3$ put z, and then $ay - xx = z^{\frac{1}{3}}$, and $a\dot{y} - 2x\dot{x} = \frac{1}{3}z^{-\frac{2}{3}}\dot{z}$: And multiplying by 3, $3a\dot{y} - 6x\dot{x} = z^{-\frac{2}{3}}\dot{z}$; and conſequently, $3az^{\frac{2}{3}}\dot{y} - 6z^{\frac{2}{3}}x\dot{x} = \dot{z}$ equal (ſubſtituting $\overline{ay - xx}|^2 = z^{\frac{2}{3}}$) $3a^3y^2\dot{y} - 6a^2x^2y\dot{y} + 3ax^4\dot{y} - 6a^2y^2x\dot{x} + 12ayx^3\dot{x} - 6x^5\dot{x} =$ to the Fluxion of $\overline{ay - xx}^3$.

The Fluxions of imperfect Powers may be alſo inveſtigated by (*Art.* 20.) the General Rule, and expreſs'd otherwiſe, and more briefly thus:

The Fluxion of $\overline{2rx - xx}|^{\frac{1}{2}}$, is equal $\frac{1}{2} \times \overline{2rx - xx}| - \frac{1}{2} \times 2r\dot{x} - 2x\dot{x} = \frac{r\dot{x} - x\dot{x}}{\sqrt{2rx - xx}}$.

The Fluxion of $\overline{ay - xx}|^3$, is $= 3 \times \overline{ay - xx}|^2 \times a\dot{y} - 2x\dot{x}$; which being reduced, will be found equal to the Fluxion thereof formerly found.

The Fluxion of $\sqrt{xy + yy}$, is $= \frac{1}{2} \times \overline{xy + yy}|^{\frac{1}{2}} \times y\dot{x} + x\dot{y} + 2y\dot{y}$ (*Article* 15.) $\frac{y\dot{x} + x\dot{y} + 2y\dot{y}}{2\sqrt{xy + yy}}$. The Fluxion of $\sqrt{a^4 + axyy}$ is $= \frac{1}{2} \times \overline{a^4 + axyy}| - \frac{1}{2} \times \overline{ay^2}\dot{x} + 2axy\dot{y} = \frac{ay^2\dot{x} + 2axy\dot{y}}{2\sqrt{a^4 + axyy}}$.

The Fluxion of $\sqrt{ax + xx + \sqrt{a^4 + axyy}}$ is $=$ (by the *Art.* 20. Rule, and the preceding Example)

$$= \tfrac{1}{2} \times \overline{ax + xx + \sqrt{a^4 + axyy}}^{\frac{1}{2}} \times a\dot{x} + 2x\dot{x} + \frac{ay^2\dot{x} + 2axy\dot{y}}{2\sqrt{a^4 + axyy}}$$

$$= \frac{a\dot{x} + 2x\dot{x}}{2\sqrt{ax + xx + \sqrt{a^4 + axyy}}} + \frac{ay^2\dot{x} + 2axy\dot{y}}{2\sqrt{ax + xx + \sqrt{a^4 + axyy}} \times z2\sqrt{a^4 + axyy}}$$

The Fluxion of $\frac{\sqrt{ax + xx}}{\sqrt{xy + yy}}$, is (*Art.* 14. 20. (finding the Fluxions of the Numerator and Denominator) $\frac{a\dot{x} - 2x\dot{x}}{3\sqrt[3]{ax + xx}^2} \times \sqrt{xy + yy} \times \frac{y\dot{x} + x\dot{y} + 2y\dot{y}}{2\sqrt{xy + yy}} \times \sqrt[3]{ax + xx}$ $\div xx + yy$.

To find the Fluxions of Quantities compounded of Rational and Surd Quantities: Let it be requir'd to find the Fluxion of $\frac{bx^2 + cax + ea^2}{x\sqrt{xx + aa}} = z$. Put $bx^2 + cax + ea^2 = p$, and $\sqrt{xx + aa} = q$. Then the given Quantity is $pq = z$, and the Fluxion thereof is $\dot{p}q + q\dot{p} = \dot{z}$: But $\dot{q}$ is $= \frac{x\dot{x}}{\sqrt{xx + aa}}$ and $\dot{p}$ is $= 2bx\dot{x} + ca\dot{x}$; therefore in the Equation $\dot{p}q + q\dot{p} = \dot{z}$, if in place of p, q, $\dot{p}$, $\dot{q}$, we reſtore the Quantities they repreſent, we ſhall have $\frac{bx^3 + cax^2 + ea^2}{\sqrt{xx + aa}} \times x\dot{x} + 2bx \times \sqrt{xx + aa} \times \dot{x} + ca \times \sqrt{xx + aa} \times \dot{x} = \dot{z}$. Which being reduc'd to one Denomination, gives $\frac{3bx^3 + 2acx^2 + ea^2x + 2ba^2x + xa^3 \times \dot{x}}{\sqrt{xx + aa}} = z =$ to the Fluxion of the given Quantity.

RULE VI.

To find the Fluxions of Powers, *where the* Exponents of those Powers *are themselves* Fluent Quantities. *By Mr.* Humphry Ditton, *Master of the New Mathematical School in* Christ's Hospital.

Let z, y, x, and v be flowing Quantities; the Varieties that may happen here, are reducible to these following Cases.

It is either z^y, z^{y+x}, z^{yx}, $z^{\frac{y}{x}}$, $z^{\frac{x}{y}}$; in which last Case x is the Exponent of y, as y it self is also of z.

CASE I.

Let z^y be proposed, and suppose $z^y = v$, then $\overline{z + \dot{z}|^{y+\dot{y}} = v + \dot{v}}$, but $\overline{z + \dot{z}|^{y+\dot{y}} = z^{y+\dot{y}} + y z^{y+\dot{y}-1}\dot{z}}$ (rejecting all the consequent Terms of the Series in which any Powers or Products of Fluxions would be found) *ergo* $v + \dot{v} = z^{y+\dot{y}} + y z^{y+\dot{y}-1}\dot{z}$, and $z^{y+\dot{y}} + y z^{y+\dot{y}-1}\dot{z} - v = \dot{v}$, but $v = z^y$; from whence $z^{y+\dot{y}} + y z^{y+\dot{y}-1}\dot{z} - z^y = \dot{v}$, is for that reason the Value of the Fluxion required.

CASE II.

2. Let $z^{y+z} = v$, then $\overline{z + \dot{z}|^{y+\dot{y}+x+\dot{x}} = v + \dot{v}}$, but $\overline{z + \dot{z}|^{y+\dot{y}+x+\dot{x}} = z^{y+\dot{y}+x+\dot{x}} + y z^{y+\dot{y}+x+\dot{x}-1}\dot{z} + x z^{y+\dot{y}+x+\dot{x}-1} z}$; *ergo* $z^{y+\dot{y}+x+\dot{x}} + y z^{y+\dot{y}+x+\dot{x}-1}\dot{z} + x z^{y+\dot{y}+x+\dot{x}-1} z - z^{y+x} = \dot{v}$.

CASE III.

3. Let $z^{yx} = v$, then $v + \dot{v} + \overline{z + \dot{z}|^{yx+y\dot{x}+x\dot{y}} = z^{x+y\dot{x}+x\dot{y}+xy\dot{x}} z^{yx+y\dot{x}+x\dot{y}-1}\dot{z}}$, from whence arises $z^{yx+y\dot{x}+x\dot{y}} + xyx\, z^{yx+y\dot{x}+x\dot{y}-1}\dot{z} - z^{yx} = \dot{v}$.

CASE IV.

4. Let $z^{\frac{y}{x}} = v$, then $v + \dot{v} = \overline{z + \dot{z}|^{\frac{y}{x} + \frac{\dot{y}x - x\dot{y}}{xx}}} = z^{\frac{yx+x\dot{y}}{xx} - \frac{y\dot{x}}{xx}} z^{\frac{yx+x\dot{y}-y\dot{x}-1}{xx}}\dot{z}$, thence $z^{\frac{yx+x\dot{y}-y\dot{x}}{xx}} = z^{\frac{yx+x\dot{y}-y\dot{x}}{xx}} + \frac{y}{x}$ $z^{\frac{yx+x\dot{y}-y\dot{x}-1}{xx}}\dot{z} - z^{\frac{y}{x}} = \dot{v}$.

CASE V.

Lastly, Let $z^{\frac{x}{y}} = v$, the Fluxion of $y^x = y^{x+\dot{x}} + xy^{x+\dot{x}-1}\cdot y - y^x$; *ergo* we have $v + \dot{v} = z^{\frac{x}{y} + \frac{x+\dot{x}}{y} + \frac{x\dot{y}}{yy} - \frac{x+\dot{x}-1}{y-1}}\dot{z} = z^{\frac{x}{y}} + \frac{x+\dot{x}}{y} + \frac{x\dot{y}}{yy} - \frac{x+\dot{x}-1}{y-1}\dot{z}$; and thence it is plain, that $v = z^{\frac{x+\dot{x}}{y} + \frac{x\dot{y}}{yy} - \frac{x+\dot{x}-1}{y-1}\dot{z}} - z^{\frac{x}{y}}$.

Next for the Rule *Inversely*, to find the Flowing Quantity belonging to the Fluxion of any Power, whether Perfect or Imperfect, proceed thus:

I. Take the Fluxionary Letter or Letters out of the Equation.

II. Augment the Index of the Fluxion by 1 or Unity.

III. Divide the Fluxion by the Index of its Power so increased by Unity.

Examples.

If $3\dot{x}\dot{x}\dot{x}$ were proposed; by taking away $\dot{x}$, it will be $3\dot{x}\dot{x}$; and by increasing its Index by Unity, it will be $3\dot{x}\dot{x}\dot{x}$: Then dividing it by 3. its now (augmented) Index, the Quotient will be $\dot{x}\dot{x}\dot{x}$, the Flowing Quantity required.

Again:

Suppose $\frac{n}{m}\dot{x}x^{\frac{n}{m}-1}$ a Fluxion proposed: By taking away the Fluxionary $\dot{x}$, it will be $\frac{n}{m}x^{\frac{n}{m}-1}$: By augmenting the Index by Unity (*i. e.* taking away -1) it will be $\frac{n}{m}\dot{x}^{\frac{n}{m}}$: And lastly, by dividing the remaining Part of the Fluxion by $\frac{n}{m}$, prefixed to, or multiplied into $\dot{x}$, the Quotient will be $x^{\frac{n}{m}}$: Which is the Flowing Quantity sought.

You will find Examples enough of this *Inverse Method*, the *Calculus Integralis*, or *Summatory Arithmetick*, in Mr. *Hayes*'s Book of Fluxions. *Sect.* 4.

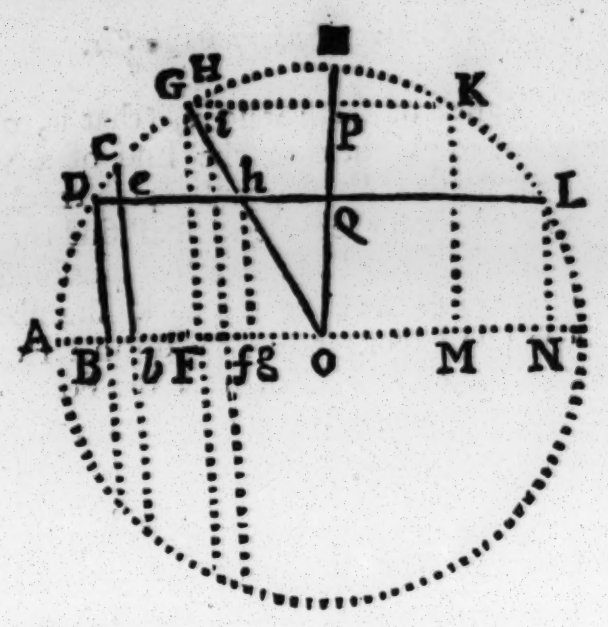
Some Instances of the Proportions of Fluxions in various Curves, by Mr. H. Ditton.

Let x and v express Abscisses, y and z the Correspondent Ordinates universally: Then in the Circle we have $\dot{y} : \dot{z} :: \frac{r\dot{x} - x\dot{x}}{y} : \frac{r\dot{v} - v\dot{v}}{z}$: And supposing the Abscisse to flow uniformly, and consequently $\dot{x} = \dot{v}$, we have $\dot{y} : \dot{z} :: ry = xz : ry - vy :: r - x : \frac{ry - vy}{z}$; *viz.* the Fluxions Ce, Hi, are to one another, as BO to GO; the Point g being ever determined by the Perpendicular hg, let fall from h the Intersection of the Radius OG, with the Line Dh.

'Tis certain that $gO = \frac{ry = vy}{z}$, from the Similar Triangles GFO, hgO; for $hg = DB = y$, and $z : r - v :: y : \frac{ry - vy}{z}$.

$AC = r$

$AC = r$ $CF = z$ $Hi = z$
$AB = x$ $DB = y$ $OF = u$
$AF = v$ $Ce = j$ $OB = x$



In the Parabolick Curves, putting p the Parameter $= 1$, then $y = x^n$, and $z = v^n$, then $\dot{y} : \dot{x} :: n x^{n-1} : n v^{n-1} :: v^{n-1} : y^n :: \frac{v^{n-1}}{y^n} : \dot{z}$.

Therefore in the common Parabola, $\dot{y} : \dot{z} :: \frac{1}{y} : \frac{1}{z} :: z : y$, that is, the Fluxions of the Ordinates are reciprocally as the Ordinates.

Therefore if an Hyperboloid be form'd from the Parabola; that is, one whose Ordinates (to the Convex Side of the Curve, and parallel to one of the Asymptotes) be a Series of Reciprocals to the Subsecundans; and one Asymptote being the Axe of the Parabola, and the other the Vertical Tangent of the Parabola; then the Fluxion of the Parabolical Ordinates shall be as the corresponding Ordinates in the Hyperboloid.

In the Vulgar Cycloid, the corresponding Circular Ordinates being called s and t, from the Nature of the Cycloid $\dot{y} = \dot{s} + \dot{c}$, and $\dot{z} = \dot{t} + \dot{C}$, the Quantities c and C expressing the Circular Arches. But from the Nature of the Circle $\dot{s} + \dot{c} = \frac{2r\dot{x} - x\dot{x}}{s}$, and $\dot{t} + \dot{c} = \frac{2r\dot{v} - v\dot{v}}{t}$, so that $\dot{y} : \dot{z} :: \frac{2r - x}{s} : \frac{2r - v}{t} :: \frac{}{2r - x} \times t : \frac{}{2r - v} \times s$. So that the Fluxions of the Cycloidick Ordinates, are in the Ratio compounded of the Segments of the Diameter directly, and the Circular Ordinates Inversely, or as the Rectangles under those Segments, and the Ordinates alternately taken.

In the Circle putting c, C, the Fluxions of the Curve corresponding to the Equal Fluxions of the Absciffes $\dot{x}$ and $\dot{v}$, we have $\dot{c} = \frac{r\dot{x}}{y}$, and $\dot{C} = \frac{r\dot{v}}{z}$; and consequently, $\dot{c} : \dot{C} :: \frac{r}{y} : \frac{r}{z} :: z : y$; that is, the Fluxions of the Curve are reciprocally as the Ordinates.

FLUXUS *Chylosus*, the same with *Celiaca passio*.

FLUXUS *Hepaticus*, is a kind of Dysentery, wherein black shining Blood, and much over-heated and torrified, as it were, is driven out of the Guts by the Fundament: It is sometimes taken for a Dysentery, wherein serous sharp Blood is evacuated. *Blanchard*.

FLY: See *Flie*.

FLYING-CAMP, is a small Body of an Army, consisting of 4, 5, or 6000 Men, and sometimes of a greater Number, as well Foot as Horse, which continually keeps the Field, making divers Motions to prevent the Incursions of the Enemies, or to frustrate their Enterprizes; to hinder Convoys, to harass the adjacent Country, and to throw it self, as occasion serves, into any Besiged Place.

FLYING-PINION, is a Part of a Clock, having a Fly or Fan, thereby to gather Air, and so to bridle the Rapidity of the Clock's Motion, when the Weight descends in the Striking Part.

FOCILE *Majus*, is the greater Bone of the Cubit called *Ulna*; or the lesser Bone of the Leg, called *Fibula*.

FOCILE *Minus*, is the lesser Bone of the Cubit, called *Radius*; or the lesser Bone of the Leg, called *Tibia*.

FOCUS, is with some a Place in the Mesentery, or other Parts, whence they formerly deduced the Original of Fevers.

FOCUS of an *Ellipsis*, is a Point towards each End of the longer Axis; from whence two Right Lines being drawn to any Point in the Circumference, shall be together equal to that longer Axis: See *Ellipsis*.

FOCUS of a *Parabola*, is a Point in the Axis within the Figure, and distant from the Vertex by a fourth Part of the *Parameter* or *Latus Rectum*. To find it, see *Parabola*, *Consectary* 5.

It is called the *Focus*, because it is the Point where the Sun's Rays will be united, when reflected from a *Parabolick Concave*, and consequently will there burn Bodies, and hence by some it is called the *Burning Point*. See more under *Parabola*.

FOCUS, in *Opticks*, or the *Focus* of a Glass, is the Point of Convergence or Concourse, where the Rays meet and cross the Axis after their Refraction by the Glass.

How to find this Point or Focus, Mr. *Molyneux*, in his Excellent *Dioptrica Nova*, gives several demonstrative Ways, *Pag.* 10, 11, 12, &c. As,

1. If there be a Body of Glass whose Surface is Convex, or the Segment of a Sphere, the Focus will be distant from the Pole or Vertex of the Glass almost a Diameter and half of the Convexity.

2. In a Plano-Convex Glass, the parallel Rays are united with the Axis, or its Focus is from the Pole of the Glass at the Distance of a Diameter of the Convexity, if the Segment be but of 30 Degrees.

In a Plano-Convex Glass, As 107 : 193 :: So is the Radius of the Convexity: To the Refracted Ray taken in its Concourse with the Axis, which in Glasses of large Spheres, is almost equal to the Distance of the Focus taken in the Axis.

3. In double Convex Glasses of the same Sphere, the Focus is distant from the Pole of the Glass about the Radius of the Convexity, if the Segment be but 30 Degrees.

But if the Convexities are unequal, or if the two Sides are Segments of different Spheres;

Then the Rule is,

As the Sum of the Radij of both Convexities:
To the Radius of either Convexity alone ::
So is the double Radius of the other Convexity:
To the Diſtance of the Focus.

N. B. The Rays which fall nearer the Axis of any Glaſs, are not united with it ſo ſoon as thoſe which are farther off: Nor will the Focal Diſtance be ſo great in a Plano-Convex Glaſs, when the Convex Side is towards the Object, as on the contrary. Wherefore that Learned Gentleman concludes truly, That in viewing any Object by a Plano-Convex Glaſs, the Convex Side ſhould be turned outward: As alſo in burning by ſuch a Glaſs, *P.* 25.

FOCUS *Virtual:* See *Virtual Focus.*

1. In Concave Glaſſes, when a Ray falls from Air parallel to the Axis, the *Virtual Focus*, by its firſt Refraction, is at the Diſtance of a Diameter and a Half of the Concavity.

2. In Plano-Concave Glaſſes, when the Rays fall parallel to the Axis, the *Virtual Focus* is diſtant from the Glaſs the Diameter of the Concavity.

3. In Plano-Concave Glaſſes, As 107: 193::
So the Radius of the Concavity:
To the Diſtance of the *Virtual Focus.*

4. In Double Concaves of the ſame Sphere, Parallel Rays have their *Virtual Focus* at the Diſtance of the Radius of the Concavity.

But whether the Concavities be equal or unequal, the *Virtual Focus*, or *Point of Divergency* of the parallel Rays is determined by this Rule:

As the Sum of the Radii of both Concavities:
Is to the Radius of either Concavity ::
So is the Double Radius of t'other Concavity:
To the Diſtance of the *Virtual Focus.*

5. In Concave Glaſſes, if the Point to which the incident Ray Converges, be diſtant from the Glaſs farther than the *Virtual Focus* of parallel Rays; The Rule for finding the *Virtual Focus* of this Ray is this;

As the Difference between the Diſtance of this Point from the Glaſs, and the Diſtance of the *Virtual Focus* from the Glaſs:
Is to the Diſtance of the *Virtual Focus* ::
So the Diſtance of this Point of Convergence from the Glaſs:
To the Diſtance of the *Virtual Focus* of this Converging Ray.

6. In Concave Glaſſes, if the Point to which the Incident Ray Converges, be nigher to the Glaſs than the Virtual Focus of parallel Rays; the Rule to find where it croſſes the Axis is this:

As the Exceſs of the *Virtual Focus* more than this Point of Convergency: Is to the Virtual Focus ::
So the Diſtance of this Point of Convergency from the Glaſs:
To the Diſtance of the Point where this Ray croſſes the Axis.

7. To find the Focus of a Meniſcus Glaſs; ſee under the Word *Meniſcus.*

Practical Rules for finding the Foci *of Glaſſes.*

For Convex *Spherick Glaſſes.*

1. For Glaſſes of ſmall Spheres, (that is, of deep Convexities) apply them to the End of a Scale of Inches and Decimal Parts, and expoſe them before the Sun; and upon the Scale we ſhall find the bright Interſection of the Rays exactly meaſured out; or expoſe them in the Hole of a dark Chamber, and where a White Paper receives the diſtinct Repreſentation of diſtant Objects, there is the Focus of this Glaſs. This is an univerſal and certain way for all Convexes.

For a Glaſs of a pretty long Focus, obſerve ſome diſtant Objects through it, and recede from the Glaſs till the Eye perceives all in *Confuſion*, or till the Objects begin to appear *Inverted*; here the Eye is in the Focus.

If it be a *Plano-Convex Glaſs*, make it reflect the Sun againſt a Wall; we ſhall on the Wall perceive two Sorts of Light; one more *bright*, within another more *obſcure*; withdraw the Glaſſes from the Wall till the *bright* Image is at its ſmalleſt, the Glaſs is then diſtant from the Wall about the fourth Part of its Focal Length.

If it be a *Double Convex*, expoſe each Side to the Sun in like manner, and obſerve both the Diſtances of the Glaſs from the Wall. The firſt Diſtance is about half the Radius of the Convexity turned from the Sun; and the ſecond Diſtance is about half the Radius of t'other Convexity likewiſe: Thus we have the Radii of the two Convexities; whence the Focus is found by this Rule;

As the Sum of the Radii of both Convexity:
To the Radius of either Convexity ::
So is the Double Radius of the other Convexity
To the Diſtance of the Focus.

The *Foci* of Concaves are obtain'd by Reflection; for as a *Concave Mirror*, or *Speculum*, burns at the Diſtance of about half the Radius of the Concavity; ſo a *Concave Glaſs*, being ſuppoſed a *Reflecting Speculum*, ſhall unite the Rays of the Sun at the Diſtance of about half the Radius of the Concavity.

Mr. *Halley*'s Doctrine of the Foci of Spherical Glaſſes of all Sorts, expoſed either to Diverging, Converging, or Parallel Rays, is as follows: See Appendix to *Molyneux*'s Dioptricks.

PROPOSITION.

To find the Focus of any Parcel of Rays Diverging from, *or* Converging to *a given Point in the* Axis *of a* Spherical Lens, *and inclined thereto under the ſame Angle, the* Ratio *of the Sines in Refraction being known.*

Let *G L* be the *Lens.*
P any Point in its Surface.
V the Pole thereof.
C the Center of the Sphere whereof it is a Segment.
O the *Object* or Point in the Axis, to or from which the Rays do proceed.
O P a given Ray.
Let the *Ratio* of Refraction be as *r* to *s*: Make *C R* to *C O*, as *s* to *r*, for the *Immerſion* of a Ray; or

or as r to s for the *Emerſion*; (that is, as the Sines of the Angles in the Medium which the Ray enters, to their correſponding Sines in the Medium out of which it comes.)

And laying CR from C towards O, the Point R ſhall be the ſame for all the Rays of the Point O.

Then draw the Radius PC, if need be, continued; and with the Center R, and Diſtance OP, ſweep a touch of an Arch interſecting PC in Q: The Line QR being drawn, ſhall be parallel to the Refracted Ray; and PF being made parallel thereto, ſhall interſect the Axis in the Point F, which is the Focus ſought.

Or make it, As $CQ : CP :: CR : CF$, and CF ſhall be the Diſtance of the Focus from the Center of the Sphere.

Demonſtration.

Let fall the Perpendiculars Px on the Axis, Cy on the given Ray, and Cz on the refracted Ray.

Then PF and QR are parallel by Conſtruction, whence the Triangles QRC and PFC are ſimilar.

And $CR : QR :: CF : PF$;
That is, $CR : OP :: CF : PF$.
Now $CF : PF :: Cz : Px$ *ob ſim. Tri.*]
Whence $CR : OP :: Cz : Px$
And $CR : Cz :: OP : Px$

Again, $CR : CO ::$ As the Sines of Refraction, by Conſtruction; that is, as s to r, or r to s; and

as $CR : Cz :: CO = \frac{r}{s}$, or $\frac{s}{r} CR : \frac{r}{s}$ or $\frac{s}{r} Cz$,
$:: PO : Px$.
But $PO : Px :: CO : Cy$,

Therefore $Cy = \frac{r}{s}$ or $\frac{s}{r} Cz$;

That is, $Cy : Cz ::$ As the Sines of Refraction.
But $\left\{\begin{matrix} Cy \\ Cz \end{matrix}\right\}$ is the Sine of the $\left\{\begin{matrix} \text{Angle of Incidence.} \\ \text{Refracted Angle.} \end{matrix}\right.$
Q. E. D.

The ſeveral Caſes of Rays Diverging or Converging, as they enter the Curve Surface of a *Convex* or *Concave Lens*, are for the Reader's Eaſe delineated in *Fig.* 1, 2, 3, 4: And the like Caſes of *Emerging Rays* in *Fig.* 5, 6, 7, 8.

Fig. 1

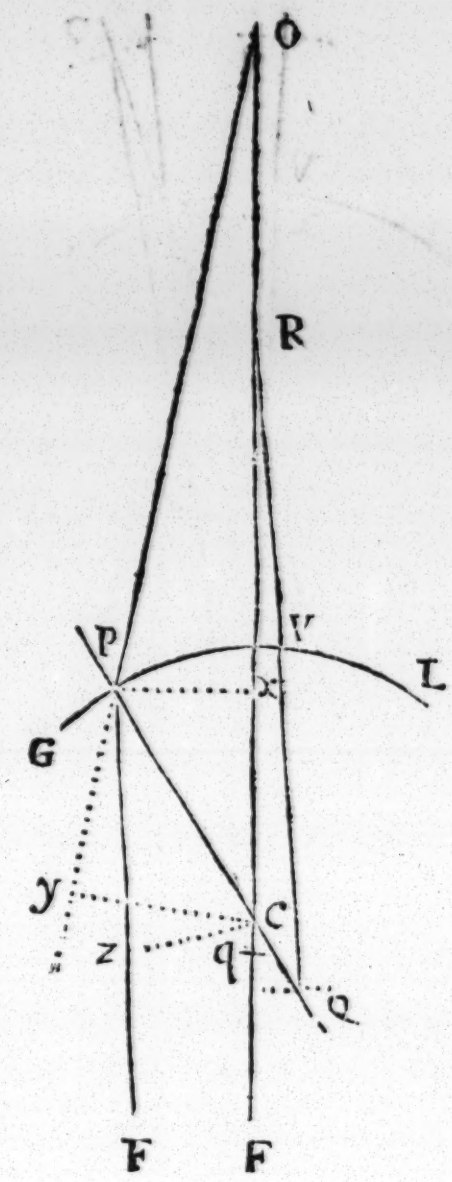


Fig. 2.

Fig. 3.

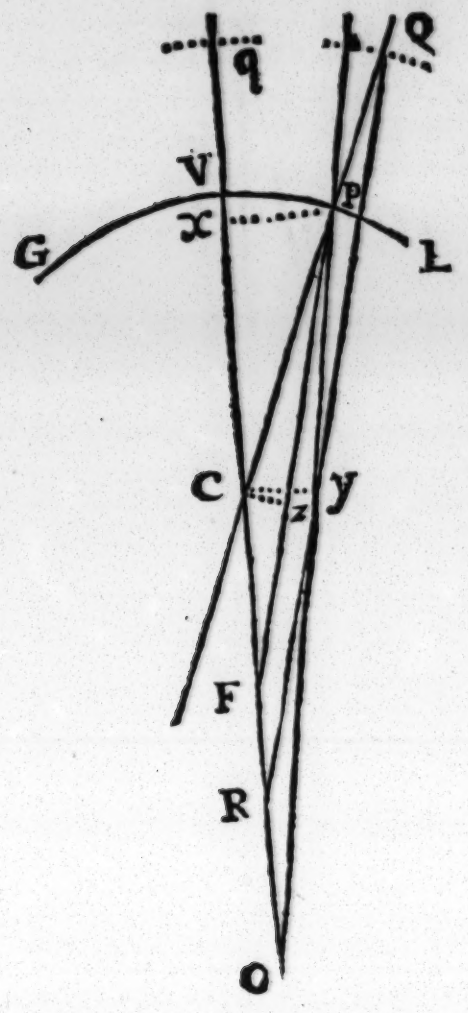


Fig. 4.

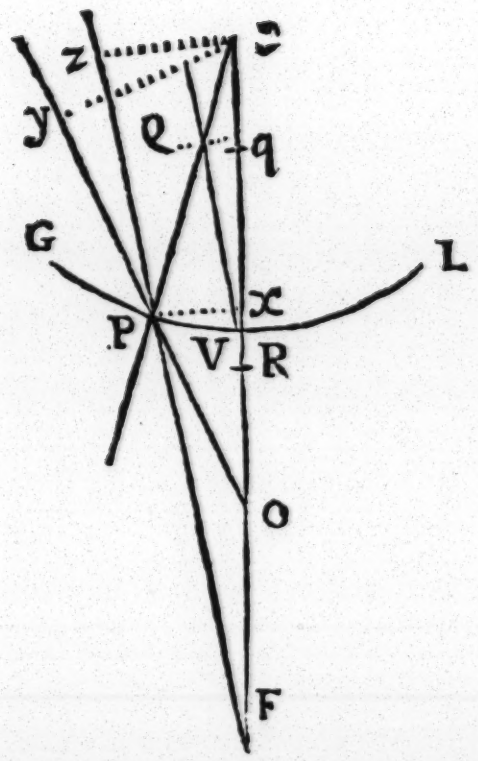


Fig. 5.

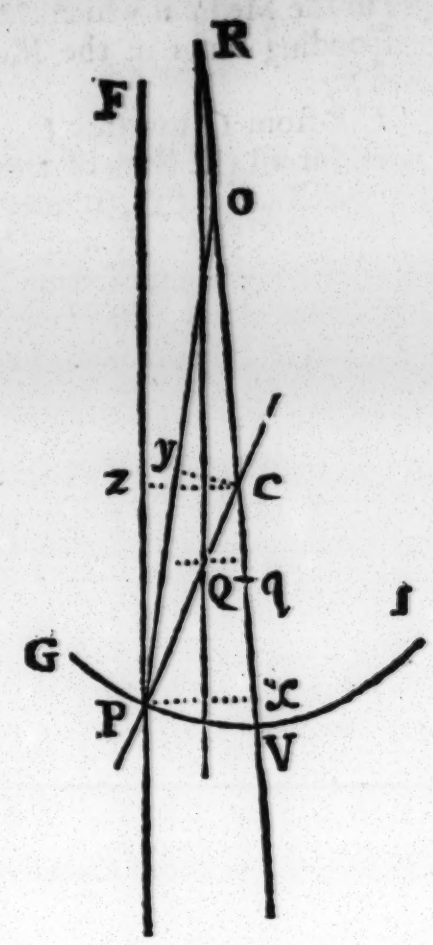


Fig. 6.

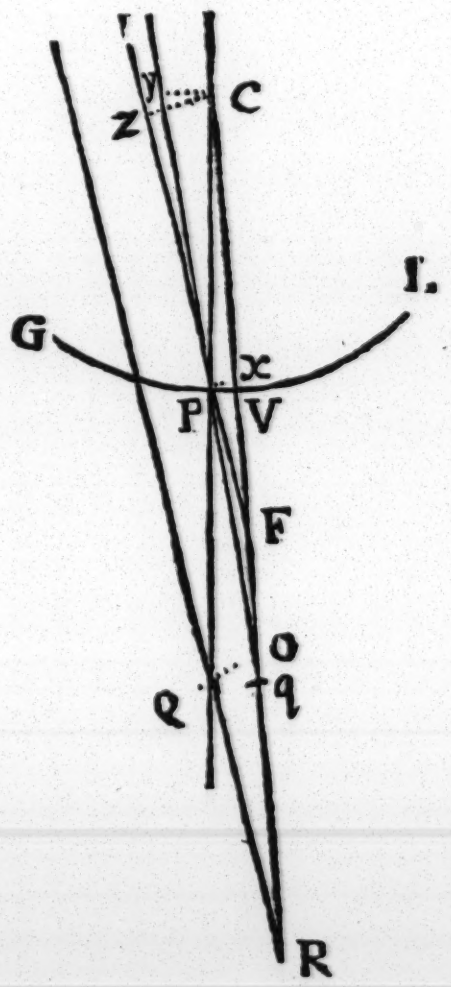


Fig.

Fig. 7.

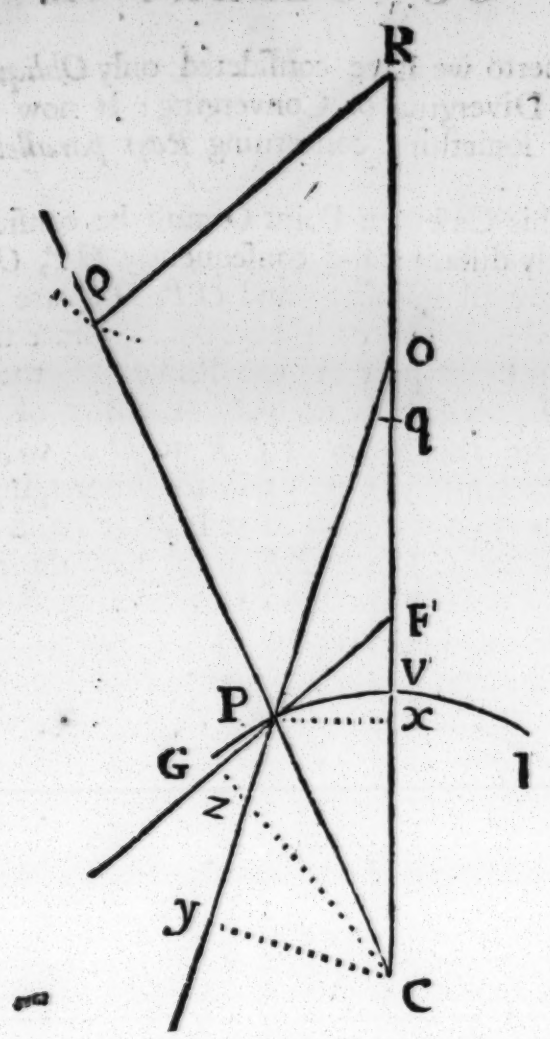
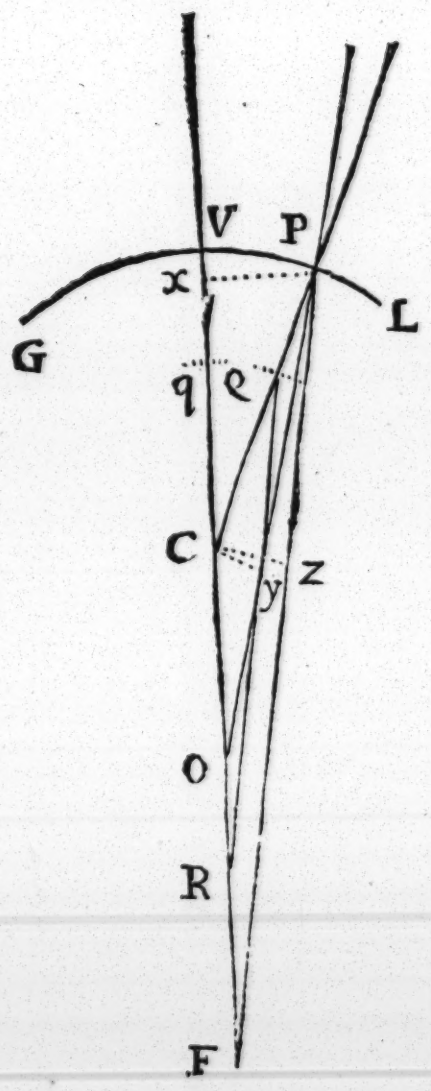


Fig. 8.



All which are drawn with the ſame Letters to their reſpective Points; only in ſome the Point *F* falling far diſtant, is to be underſtood in the Interſection of the Line *P F* with the Axis.

This thus demonſtrated, in the moſt difficult Caſes will give all the Rules for the Foci of Rays parallel to the Axis, as likewiſe for the principal Focus, where the Rays neareſt the Axis do unite: All which Rules are collected in theſe following *Corollaries*.

COROLLARY I.

If *O P* be equal to *C R*, then the Points *Q* and *C* are coincident, and the Rays *O P*, after Refraction, run on parallel to the Axis.

COROLLARY II.

If the Point *Q* fall on the ſame Side of the Axis, as is the Point *P*, then the Beams after Refraction do tend on, either Diverging or Converging, as before: But if *Q* fall on the other Side the Axis, as in *Fig.* 1. the Diverging Rays are made to Converge by a *Convex*, or the Converging to Diverge by a *Concave Glaſs*.

COROLLARY III.

If *O P* do exceed *C R*, the Focus is in all Caſes on the ſame Side of the Glaſs as is the Center of the Sphere *C*.

But contrariwiſe, if *O P* be leſs than *C R*, the Focus falls on the other Side of the Glaſs beyond the Vertex *V*.

COROLLARY IV.

An Object may be ſo placed, that the Rays next the Axis of a *Convex Glaſs* ſhall have an Imaginary Focus tranſmitting Diverging Rays, when the more remote Parts thereof ſhall make them Converge to a real Focus.

COROLLARY V.

If *O V* the Diſtance of the Object from the Pole or Vertex of the Glaſs, be taken inſtead of *O P*, then will *C Q* be the Difference of *O V* and *C R*; and as that Difference is to *C R*, ſo is the Radius *C V*, to *C F*, the Diſtance of the principal Focus from the Center of the Sphere, whereof the Glaſs is a Segment.

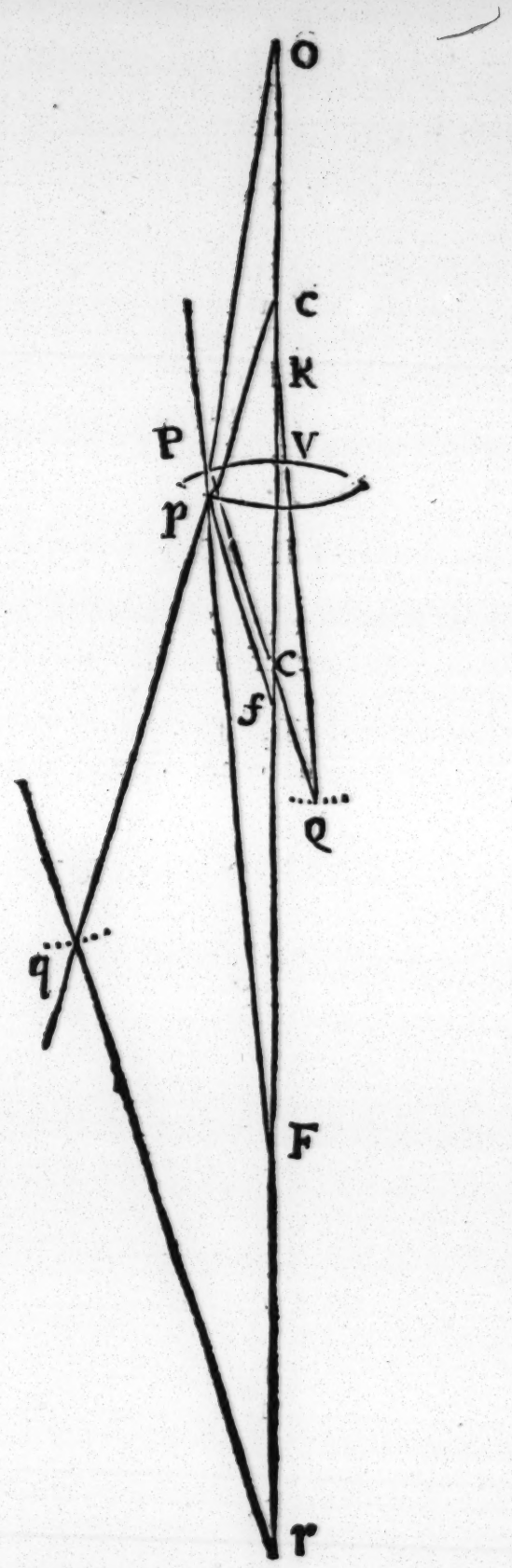
Or elſe, As *C Q*: To *O P* or *R Q* :: So *P C*: To *V F*, the Focal Diſtance from the Pole of the Glaſs.

Whence follows a General Rule for the Foci of all Glaſſes, only according to *Cor.* 3. if *O V* do exceed *C R*, the Focus is on the ſame Side of the Glaſs, as the Center of the Sphere: But if *C R* be greater, then the Focus is on the oppoſite Side of the Glaſs; whence it will be determined, whether the Focus be real or Imaginary.

COROLLARY VI.

What has been ſaid of one Surface of a *Lens*, is eaſily applicable to the other; taking *F*, the Focus of the firſt Surface, as an Object, and uſing it as *O* in the Figures for Emerging Rays; whereby the Focus of both Surfaces will be determined, as in *Fig.* 9.

Fig. 1.



COROLLARY VII.

Hitherto we have conſidered only *Oblique Rays*, either Diverging or Converging: It now remains to add ſomething concerning *Rays parallel* to the *Axis*.

In this Caſe the Point *O* muſt be conſidered as infinitely diſtant; and conſequently *OP*, *OC*, and *CR*, are all infinite; and *OP*, *OC* are in this Caſe to be accounted always equal, (ſince they differ but by a part of the Radius of the Sphere *GPVL*, which is no part of either of them;) wherefore the *Ratio* of *CR* to *OP* will be always the ſame, *viz.* as *s* to *r* for Immerging Rays, and as *r* to *s* for thoſe that Emerge; and by this Propoſition, *CF* is to *PF* in the ſame *Ratio*.

This Problem has been very fully conſidered by the celebrated Dr. *Wallis*, in his *Treatiſe of Algebra*, *Pag.* 258, but the Conſtruction thereof muſt be repeated here: See *Fig.* 1. preceding, and this following one.

Fig. 2.

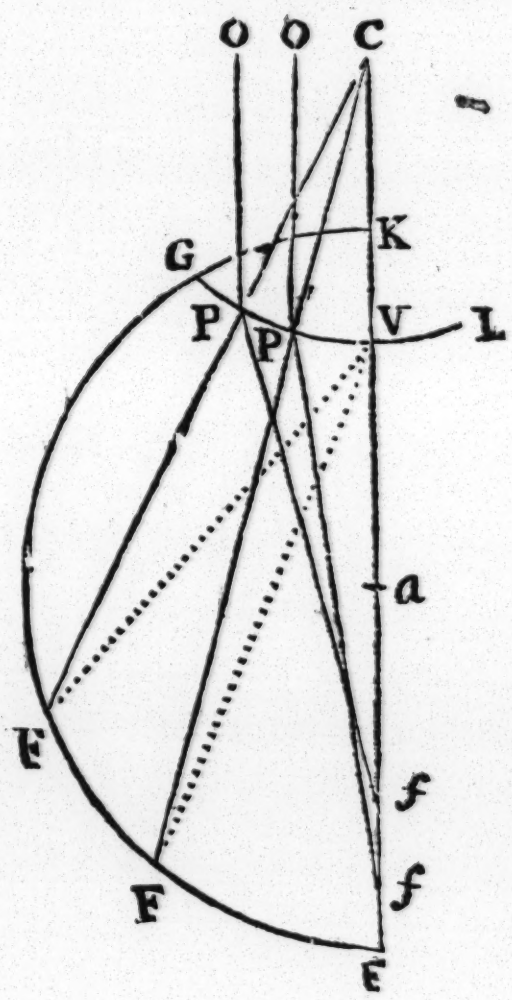
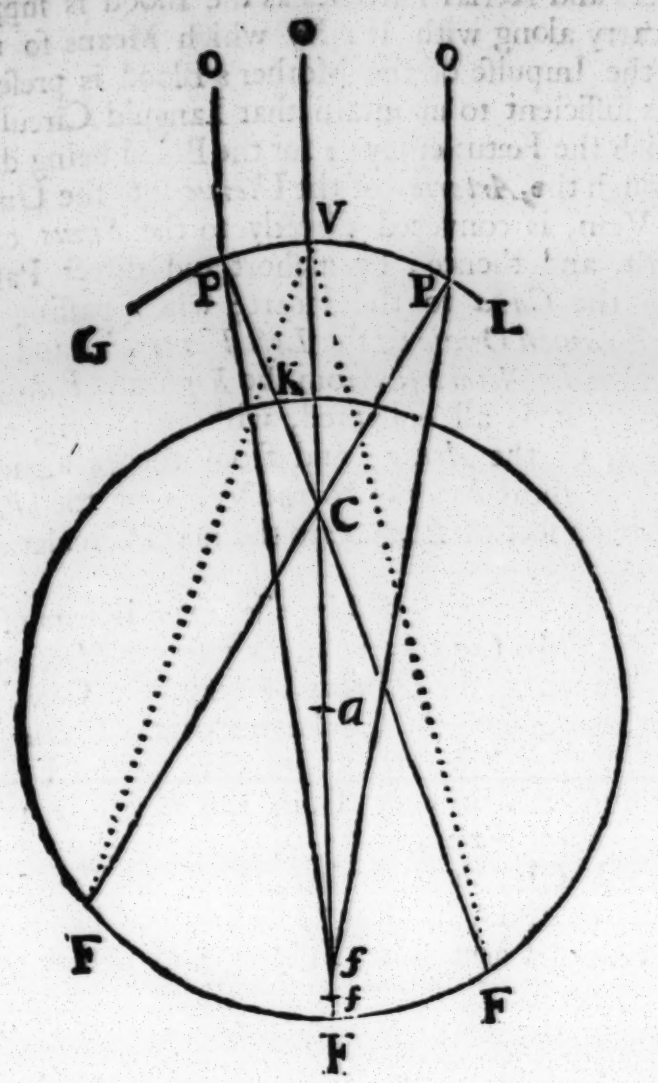


Fig. 2.



Let *GPVL* be a *Lens*, *VC* or *PC* the Radius of its Sphere; and let it be required to find all the Points *f*, *f*, ſo as *Cf*, may be to *Pf*, in the given Ratio as *s* to *r* for Immerging Rays, or as *r* to *s* for the Emerging.

Divide *CV* in *K*, and continue *CV* to *F*, that *CK* may be to *VK*, as *CF* to *VF* in the propoſed Ratio: Then divide *KF* equally in the Point *a*; and with that Center ſweep the Circle *FKF*; this Circle being drawn, gives readily all the Foci of the parallel Rays *OP*, *OP*: For having continued *CP* till it interſect the Circle in *F*, *PF* ſhall be always equal to *Vf*, the Diſtance of the Focus of each reſpective Parcel of Rays *OP*, from the Vertex or Pole of the *Lens*.

Demonſtration.

Draw the prick'd Line *VF*, and by what is delivered by Dr. *Wallis* in the afore-cited Place, *VF* and *CF* will be always in the ſame propoſed Ratio.

Again, *Vf* being made equal to *PF*, *CF* and *Cf* will be likewiſe equal, as are *GP* and *VC*; and the Angles *PCf*, *VCF* being *ad verticem*, are alſo equal: Wherefore *Pf* will be equal to *VF*, and conſequently *Cf* to *Pf* in the ſame Ratio as *CF* to *Vf*; whence, and by what foregoes, the Points *f*, *f*, are the ſeveral reſpective Foci of the ſeveral Parcel of Rays *OP*, *OP*. Q. E. D.

That *CF* is to *PF* in the Ratio of the Refraction in the Caſe of parallel Rays, will yet be more evident, if it be conſidered, that the Angle at *C* is equal to the Angle of Incidence, and the Angle at *P* to the Refracted Angle; wherefore *PF* the Side oppoſite to the Angle at *C*, is as the Sine of the Angle of Incidence; and *CF* oppoſite to the Angle at *P*, is as the Sine of the reſpective refracted Angle. Whence in all Caſes of parallel Rays, *CF* is to *PF* in the ſame conſtant Ratio of Refraction.

If it ſhall be deſired to effect in Numbers what we have here done by Lines, it will be moſt eaſy to adapt a Calculus to the foregoing Geometrical Conſtruction.

For if in the Triangle *POC*, there be given the Radius *CP* equal to Unity, *CO* the Diſtance of the Object from the Center of the Sphere, and the Perpendicular *Px*, equal to the Sine of the Angle *PCO*, the Side $PO = QR$ will be equal to $\sqrt{CO^2 + CP^2 + 2CO}$ in $\sqrt{CP^2 - Px^2}$.

Then, As *QR* or *PO*: To *Px* :: So *CR*: To the Sine of the Angle *CQR*, and the Complement to 180 Degrees of the Sum of the Angles *CPO* and *CQR*, is the Angle *CRQ* equal to *CFP*; and as *Px*: To *PO* :: So is the Sine of the Angle *CRQ*: To *CQ*; and as *CQ*: To *CP* :: So *CR*: To *CF*, which is the Diſtance of the reſpective Focus of all the Rays *PO*, from the Center of the Sphere *C*.

But the Foci of Rays parallel to the Axis may be computed more readily, following the Footſteps of the Conſtruction; for thereby it will appear, that the Radius of the Circle *KF*, *viz. a F*, is equal to $\frac{rs}{rr - ss} CP$, and $Ca = \frac{rr}{rr - ss} CP$, for Emerging Rays, as in *Fig.* 1. but for Immerging Rays, as *Fig* 2. *C a* will be found to be $\frac{ss}{rr - ss} CP$: And ſuppoſing the Diſtance of the Rays from the Axis $= Px$ in the Caſe of parallel Rays Emerging, the Diſtance of the Focus will be found,

$$PF = \frac{rr}{rr - ss} \sqrt{CP^2 - Px^2} + \sqrt{\frac{rs}{rr - ss} CP^2 - \frac{rr}{rr - ss} Px^2} - CP:$$

That is, *r* to *s* being as 3 to 2.

$$PF = \tfrac{9}{5} \sqrt{CP^2 - Px^2} + \sqrt{\tfrac{6}{5} CP^2 - \tfrac{9}{5} Px^2} - CP.$$

And for Immerging Rays, the Focal Diſtance is found by a like Rule:

$$PF = \frac{ss}{rr - ss} \sqrt{CP^2 - Px^2} + \sqrt{\frac{rs}{rr - ss} CP^2 - \frac{ss}{rr - ss} Px^2} + CP.$$

That is, *r* and *s* being as 3 to 2, as before.

$$PF = \tfrac{4}{5} \sqrt{CP^2 - Px^2} + \sqrt{\tfrac{6}{5} CP^2 - \tfrac{4}{5} Px^2} + CP.$$

Theſe Canons are ſo eaſily deduced from the Conſtructions, that there is no need to trouble the Reader with their Demonſtrations, only you have here added two Tables computed from them, with little more Work than a continual Addition; which may, by way of Example, ſerve to inſtruct and exerciſe the young Student in this Part of the Mathematicks.

Suppoſe *CP* the Radius of the Sphere of Glaſs 2 Inches, and the Ratio of Refraction as 3 to 2; at each Tenth of an Inch diſtance from the Axis the Foci are as follows.

For Emerging Rays.

Px	P F
0	√12.9600+√5.7600+2
1	√12.9276+√5.7276—2
2	√12.8304+√5.6304—2
3	√12.6684+√5.4684—2
4	√12.4416+√5.2416—2
5	√12.1500+√4.9500—2
6	√11.7936+√4.5936—2
7	√11.3724+√4.1724—2
8	√10.8864+√3.6864—2
9	√10.3356+√3.1356—2
10	√ 9.7200+√2.5200—2

For Immerging Rays.

Px	P F
0	√2.5600+√5.7600+2
1	√2.5536+√5.7536+2
2	√2.5344+√5.7344+2
3	√2.5024+√5.7024+2
4	√2.4576+√5.6576+2
5	√2.4000+√5.6000+2
6	√2.3296+√5.5296+2
7	√2.2464+√5.4464+2
8	√2.1504+√5.3504+2
9	√2.0416+√5.2416+2
10	√1.9200+√5.1100+2

But it is to be noted, That these *Foci* for Immerging Rays must not be taken for the *Foci* of a Plano-Convex, when the Convex-side is towards the Object; for the Plane-side, by its Refraction, does contract the Focal Length by about a Semidiameter of the Sphere; these suppose the Body of Glass continued.

The same Ingenious Author, as an Instance of the Excellence of the *Modern Algebra*, gives also in *Philos. Transf. N.* 205. a Way to find the Foci of all Optick Glasses universally; and shews of what great Use his and such Theorems are: But having enlarged so much already, I can only refer the *Algebraical Reader* thither, where he will find sufficient Satisfaction.

FODINA, is the Labyrinth in the Bone of the Ears.

FÆCULA, signifies a Powder which subsides to the Bottom in certain Strainings of Vegetables; for it is prepared of some green, washed, and pared Roots beat together with a little Water, then strained, that there may subside a white sort of Powder, which is to be dried lightly.

FOETUS, is the Young of all kind of Creatures, more especially Human: immediately after the Conception it is called an *Embryo*, but when its Formation in the Womb is perfectly finished, it is properly termed the *Fœtus*.

Dr. *Drake*, in *Phil. Transf. N.* 281. ingeniously tells us, That the Nourishment of the *Fœtus* in the Womb (which he makes to have a little more than Vegetative Life, and to be a Graft, as it were, upon the Stock of the Mother) is by Transfusion of the Blood from the Hysterick Arteries, immediately to the Umbilical Vein, together with such Nutritious Juices and Aerial Particles as the Blood is supposed to carry along with it: By which Means so much of the Impulse of the Mother's Blood is preserved, as is sufficient to maintain that Languid Circulation which the Fœtus enjoys; for the Blood being driven through the *Arteries* of the *Uterus* into the Umbilical Vein, is conveyed directly to the *Sinus* of the *Porta*, and thence, by a short and direct Passage, thro' the *Cava* to the Heart; where passing thro' the *Foramen Ovale* to the *Left Ventricle*, and thro' the *Canalis Arteriosus* from the *Right* and *Pulmonary Artery*, it is all delivered, without coming at the Lungs, to the *Aorta*; and from thence again, by the Umbilical Arteries to the Veins of the *Uterus*, making a sort of *Epicycle* to the main Circulation in the Mother.

And this is confirmed by the Experiments of the Accurate Mr. *Cowper*, who, by pouring *Mercury* into a Branch of the *Uterine Artery* of a Cow, that went into one of the *Cotyledones* of the *Uterus*, filled with that Metal those Branches of the Umbilical Veins, which went from the *Cotyledon* to the Navel of the *Fœtus*.

FOLIAGE, the branched Work in Tapestry or Painting; also a kind of Ornament used in Cornices, Frizes, Capitals of Pillars, and other Members of Architecture; some of which represent the Leaves of the Herb *Brank-Ursine* or *Bear's-Foot*; and others those of divers sorts of Trees, as the *Oak*, *Laurel*, *Olive*, *Vine*, &c.

FOLIATE; to *foliate* Looking-Glasses, is to spread a Composition of something which will firmly adhere to the Back of the Glass, and there reflect the Image. This is called the *Foile*, and is usually made with Quicksilver mix'd with some other Ingredients.

FOLIATION, according to Dr. *Grew*, is one of the Parts of a Flower of a Plant, being the Collection of those Fugacious Coloured Leaves (in *Latin Petala*) which constitute the Compass of the Flower; and also, sometimes to secure and guard the Fruit which succeeds the *Foliation*, as in Apples, Pears, &c. and sometimes stands within it, as in Cherries, Abricots, &c. for these being of a very tender and pulpous Body, and coming forth in the colder Part of the Spring, would be often injured by the Extremities of Weather, if they were not thus protected and lodged up within their Flowers.

The *Foliation* also is serviceable to the Growth of the Fruit in its Infancy or Embryo-State, being always proportionable to the Nature of the Fruit, and to the Plenty of the Sap by which the Fruit is fed or supplied. *Anat. of Plants, P.* 37.

The Doctor observes, That the Flowers of all Plants are perfectly formed or finished in all their Parts long before they appear in Sight, usually 2 or 3 Months, and sometimes Half a Year or more: And though usually the Flower appear before the Seed, yet is the Seed first formed, and then the Flower.

FOLLICULUS, a Term in Botany, signifying the Seed-Vessel, *Capsula Seminalis*, the Case, Husk, Coat, or Cover, which some Fruits and Seeds have over them; as that of the *Alkekengi*, the *Pedicularis*, &c.

FOLLICULUS *Fellis*, or *Vesica Bilaria*, is a little Bladder fastned to the Concave Part of the Liver, and receives the Bile, which in Process of Time empties

empties it ſelf into the Gut *Duodenum*, by a Ductus or Paſſage called *Choledochus ductus*.

FOMAHANT, a Star of the firſt Magnitude in *Aquarius*, whoſe Longitude is 329 Degrees 17 Minutes, Latitude 21 Degrees 3 Minutes.

FOMENTATION, is the bathing of any Part of the Body with a convenient Liquor; which is uſually a Decoction of Herbs in Water, Wine, or Milk: Alſo applying of Bags ſtuffed with Herbs and other Ingredients, which is commonly called a *Dry Fomentation*.

FONTANELLÆ, or *Iſſues*, are little Ulcers which Surgeons make in ſound Parts of the Body, to evacuate Humours, cure Diſeaſes, or prevent them. *Iſſues* are made either with an actual or a potential Searing-Iron, with a Lancet, and a Pair of Sciſſers, &c. You muſt always obſerve to make *Iſſues* betwixt two Muſcles. *Blanchard*.

FORAMEN *Lacrymale*: See *Lacrymale Punctum*.

FORCE, in Common Law, ſignifies an Offence, by which Violence is uſed to Perſons or Things; and is either *Simple* or *Compound*.

Simple Force, is that which is ſo committed, that it hath no other Crime adjoined to it: As if one by *force* do enter into another Man's Poſſeſſion without doing any other unlawful Act.

Mixt or *Compound Force*, is that Violence which is committed with ſuch a Fact, as of it ſelf only is Criminal; as if any by *force* enter into another Man's Poſſeſſion, and to kill a Man, or raviſh a Woman there, &c.

Force is alſo divided into true *Force*, and *Force* after a ſort, with ſeveral other Branches; as *forcible* Entries, *forcible* Detaining, unlawful Aſſembly, Routs, Riots, Rebellions, &c.

FORCEPS, is an Inſtrument wherewith dead and corrupt Parts (alſo things beſides or againſt Nature) are ſeized, cut off, or pulled out; they are of ſeveral Shapes, as long, crooked with Teeth, with Beaks, in faſhion of an Half-Moon, ſuch as will open the Mouth or the Womb, and by which you may ſee into either of them; which, according to the Difference of their Shape, are of different uſe. *Blanchard*.

FORCIBLE *detaining or holding of Poſſeſſion*, is a violent Act of Reſiſtance by ſtrong Hand of Men weapon'd with Harneſs, or other Action of Fear in the ſame Place, or elſewhere, whereby the lawful Entry of Juſtices or others is barr'd or hinder'd.

FORCIBLE *Entry*, is a violent actual Entry into a Houſe or Land, &c. or taking a Diſtreſs of any Perſon weapon'd, whether he offer Violence, or Hurt to any there, or furiouſly drive any out of the Poſſeſſion thereof.

FORE-CASTLE *of a Ship*, is that Part where the Fore-Maſt ſtands, and 'tis divided from the reſt of the Floor by a Bulk Head; that Part of the *Fore-Caſtle* which is aloft, and not in the Hold, is called the *Prow*.

FOREFOOT, a Sea Term for one Ship's lying or ſailing croſs anothers way; as if two Ships being under Sail, and in ken of one another, one of them lies in a Courſe, with her Stem ſo much a Weather the other, that if they both hold on their Courſe, the Windward Ship will run or go out a-head of the other; and then they ſay ſuch a Ship lies with the others *Fore-foot*, tho' as ſoon as ſhe has paſſed her, or gone out before her a-head, they do not ſay, ſhe paſſed by her Forefoot, but that ſhe is *gone out a-head*.

FOREJUDGED *the Court*, is when an Officer of any Court is expelled the ſame for ſome Offence, or for not appearing to an Action by Bill filed againſt him; and in the latter he is not to be re-admitted till he ſhall appear, but ſhall loſe his Office, and be *Forejudged the Court*.

FOREJUDGER, in Law, ſignifies a Judgment, whereby a Man is deprived, or put by the thing in queſtion.

FORELAND, a Term in Fortification, the ſame with *Berme*.

FORELOCKS, in a Ship, are little flat Wedges like pieces of Iron, uſed at the ends of Bolts, to keep the Bolts from flying out of the Holes. They are uſed alſo to keep faſt down the Cap-ſquares of the Carriages for the Guns; theſe are alſo called *Forelockeys*.

FORE-MAST of a Ship, is a round large piece of Timber, ſeated in her fore-part or Fore-caſtle, on which is born the Fore-ſail and Foretop-ſail-Yards. Its Length is uſually $\frac{8}{9}$ of the *Main-maſt*; the Foretop-maſt is half the Length of the Fore-maſt, and the Foretop-gallant-Maſt is half the Length of the Foretop maſt.

FORE-REACH; the Seamen ſay one Ship *forereaches* upon another, when both Sailing together, ſhe ſails better or out-goeth the other.

FORE-STAFF: See *Croſs-ſtaff*, being an Inſtrument uſed at Sea, for taking the Altitude of the Sun, Moon, or Stars, with ones Face towards the Object.

FOREIGN, is in Law uſed adjectively, being joyned with divers Subſtantives in ſeveral Senſes: As,

FOREIGN *Anſwer*, is ſuch an Anſwer as is not triable in the County where it is made.

FOREIGN *Attachment*, is an Attachment of Foreigners Goods found within a Liberty or City, in the Hands of a third Perſon, for the Satisfaction of ſome Citizen, to whom the ſaid Foreigner oweth Money.

FOREIGN *Matter*; that is, Matter triable in another County.

FOREIGN *Oppoſer*, or *Appoſer*, is an Officer in the *Exchequer*, to whom all Sheriffs and Bayliffs do repair to be appoſed by him of their Green Wax, after they are appoſed of their Sums out of the Pipe-Office; and from thence draws down a Charge upon one of them to the Clerk of the Pipe: His Buſineſs is to examine the Sheriffs Eſtreats with the Record, and to ask the Sheriff, what he ſays to every particular Sum therein.

FOREIGN *Plea*, is a Refuſal of the Judge as Incompetent, becauſe the Matter in Hand was not within his Precinct.

FOREIGN *Service*, is ſuch Service whereby a mean Lord holdeth over of another, without the Compaſs of his own Fee; or elſe that which a Tenant performeth either to his own Lord, or to the Lord Paramount out of his own Fee.

FOREST, is a large Wood priviledged to hold the King's Game of all kind.

The Properties of a Foreſt are theſe;

Firſt, A Foreſt, as it it is truly and ſtrictly taken, cannot be in the Hands of any but the King, for none hath Power to grant Commiſſion to be a Juſtice in *Eyre*, or the Foreſt, but the King.

The ſecond Property conſiſts in the Courts, as the *Juſtice-Seat* every three Years, the *Swain-mote* thrice every Year, and the *Attachment* once every forty Days.

The Third Property, are the Officers belonging to it, for the Preſervation of the Vert and Veniſon; as the Juſtices of the Foreſt, the Warden or Keeper, Verderers, Foreſters, Agiſtors, Regarders, Bayliffs, Beadles, and ſuch like.

FORESTER, is a Sworn Officer of the Foreſt, appointed by the King's Letters-Patent to walk the Foreſt both early and late, watching both the Vert and Veniſon, attaching and preſenting all Treſpaſſes againſt them within their own Balywick or Walk: And tho' theſe Letters-Patents be ordinarily granted but *quam diu ſe bene geſſerint*, yet ſome have it to them and their Heirs, and thereby are called *Foreſters in Fee.*

FORFEITURE, in our Language, ſignifies rather the Effect of tranſgreſſing a Penal Law, than the Tranſgreſſion it ſelf, as Forfeiture of Eſcheats.

FORFEITURE *of Marriage*, is a Writ lying againſt him, who holding by Knights Service, and being under Age, and Unmarried, refuſes her whom the Lord offers him with his Diſparagement, and Marrieth another.

FORFEX, is an Inſtrument to pull out Teeth with.

FORGERY: See the next following, *viz.*

FORGER *of Falſe Deeds*, in Law, ſignifies either him that fraudulently maketh and publiſheth *Falſe Writings*, to the Prejudice of any Man's Right; or elſe the Writ that lieth againſt him that committeth this Offence, which by ſome is called, *The Writ of Deceit.*

FORELORN-HOPE, or the *Enfans Perdue* in an Army.

FORM of any Natural Body, is the Eſſential, Specifical, or diſtinguiſhing Modification of the Matter of which it is compoſed, ſo as thereby to give it ſuch a peculiar manner of Exiſtence: And this is an Aggregate or Convention of as many particular Qualities, as ſerve to denominate the Body of ſuch a Nature, and to give it ſuch a Name, and which diſtinguiſhes it from other Bodies. Thus the Qualities of greateſt Specifick Gravity, Fixity in the Fire, Ductility under the Hammer, Paucity and yet Largeneſs of Pores, Diſſolubility in *Aqua Regia* and not in *Aqua fortis*, and Yellowneſs of Colour, make up the Form of that Metal which we call Gold. So that 'tis not any kind of ſubſtantial Soul or Subſtance diſtinct from Matter, but only ſuch a proper and agreeable Convention of Accidents, as by common conſent are reputed ſufficient to make a Portion of Univerſal Matter, belong to this or that Determinate Genus or Species of Natural Bodies. But yet ſome are of Opinion, That the Human Soul may properly enough be called, a *Subſtantial Form.*

FORMED *Stones*, are with the Writers of Natural Hiſtory, ſuch Bodies as being either pure Stone, Flint, or Sparr, are found in the Earth ſo formed, as that they bear a near Reſemblance to the external Figure and Shape of Muſcles, Cockles, Perewinkles, and other Shells. There hath been a great Diſpute amongſt the Naturaliſts, how theſe Bodies came thus formed, and a great many have been very fond of (what appears to me as a very abſurd Opinion) *viz.* That theſe are only a *Luſus Naturæ*, only the Sports and Diverſions of Nature, to make her ſelf Merry in the dark Regions of the Earth. But Dr. *Woodward*, in his Natural Hiſtory of the Earth, advances a very fair Solution of this Difficulty, and proves, that theſe formed Stones, by the Diſſolution of the Earth at the Deluge, were then made by being caſt into the Cavities of thoſe Shells which they repreſent, the Shells ſerving as Moulds to give them their proper form.

FORMEDON, is a Writ that lies for him that hath Right to any Lands or Tenements, by Vertue of an *Entail:* It lieth in three ſorts;

1. *Formedon in the Deſcender*, which lieth for the Recovery of Lands, &c. given to one and the Heirs of his Body, or to a Man and his Wife, and the Heirs of their Bodies, or to a Man and his Wife being Couſin to the Donor in *Frank-Marriage*, and afterwards alienated by the Donee; for after his Deceaſe, his Heirs ſhall have this Writ againſt the Tenant or Alliance.

2. *Formedon in the Reverter*, lieth for the Donor or his Heirs, where Land entail'd to certain and their Iſſue, with condition for want of ſuch Iſſue, to revert to the Donor and his Heirs, againſt him to whom the Donee alienateth, after the Iſſue extinct to which it was entail'd.

3. *Formedon in the Remainder*, lieth where a Man giveth Lands in Tail, the Remainder to another in Tail; and afterwards the former Tenant in Tail dieth without Iſſue of his Body, and a Stranger abateth, then he in the Remainder ſhall have this Writ.

FORMEE, the Term ſometimes uſed for the *Croſs Patee* in Heraldry: See *Patee.*

FORMER, is the Name of a piece of Wood turn'd round and fitted to the Bore of a Piece of Ordnance, on which are founded the Cartridges which hold the due Charge of Powder for the Gun.

FORMULÆ, is the Word uſed for the Phyſician's Preſcriptions. *Blanchard.*

FORNIX, is the Callous Subſtance of the Brain, ſo called, becauſe it ſeems to ſuſtain the Cavities of the Ventricles, and the Bulk of the impending Brain, like an Arch or Vault.

FORESTAL, is to be quit of Amerciaments and Cattle arreſted within your Land, and the Amerciaments thereof coming.

FORESTALLING, ſignifies the Buying or Bargaining for any Victuals or Wares coming to be ſold towards any Fair or Market, or from beyond the Seas towards any City, Port, Haven, Creek, or Road of this Realm, and before the ſame be there, to the intent to ſell the ſame again at a higher and dearer price.

FORT, is a Caſtle, or a place of ſmall extent, fortified either by Art or Nature.

FORT-ROYAL, is that which hath 26 Fathoms for the Line of Defence.

FORT-STAR, is a Redoubt, conſtituted by Reentring and Salient Angles, which commonly have from 5 to 8 Points: See more under the Word *Sconces.*

FORTIFICATION, or *Military Architecture*, is an Art ſhewing how to fortifie a place with *Ramparts*, *Parapets*, *Moats*, and other *Bulwarks*, to the end, that a ſmall number of Men within may be able to defend themſelves for a conſiderable time againſt the Aſſaults of a numerous Army without; ſo that the Enemy in attacking them muſt of neceſſity ſuffer great loſs.

Fortification is either *Regular* or *Irregular*, and with reſpect to Time, may be diſtinguiſh'd into *Durable* and *Temporary.*

Regular Fortification, is that which is built on a *Regular Polygon*, the Sides and Angles whereof are all equal; being commonly about a Musket-ſhot one from another.

Irregular Fortification, is that where the Sides and Angles are not at all uniform, equi-diſtant, nor equal one to another.

Durable Fortification, is that which is raiſed to continue a long while.

Temporary Fortification, is that which is erected upon an emergent occaſion for a little time; ſuch are all ſorts of Works caſt up for the ſeizing or maintaining

taining of a Poſt or Paſſage, as alſo *Circumvallations*, *Contravallations*, *Redoubts*, *Trenches*, *Batteries*, &c.

The principal Maxims of Fortification, *are theſe:*

1. Every Place within the *Fortification* ought to be flank'd; that is, ſeen ſidewiſe, or defenſible from the other Parts, ſo that there may be no Place in which an Enemy can lodge himſelf undiſcovered by thoſe that are within, and that both from the Front, the Sides, even from Behind if poſſible.

2. The Fortreſs ought to command all Places round about; and therefore all the Out-works muſt be lower than the Body of the Place.

3. The Works that are moſt remote from the Center of the Place, ought always to be open to thoſe that are more near.

4. The *Angle Flanquant*, or the Point of the *Baſtion*, ought to be at leaſt of 75 Degrees, or as ſome ſay (Mr. *Vauban*) not more than 100, or leſs than 60.

5. The *Angle of the Courtine* ought never to be leſs than 90, or greater than 100 Degrees, becauſe if it be larger, 'tis too much ſubject to the View of the Enemy.

6. The greater the *Flank* and *Demigorge* is in Proportion to other Things, the better; becauſe there is both more Room to retrench in, and alſo becauſe there may be made retiring Flanks, which add very much to the Strength of a Place.

7. The *Line of Defence* ought never to exceed Point-blank Muſket ſhot, which is about 120 or 125 Fathoms.

8. The *Baſtions* that are not too little, nor yet too exceſſively big, are to be preferred before others; and the Angle of a Baſtion ſhould not exceed 100, nor be leſs than 60 Degrees.

9. The greater the *Angle* that is made by the *outward Polygon* and the Face ſhall be, the greater is the Defence of the Face.

10. Whatſoever incloſes a durable Fortification, muſt be either Flank, Face, or Curtain; and built ſo well, that the firſt Diſcharge of the Cannon may not be able to pierce through it.

11. 'Tis impoſſible to fortify a Triangle after the common Way, becauſe the Angle of the Gorge is always leſs than 90 Degrees.

12. The Acuter the Angle at the Center is, the Place is by ſo much the ſtronger, becauſe it will have the more Sides.

13. In a *Regular Fortification* the Face muſt never be leſs than half the Curtain; and the Faces of the Baſtion ought to be defended by the Small Shot of the oppoſite Flanks.

14. *Dry Trenches* are preferable to thoſe filled with Water, eſpecially in great Places, where Sallies, Retreats, and Succours are frequently neceſſary; but in ſmall Fortreſſes, *Water Trenches* that cannot be drained are beſt, becauſe there is no need of Sallies, Succours, &c.

FORTINS, or *Field-Forts*, are Sconces or little Fortreſſes, whoſe *Flank'd Angles* are generally diſtant one from another 120 Fathom, but their Extent and Figure are different, according to the Situation or Nature of the Ground; ſome of them having whole Baſtions, and others only Demi-Baſtions. They are made uſe of only for a Time, either to defend the Lines of *Circumvallation*, or to guard ſome Paſſage or dangerous Poſt.

FOSSILS; all Bodies whatever that are dug out of the Earth, are by Naturaliſts commonly treated of under this general Title of *Foſſils:* But theſe may be diſtinguiſhed into two Claſſes.

Firſt, Such as are Natives of the *Earth*: Or,

Secondly, Such as are *Adventitious*, and repoſited in the Earth by the *Univerſal Deluge*, or by ſome other means.

Of which latter Sort are the *Exuvia* of *Sea* and *Land Animals*; the *Foſſil-Shells*, *Bones*, *Teeth*, &c. which are plentifully found in the Earth, and by ſome *Writers* have been erroneouſly thought a ſort of Stones that are peculiar, and as they ſpeak, *ſui Generis*.

The following *Table* of ſuch *Foſſils* are as *Natives* of the *Earth*, conſiſts only of the *Heads* and *Titles* extracted out of a *Natural Hiſtory* of theſe *Bodies*, compoſed by Dr. *Woodward*, and founded wholly upon *Experiments* and *Obſervations* made upon them.

In this *Table* they are rank'd and diſtributed according to their *Natural Properties*, and their *Relations* to each other.

Chap. 1. EARTHS.

The *Engliſh*, *Bohemian*, and the *Armenian* Boles.
Umbre. Ochre, yellow and red.
Tripela. Terra Militenſis.
Chalk. Steinomarga, or Lac Lunæ.
The common black Vegetable Earth.
Loam. Marle. Clay.
Terra Lemnia. Tobacco-pipe Clay.
Argilla, or Potter's Earth. Porcellana.
Steatites, or Soap-Earth. Fuller's-Earth.

Chap. 2. STONES.

Sect. 1. *Thoſe that are found in larger Maſſes.*

Lapis Molaris, or Milſtone. Grind-ſtone.
Sand-ſtone, or Saxum arenarium. Free-ſtone.
Saxum calcarium, or Lime-ſtone. Whetſtone.
Ragſtone.
Lapis fiſſilis, or Slate.
Hone. Oilſtone. Touchſtone.
Alabaſter. Marble.
Ophites. Porphyrites.

Sect. 2. *Stones found in leſſer Maſſes.*

Art. 1. *Thoſe that do not exceed Marble in Hardneſs.*

§. 1. *Thoſe that are of an indeterminate Figure and Texture.*

The coarſer or gritty Pebbles.
Lapis Violaceo Odore.

§. 2. *Thoſe that are of an indeterminate Figure, but of a regular Texture.*

Gypſum Striatum, *Engliſh* Talck.
Amianthus ſive Aſteſtos. Alumen plumoſum.
Talck.

§. 3. *Thoſe that are commonly of determinate Figures.*

Selenites. Lapis Spicularis, or *Muſcovy* Glaſs.
Ludus Helmontij, or the Waxen Vein.
Lapides Tubulis referti, or the Piped Waxen Vein.
Belemnites, or the Thunder-ſtone
The Foſſil Coralloid Bodies, ſimple and branched, and the Stones related to them, *e.gr.*
Stelechites. Mycetites. Porpites.
Aſtroites. The Honey-comb-ſtone.

Fluor or Spar, Stalactites, Stalagmites.
Osteocolla.

Art. 2. *Stones found in leſſer Maſſes, that do exceed Marble in Hardneſs.*

Thoſe comprehended under this Second Article, are uſually called *Gemms* or *Precious Stones*. The whole Tribe of theſe are exhibited here; and indeed none but them, excepting Pebbles and Flints, which are rank'd of courſe along with the Agate-kind, to which they really belong.

§. 1. *Thoſe that are Opaque.*

Subdiviſion 1. *Of one Colour.*

The Turcois. The Nephritick Stone. The Malachite. The two laſt are ſometimes a little variegated.

Subdiviſion 2. *Of different Colours mix'd in the ſame Body.*

Lapis Lazuli. Heliotropium, or Blood-ſtone.
The Jaſper.

§. 2. *Semi-pellucid Stones.*

Subdiviſion 1. *With Colours changeable, according to the different Poſition of the Stone to the Light.*

Oculus Cati. The Opal.

Subdiviſion 2. *With Colours permanent.*

The finer Pebbles and Flints, Agates. The Chalcedony.
Mocho-ſtones. The Oculus Beli. Onyx, and Sardonyx.
The white Cornelion. The red Cornelion, and the Beryl.

§. 3. *Stones Diaphanous, with Colours.*

§§. 1. *Yellow, or partaking of it.*
The Topaz. The Jacinth.
§§. 2. *Red, or partaking of it.*
The Granate. The ſeveral Sorts of Rubies.
The Amethyſt.
§§. 3. *Blue, or partaking of it.*
The Saphire. The Water Saphire.
The Aquemarine.
§§. 4. *Green, or partaking of it.*
The Emerald. The Chryſolite.

§. 5. *Stones Diaphanous, and without Colours.*

Cryſtal. The Pſeudo adamantes.
The white Saphire. The Diamond.

Chap. 3. SALTS.

Foſſil or Rock Salt. Sal Gemmeum.
The Tincal of *Perſia*. The Natron of *Egypt*.
Nitre, or Salt Petre.
Alum. Vitriol.

Chap. 4. BITUMINA.

§. 1. *Liquid.*

Naptha. Petroleum. Oleum terræ Barbadenſis.

§. 2. *Solid.*

Succinum, or Amber. Bitumen. Piſſaſphalton.
Gagates, or Jet. Kanal. Coal.

Chap. 5. METALLICK MINERALS.

Mercury. Cinnabar, the Mineral out of which 'tis drawn. Arſenick.
Sulphur. Pyrites, Marcaſita. Cobalt.
Lapis Calaminaris. Antimony.
Biſmuth, or Tin-Glaſs. Speltre, or Zink.
Nigrica fabrilis Merreti, or Black Lead.

Chap. 6. METALS.

Tin. Lead. Silver. Gold.
Copper. The Lapis Armenius is a Copper-Ore.
Iron. The Hæmatites is an Iron-Ore. There is alſo a little Iron in the Loadſtone. Manganeſe, Emery, the Ætites ferruginoſa, the Mineral Bezoar, the Geodes, and the Enhydros.

FOTUS, the ſame with *Fomentum*.

FOVEA *Cordis*, the ſame with *Anticardium*.

FOUGATE, or *Fongaſs*, is a ſmall Mine dug in form of a Well, in a Place ready to be gained by the Enemy, ſo that when they have made themſelves Maſters thereof, it is ſprung like a Mine by the Means of a Saucidge.

They are alſo prepar'd under a Work which is to be blown up, and are charged with Barrels or Sacks of Powder cover'd with Earth.

FOULE, a Word uſed at Sea in two Senſes, when a Ship has been long untrimmed, ſo that Graſs, Weeds Barnacles, or Periwincles, ſtick or grow to her Sides under Water, ſhe is then ſaid to be foule. They ſay alſo a Rope is foule, when it is either tangled in it ſelf, or hindred by another, ſo that it cannot run or be haled.

FOULE-WATER: A Ship is ſaid to make *foule Water*, when being under Sail, ſhe comes into ſuch Shole or ſhallow Water, that though her Keel do not touch the Ground, yet ſhe comes ſo near it, that the Motion of the Water under her raiſeth the Mud from the Bottom, and ſo polluteth or fouleth the Water.

FOUNDER: A Ship is ſaid to *founder* at Sea, when by any extraordinary Leak, or by a great Sea breaking in upon her, ſhe is ſo filled with Water, that ſhe cannot be freed of it, nor is ſhe able to ſwim under it, but ſinks with the Weight thereof.

FOURCH, in Law, ſignifies a Delay, putting off or prolonging of an Action.

FOURTH, a Term in Muſick; the ſame with *Diateſſaron*: Which ſee.

FRACTION, is a broken Number, ſignifying one or more Parts proportionally of any thing divided. It conſiſts of two Parts, which are two Numbers ſet one over another, as $\frac{5}{8}$: Of which two Numbers, that below the Line is called the *Denominator*, becauſe it denominates or ſhews the Nature or Kind of the Parts any Whole is divided into; and the Number above the Line is called the *Numerator*, becauſe it numbers or tells us how many of thoſe Parts the *Fraction* doth conſiſt of. Thus $\frac{5}{8}$ ſuppoſes ſome Whole to be divided into 8 equal Parts, and then that you take 5 of them, or 5 ſuch Parts.

In all *Fractions*, As the *Numerator*: Is to the *Denominator* :: So is the *Fraction* it ſelf: To that Whole of which it is a Fraction. Thus, ſuppoſe $\frac{3}{4}$ of

of a Pound be equal to 15 *s.* then 'tis plain, 3 : 4 :: 15 *s.* : 20 *s.*

From which general Axiom will follow these Corollaries.

1. That there may be infinite Fractions of the same Value one with another; for there may be infinite Numbers found, which shall have the Proportion one to another as 3 has to 4.

2. When the Numerator is less than the Denominator, the Fraction is less than the Whole, and consequently is what they call a *Proper Fraction.*

3. But when the Numerator is either equal to, or greater than the *Denominator*, the Fraction is called *Improper*, because 'tis equal to, or greater than the whole. Thus $\frac{4}{4}$ is equal to 1, and $\frac{5}{4}$ is equal to 1 and $\frac{1}{4}$.

Fractions are either *Single* or *Compound.*

Single Fractions are such as have but one *Numerator* and one *Denominator*, as $\frac{3}{4}$, $\frac{5}{9}$, $\frac{11}{22}$.

Compound Fractions, or Fractions of Fractions, are such as consist of more than one *Numerator* and one *Denominator*, as $\frac{1}{2}$ of $\frac{3}{4}$ of $\frac{5}{8}$, and are always connected by the Word *Of.*

Reduction of Fractions.

I. *To reduce Fractions to their least Terms.*

Rule 1. If both Numerators and Denominators are even Numbers, divide each by 2 as long as you can, till an odd Quotient ariseth, and then have recourse to the 4th *Rule*, which is General.

Thus, this Fraction $\frac{884}{1248}$ will by Bissection be reduced to $\frac{221}{312}$, and $\frac{8}{48}$ will be reduced to $\frac{1}{6}$.

Rule 2. If both end in Cyphers, cut off an equal Number of them from both, and then proceed by the other *Rules.*

Thus, $\frac{2400}{10000}$ will become $\frac{12}{50}$.

3. If both Numerator and Denominator end in 5, or one in 5, and the other in 0, they may be always reduced into lesser Terms, by dividing each by 5.

Thus, 5) $\frac{475}{8975}$ (= $\frac{95}{1795}$, and 5) $\frac{265}{480}$ (= $\frac{75}{96}$.

4. When by none of the former *Rules* you can reduce them wholly, try this Method, which is General; that is, find the greatest Number that will divide both *Numerator* and *Denominator* without any Remainder; and then dividing both Parts of the Fraction by that Number, take the Quotients for a new Fraction, which shall be of the same Value and in its least Terms.

The *Greatest Common Divisor* to any two Numbers is thus found:

Divide the Greater by the Lesser, and then divide the last Divisor by the Remainder, and so continually till nothing remain; and then take the last Divisor for the *Greatest Common Measure* sought.

If after all Trials still there remains Unity, then the Fraction cannot be reduced farther.

Thus, in reducing $\frac{91}{117}$ into its least Terms, 'twill be found to be $\frac{7}{9}$, the *Greatest Common Divisor* being 13.

91) 117 (1
91
26) 91 (3
78
13) 26 (2
26
00

But this *Rule* may also be very much abridg'd by this Method, *viz. When you find any Remainder to be more than half the last Divisor*, substract it from the Divisor, and divide that Divisor by the *new Remainder* found by such Substraction: As suppose you were to find the *Greatest Common Divisor* in this Fraction $\frac{744}{899}$.

744) 899 (1
744
155) 744 (4
620
124
155
124
31) 155 (5
155
0

Which last Remainder 124 being more than half 155, I substract it from it, and there remains 31; which dividing 155 without Remainder, I find to be the *Greatest Common Divisor* to those two Numbers.

II. *To find the Value of any* Fraction *in the known Parts of its Integer.*

As suppose it was requir'd to know what is $\frac{9}{16}$ of a Pound.

Multiply (9) the Numerator by (20) the Number of known Parts of the next inferior Denomination, and divide the Product by (16) the Denominator of the given Fraction; the Quotient will be 11 *s.* and the Remainder (4) being multiplied by (12) the Number of known Parts in the next inferior Denomination; and dividing the Product (48) by (16) as before, the Quotient will be 3 *d.* So that you find that $\frac{9}{16}$ of a Pound is 11 *s.* and 3 *d.*

20
9
16) 180 (11 *s.*
20
12
16) 48 (3 *d.*
00

III. *To*

III. *To reduce a mix'd Number (as* $4\frac{11}{12}$*) into an Improper Fraction of the ſame Value.*

Multiply (4) the Integer Part, by (12) the Denominator of the Fraction; to the Product (48) add the Numerator; the Sum (59) ſet over the former Denominator (12.) Thus $\frac{59}{12}$ will be an *Improper Fraction* of the ſame Value with the mix'd Number given; for 12 now divides that Product which before it help'd to produce, and therefore the Value muſt be the ſame as before.

IV. *To reduce a whole Number into an Improper Fraction.*

1. If no Denominator be aſſign'd, draw a Line under it, and ſet Unity beneath that Line, and 'tis done. Thus, if 8 were given to be reduc'd, write it in this Manner, $\frac{8}{1}$.

2. But if there be a Denominator (as ſuppoſe 3) given, multiply (8) the given Number by (3) the aſſign'd Denominator, and ſet the Product over (3) and 'tis done, and ſtands thus, $\frac{24}{3}$; for the Number 8 is multiplied by 3, and then that Product divided by 3, which makes it of the ſame Value now as before.

V. *To reduce an Improper Fraction into its equivalent mix'd Number, as ſuppoſe* $\frac{59}{12}$.

Divide (59) the Numerator by (12) the Denominator; the Quotient ($4\frac{11}{12}$) will be the mix'd Number ſought.

VI. *To reduce a Compound Fraction into a Single one.*

Multiply all the Numerators continually for a new Numerator, and all the Denominators for a new Denominator.

Thus, $\frac{1}{2}$ of $\frac{3}{4}$ of $\frac{5}{8}$ reduced, will be $\frac{15}{64}$.

VII. *To reduce Fractions of different Denominations to others of the ſame Value, having the ſame common Denominator.*

1. Reduce them always to their leaſt Terms.

2. Then multiply all the Denominators for a common Denominator; and multiply continually the Numerator of each Fraction into all the Denominators except its own, and that will give new Numerators to be ſet over the common Denominator.

Thus, if it was requir'd to reduce $\frac{2}{3}$, and $\frac{4}{7}$, and $\frac{5}{6}$ into one common Denominator:

I ſay, 3 into 7, into 6, produces 126 for a common Denominator.

Then $2 \times 7 \times 6 = 84$, therefore $\frac{2}{3} = \frac{84}{126}$.
And $3 \times 4 \times 6 = 72$, therefore $\frac{4}{7} = \frac{72}{126}$.
Alſo $5 \times 7 \times 3 = 105$, therefore $\frac{5}{6} = \frac{105}{126}$.

Addition in Vulgar Fractions.

1. *If the Fractions propoſed have equal Denominators*, only add the Numerators, and ſet the Sum over the common Denominator.

Thus, $\frac{5}{12} + \frac{9}{12} = \frac{14}{12}$.

2. But if they have not a common Denominator, they muſt be reduced to others of the ſame Value, that have a common Denominator; then add as in the firſt *Rule*.

3. If Compound Fractions are given to be added, they muſt firſt be reduced to ſingle ones of the ſame Value, and then they will fall under theſe two *Rules* foregoing.

4. When Fractions of different Denominations are given to be added, they muſt be reduced into Fractions of the ſame Denomination, (or which have the ſame common Integer) by the *Rule* for reducing Compound Fractions.

Thus, if $\frac{5}{8}$ of a Pound, $\frac{2}{3}$ of a Shilling, and $\frac{4}{7}$ of a Penny, were propoſed to be added together, they muſt all be brought into the Denomination of Pounds.

Thus, $\frac{2}{3}$ of a Shilling is $\frac{2}{3}$ of $\frac{1}{20}$ of a Pound, (which reduced, is $\frac{2}{60}$ of a Pound:) So $\frac{4}{7}$ of a Penny is $\frac{4}{7}$ of $\frac{1}{12}$ of $\frac{1}{20}$ of a Pound (which being reduced, is $\frac{4}{1680}$) then thoſe two Fractions $\frac{2}{60}$ and $\frac{4}{1680}$ may be added by the ſecond *Rule*.

5. *To add mix'd Numbers.*

1. Add the Integers in both Numbers together, then add the Fractional Parts, and if their Sum be a proper Fraction, only annex it to the Sum of the Integers.

2. But if it be an Improper Fraction, reduce it to its equivalent mix'd Number; and adding the Integral Part to the firſt Sum of the Integers, ſet the remaining Fractional Part after the Integers, and 'tis done.

Thus, $5\frac{2}{3} + 4\frac{1}{2} = 10\frac{1}{6}$.

Subſtraction of Vulgar Fractions.

1. If they have a common Denominator, ſubſtract the leſſer Numerator from the greater, and ſet the Remainder over the common Denominator.

Thus, from $\frac{8}{18}$ take $\frac{5}{18}$, and there remains $\frac{4}{18}$.

2. If they have not a common Denominator, they muſt be reduced to Fractions of the ſame Value, having a common Denominator; and then as in the 1ſt Rule.

Thus, $\frac{6}{7} - \frac{2}{5} = \frac{30}{35} - \frac{14}{35} = \frac{16}{35}$.

3. To ſubſtract a whole Number from a mix'd Number, or one mix'd Number from another.

Reduce the whole or mix'd Numbers to Improper Fractions, then proceed as in the 1ſt or 2d *Rule*.

N. B. This *Rule* is General; yet there are particular *Rules*, which in ſome Caſes are more Expeditious; as follows.

Particular Rules.

1. *To ſubſtract a whole Number from a mix'd.*

Subſtract the whole Number from the Integral Part of the mix'd Number; then to the Remainder annex the Fractional Part of the mix'd Number.

Thus, 3 from $5\frac{2}{7}$, leaves $2\frac{2}{7}$.

2. *To ſubſtract a Fraction from* 1 *or Unity.*

Subſtract the Numerator from the Denominator, and 'tis done.

Thus, $\frac{1}{4}$ from 1, leaves $\frac{3}{4}$.

3. To subſtract a Fraction from any whole Number greater than Unity.

Subſtract the Fraction from Unity (by 2d) then from the whole Number given ſubſtract that Unity, and place the remaining Integer before, and the Fractional Part (firſt found) after it, ſo ſhall that mix'd Number be the Remainder ſought.

Thus, $\frac{2}{5}$ from 7, leaves $6\frac{3}{5}$.

4. To ſubſtract a mix'd Number from a whole Number.

Firſt ſubſtract the Fractional Part from Unity, borrowed from the whole Number given, and ſet down the Remainder; then adding the Integer borrowed, to the Integers of the mix'd Number, ſubſtract the ſaid Sum from the whole Number, and to the Remainder annex the Fractional Part firſt found, and 'tis done.

Thus, $3\frac{1}{4}$ from 9, leaves $5\frac{3}{4}$.

5. To ſubſtract a Fraction from a mix'd Number.

1. If the Fraction given, be leſs than the Fractional Part of the mix'd Number, only ſubſtract the Fraction from the Fractional Part, and annex the Remainders to the integer Part of the mix'd, and 'tis done.

Thus, $\frac{1}{4}$ from $6\frac{3}{4}$, leaves $6\frac{2}{4}$.

2. But when the Fraction given is greater than the Fractional Part of the mix'd Number;

Subſtract the Fraction from Unity, and add the Remainder to the Fractional Part of the mix'd Number; then leſſening the Integral Part of the mix'd Number by Unity, annex the Fractional Part (laſt found) to it:

Thus, $\frac{7}{9}$ from $6\frac{3}{9}$, leaves $5\frac{5}{9}$.

CASE I.

6. To ſubſtract one mix'd Number from another.

When the Integral Part, and Fractional Part, of the mix'd Number to be ſubſtracted, are both leſſer than the Integers and Fractional Parts of the other mix'd Numbers; only ſubſtract the leſſer Integer from the greater, and the leſſer Fraction from the greater, and to the Remainder of the Integers annex the Remainder of the Fraction, and 'tis done.

Thus, $2\frac{7}{12}$ from $5\frac{9}{12}$ leaves $3\frac{2}{12}$, or $3\frac{1}{6}$.

CASE II.

When the Fractional Part of the mix'd Number (to be ſubſtracted) is greater than the Fractional Part of the other mix'd Number:

Firſt, Subſtract the greater Fraction from Unity, and add the Remainder to the Fractional Part of the other mix'd Number; which Sum, as the Fractional Part of the Remainder ſought, is to be kept.

Then add Unity to the leſſer Integral Part, and ſubſtract the Sum from the greater Integral Part, and to the Remainders annex the Fractional Part before reſerved, and 'tis done.

Thus, $2\frac{3}{4}$ from $7\frac{2}{5}$, reſts $4\frac{13}{20}$.

Multiplication of Vulgar Fractions.

1. When the Fractions propoſed are both ſingle Fractions, only multiply the Numerators one by another for a new Numerator, and the Denominators for a new Denominator.

Thus, $\frac{5}{8}$ into $\frac{9}{13}$, produces $\frac{45}{104}$.

2. If one be a mix'd or Whole Number, it muſt be reduced to an *Improper Fraction*, and then proceed as in the laſt Rule.

Thus, $\frac{2}{8}$ into $5\frac{2}{13}$, gives $\frac{67}{104}$; and $\frac{4}{9}$ into $\frac{10}{1} = 40$.

N. B. In *Multiplication of Fractions* the Product is leſs in Value than either Multiplicand or Multiplicator; becauſe in all Multiplications, As Unity: Is to the Multiplicator :: So is the Multiplicand: To the Product; or, As Unity: Is to either Factor :: So is the other Factor: To the Product. But Unity is bigger than either Factor (if the Fractions are proper) and therefore either of them muſt be greater than the Product.

Thus in Whole Numbers, if 5 be multiplied by 8, 'twill be, As 1 : 5 :: 8 : 40; or, 1 : 8 :: 5 : 40. Wherefore in Fractions alſo, As $1 : \frac{3}{4} :: \frac{5}{8} : \frac{15}{32}$; or, As $1 : \frac{5}{8} :: \frac{3}{4} : \frac{15}{32}$.

But 1 is greater than either $\frac{3}{4}$ or $\frac{5}{8}$: Wherefore either of them muſt be bigger than $\frac{15}{32}$.

Diviſion in Fractions.

1. When the Fractions propoſed are both ſingle, multiply the Denominator of the Diviſor by the Numerator of the Dividend; the Product is the Numerator of the Quote.

Then multiply the Numerator of the Diviſor, by the Denominator of the Dividend; the Product is the Denominator of the Quotient.

Thus, $\frac{3}{5}) \frac{4}{9} (\frac{20}{27}$.

2. If either Dividend, Diviſor, or both, be Whole or Mix'd Numbers, reduce them to improper Fractions; and if they be Compound Fractions, reduce them to Simple ones, and proceed as in the firſt Rule.

N. B. That in Diviſion of Fractions, the Quotient is always greater than the Dividend; becauſe in all Diviſion, As the Diviſor: Is to Unity :: So is the Dividend: To the Quotient; as if 3 divide 12, 'twill be, As 3 : 1 :: 12 : 4. Now 3 is greater than 1, wherefore 12 muſt be bigger than 4: But in Fractions, As $\frac{3}{5} : 1 :: \frac{4}{9} : \frac{20}{27}$; where $\frac{3}{5}$ is leſs than 1; wherefore $\frac{4}{9}$ muſt alſo be leſs than $\frac{20}{27}$.

FRACTURA *Oſſis*, the breaking of a Bone, is a Solution of the *Continuum* in the hard or bony Parts of the Body.

FRÆNULUM, is a membranous Ligament under the Tongue, which being extended too far towards the Tip of the Tongue, hinders Children in ſucking, whence they are ſaid to be Tongue-ty'd.

FRÆNUM, is that Ligament whereby the Prepuce is tied to the lower Part of the Glans of the *Penis*.

FRAISES, in Fortification, are pointed Stakes fixed in Bulwarks made of Earth, on the one ſide of the Rampart a little below the Parapet. Theſe Stakes being from 7 to 8 Foot long, are driven in almoſt half way into the Earth, and preſent their Points ſomewhat ſloping toward the Field. They ſerve to prevent Scalades and Deſertion.

FRAME, is the Out-work of a Clock or Watch, conſiſting of the Plates and Pillars, and which contains in it the Wheels and the reſt of the Work.

FRANCHISE, in Law, is taken to be a Privilege or Exemption from ordinary Jurisdiction, and ſometimes an Immunity from Tribute: It is either Perſonal or Real; that is, belonging to a Perſon immediately, or elſe by means of this or that Place, or Court of Immunity, whereof he is either Chief, or a Member.

FRANCHISE *Royal*, is where the King granteth to one and his Heirs, that they ſhall be quit of Toll.

FRANK-ALMOIN, in Law, ſignifies a Tenure or Title of Lands or Tenements beſtow'd upon God; that is, given to ſuch People as beſtow themſelves to the Service of God, for pure and perpetual Alms.

FRANK-BANK: See *Free-bench*.

FRANK-CHASE, is a Liberty of Free-Chaſe, whereby all Men (having Ground within that compaſs) are prohibited to cut down Wood, &c. without the View of the Foreſter, tho' it be in his own Demeſnes.

FRANK-FEE, in Law, is that which is in the Hands of the King or Lord of the Mannor, being ancient Demeſne of the Crown; whereas that which is in the Hands of the Tenant, is ancient Demeſne only.

FRANK-FORM, is a Land or Tenement, wherein the Nature of the Fee is charged by Feoffment out of Knight's-Service for ſeveral Yearly Services; and whence neither Homage, Worſhip, Marriage, nor Relief may be demanded, nor any other Service not contain'd in the Feoffment.

FRANK-FOLD, is where a Lord hath Benefit of Folding his Sheep within his Mannor for the Manuring of his Land.

FRANK-LAW, is taken for the free Enjoyment of all thoſe Privileges which the Law permits to a Man not found guilty of any heinous Offence. And he that loſeth his *Frank-Law*, is ſaid to fall into theſe Inconveniencies:

Firſt, That he may never be impannelled upon any Jury or Aſſize, or otherwiſe uſed in teſtifying any Truth.

Secondly, If he have any thing to do in the King's Court, he muſt not approach thither in Perſon, but appoint his Attorney.

Thirdly, His Lands, and Goods, and Chattels muſt be ſeized into the King's Hands; and his Lands muſt be eſtreated, his Trees rooted up, and his Body committed to Priſon.

FRANK-MARRIAGE, is a Tenure in Land Special, whereby a Man hath Land with a Woman to him and the Heirs of his Body, without doing any Service, but Fealty to the Donor.

FRANK-PLEDGE, in Law, a certain Pledge or Surety for Freemen.

FRANK-TENEMENT: See *Free-hold*.

FREE; the Seamen ſay, The Pump *frees* the Ship, when it throws out more Water than leaks into her; but on the contrary, when it cannot throw out the Water as faſt as it leaks in, they ſay, The Pump cannot *free* her: Alſo bailing or lading out Water out of a Boat, is called, *Freeing the Boat*.

FREE-BENCH, *Frank-Bank*, in Law, ſignifies that Eſtate in Copy-hold Lands that the Wife, being eſpouſed a Virgin, hath after the Deceaſe of her Huſband, for her Dower.

FREEHOLD, or *Frank-Tenement*, is that Land or Tenement which a Man holdeth in Fee, Fee-tail, or at the leaſt for Term of Life; and 'tis either *Freehold in Deed*, or *Freehold in Law*.

Freehold in Deed, is the Real Poſſeſſion of Lands or Tenements in Fee, Fee-tail, or for Life.

Freehold in Law, is the Right that a Man hath to ſuch Lands or Tenements before his Entry or Seiſure.

FREESE, a Term in Architecture: See *Frize*.

FREESING: The *Carteſians* explicate Freezing by the Receſs, or going out of the Ætherial Matter from the Pores of the Water or other Liquor; which being once done, the finer Parts are too ſmall and flexible to keep the long, ſlender, and Eel-like Particles of Water fluent, or in the form of a Liquor.

But the *Corpuſcularians* aſcribe the freezing of Water more probably, to the Ingreſs of Multitudes of cold or frigorifick Particles, as they call them, which entring the Liquor in Swarms, and diſperſing themſelves every way thro' it, do crowd into the Pores of the Water, and hinder the wonted agitation of its Parts, and wedge it up as it were into the hard or conſiſtent Body of Ice.

Freezing Mixture, is what is mix'd together in order to *freeze* other Bodies. Mr. *Boyle* in his Hiſtory of Cold ſhews, That not only all Sorts of Salts, whether *Alkalizate* or *Acid*, but even *Ardent Spirits*, ſuch as that of Wine; alſo Sugar and *Saccharum Saturni*, mix'd with Snow, are capable of freezing other Bodies; and the ſame Effect was alſo very eminently produced by the Mixture of Oil of *Vitriol*, or Spirit of *Nitre* with Snow, &c.

That Ice is ſpecifically lighter than the Water out of which it is by freezing made, is certain by its ſwimming in it; and that this Levity of Ice proceeds from theſe numerous Bubbles, which are produced in it by its Congelation, is equally plain; but how thoſe Bubbles come to be generated in freezing, and what Subſtance they contain in them (if they are not quite empty) is an Enquiry of great Importance, and perhaps if diſcovered, may help us much to underſtand the Nature of Cold.

Mr. *Hobbs* aſſerts, That they are occaſioned by the common Air, which intrudes into Water in its Coagulation, and ſo expands it.

But Firſt, No ſuch Ingreſs of Air into Water appears in its Coagulation; and that it doth not get into frozen Oil is plain, becauſe that Body is condenſed by being frozen.

Secondly, Mr. *Boyle* ſhews by undoubted Experiments, That Water frozen in Glaſſes ſealed hermetically, and in Braſs Bodies or Veſſels cloſely ſtopt, hath yet been turn'd into Ice abounding with theſe Bubbles.

Thirdly, He proves alſo by Experiment, That Water kept a while in the exhauſted Receiver, till all its Bubbles were emerged and gone, being afterwards turn'd into Ice by a freezing Mixture, that Ice had ſcarce any Bubbles at all in it. Whence 'tis plain theſe Bubbles are filled with ſome Matter which is within the Water, if they are filled with any thing: But he proves alſo by plain Experiments, that they have none, or at leaſt exceeding little true Elaſtick Air contain'd in them. *See* Vol. II.

FREEZLAND-HORSE, the ſame with *Chevaux de Freeze*.

FRESCO, in Architecture, to *Paint in Freſco*, is a ſort of Painting which is made upon the Plaiſtring of an Edifice before it be dry.

FRESH-DISSEISIN, in Law, ſignifies ſuch a *Diſſeiſin*, as a Man may ſeek to defeat of himſelf, and by his own Power, without the help of the King or Judges.

FRESH-FINE, is that which is levied within a Year paſt.

FRESH-FORCE, is a Force done within forty Days: For if a Man be diſſeiſed of any Lands or Tenements within any City or Boroughs, or *deforced* from them after the Death of his Anceſtor, to whom he is Heir, or after the Death of his Tenant for Life, or in Taile, he may within forty Days after his

his Title accrued, have a Bill out of the Chancery to the Mayor, *&c.*

FRESH-SHOT, in the Sea Phraſe, ſignifies the falling down of any great River into the Sea, ſo that the Sea has freſh Water a good Way from the Mouth of that River, which ſometimes by Accident is by the Deſcent of Land-Waters on a ſudden; and as this is more or leſs, they call it a great or ſmall *Freſh-Shot*.

FRESH-SUIT, in common-Law, is ſuch a preſent and earneſt Purſuit of an Offender, as never ceaſeth from the Time of the Offence committed or diſcovered, until he be apprehended: And the Effect of this in the Purſuit of a Felon is, that the Party purſuing ſhall have his Goods again; whereas otherwiſe they are the King's.

FRETT, a Bearing in Heraldry of this Figure.

Diamond, a *Frett Topaz*: The Coat Armour formerly of *Henry* Lord *Maltrevers*, and now quatered by the Duke of *Norfolk*.

Here is but one Frett, but ſometimes the Frett is of eight Pieces, and then 'tis ſpecified to be ſo; but if it conſiſt of more, 'tis called *Frette*.

FRIABLE, a Word uſed in reference to ſuch Bodies as will eaſily on rubbing break, crumble, or divide into ſmall Parts.

FRIGID *Zones*, See *Zones*.

FRIGORIFICK *Particles*, are ſmall Particles of Matter, actually and eſſentially Cold, which entring and penetrating other Bodies, do (according to the Opinion of *Gaſſendus* and others) produce in them that Quality which we call Cold: See *Cold*.

FRISE, or *Freeſe*, in Architecture, is that round Part of the Entablature which is between the *Architrave* and *Cornice*. This the *French* call the *Gorgerin* or *Collier*.

FRODMORTEL, or rather *Freemortoll*, in Law, is an Immunity or Freedom granted for Murder or Man-ſlaughter. *Cowel.*

FROENULUM, or *Frœnum Penis*, is a Membrane which ties the *Præputium* to the Glands of the *Penis*.

FRONT, in Perſpective, is the Orthographical Projection of an Object upon a Parallel Plane.

FRONT, in Fortification, is what the *French* call *Tenaille de Place*, and the Face of a Place. It is that which is comprehended between the Points of any two neighbouring Baſtions, *viz.* the Courtine, the two Flanks which are raiſed upon the Courtine, and the two Faces of the Baſtions which look towards one another.

FRONT-LINE, in Perſpective: See *Line of the Front*.

FRONTALE, or *Frontlet*, is an external Medicine, frequently applied to the Forehead for a Pain or Heat in the Head: It is made for the moſt Part of Herbs, Flowers, Seeds, Meal moiſtned with Vinegar of Roſes. *Blanchard.*

FRONTALIS, is a Muſcle which ariſes thin, broad, and fleſhy from the upper Part of the *Os Frontis*, near the *Sutura Coronalis*, and deſcending by the Poſterior and Forepart of the *Temporalis*, meets with its Partner near their Inſertions to the Skin of the Eye-brows; theſe draw up and wrinkle the Skin of the Forehead.

FRONTATUM, is a Term uſed by Mr. *Ray*, and other Botaniſts, to expreſs that the Leaf of a Flower (*Petalum*) grows broader and broader, and at laſt perhaps is terminated by a Right Line; and 'tis uſed in oppoſition to *Cuſpidatum*, which expreſſes that the Leaves of a Flower end in a Point.

Thus Marygolds, *Petala habent Frontata*,
But *Flos Solis*, *cuſpidata*.

FRONTIS *Os*, or *Coronale*, is a Bone of the *Cranium*, in form almoſt round; it joins the Bones of the *Sinciput* and Temples, by the Coronal Suture, and the Bones of the upper Jaw by the *Sutura Tranſverſalis*, and the *Os Sphænoides* by the *Sutura Sphænoidalis*. It forms the upper Part of the Orbit, and it has four *Apophyſes*, which are at the four Angles of the two Orbits. It has two Holes above the Orbits, through which paſs the Vein, Artery, and ſome Twigs of the firſt Branch of the fifth pair of Nerves. It has alſo one in each Orbit, a little above the *Os Planum*, through which a Twig of the Ophthalmick Branch of the fifth pair of Nerves paſſes to the Noſe, it is the Orbiter *Internus*. It has two *Sinus*'s above the Eye-brows, between its two Tables; they are lined with a thin Membrane, in which there are ſeveral Blood-Veſſels and Glands, which ſeparate a Mucous Seroſity, which falls into the Noſtrils. The Inſide of this Bone has ſeveral Inequalities, made by the Veſſels of the *Dura Mater*. It has two large Dimples, made by the anterior Lobes of the Brain. Above the *Criſta Galli* it has a ſmall blind Hole, into which the End of the *Sinus Longitudinalis* is inſerted. From this Hole it has a pretty large Spine which runs up along its Middle; inſtead of this Spine there is ſometimes a *Sinus*, in which lies the *Sinus Longitudinalis*, which ought to be obſerved carefully by Surgeons in Wounds of this Place. This Bone is thicker than the *Sinciput* Bones, but thinner than the *Os Occipitis*: In Children it is always divided into its Middle by a true Suture.

FRONTON, is a Part or Member in Architecture, which ſerves to compoſe an Ornament raiſed over Doors, Croſs-works, Nitches, *&c.* ſometimes making a Triangle, and ſometimes Part of a Circle. It is alſo called *Faſtigium* by *Vitruvius*, and *Pediſment* by the *French*.

FROZEN *Zones*: See *Zones*.

FRUCTIFEROUS, is that which produces Fruit; and is a Word uſed by my Lord *Bacon* and others, for ſuch Experiments in Natural Philoſophy, which are advantageous to the Experimenter in Point of Gain or Profit

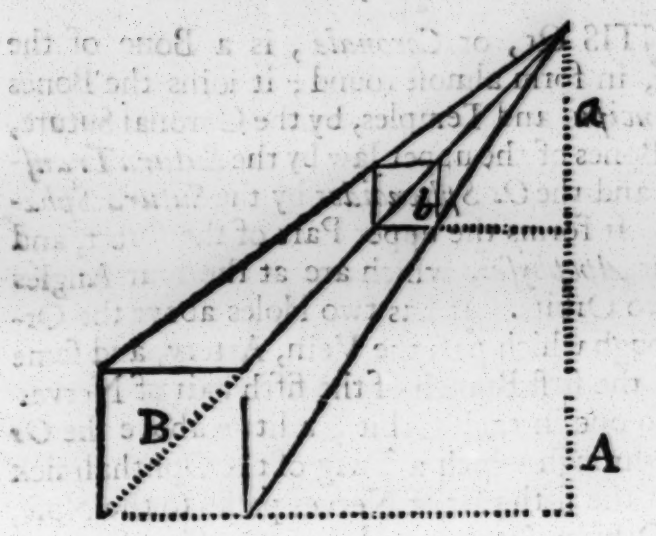
FRUMENTA and *Frumentaceous Plants*, are by the Botaniſts reckon'd all ſuch as have their Culm (or Stalk) pointed, and their Leaves like Reeds; and which bear their Seed (which is fit to make Bread, or be ground into Flower) in *Ears*, like common Corn; for they reckon two Kinds of *Fruges*, *Frumenta* and *Legumina*: See *Gramineous* and *Culmiferous Herbs*.

FRUSTUM, in Mathematicks, ſignifies a Piece cut off, or ſeparated from any Body; as the *Fruſtum* of a Pyramid or Cone, is a Part or Piece thereof cut off (uſually) by a Plane parallel to the Baſe.

All Round and Square Timber that is tapering may be conceiv'd as the *Fruſtum* of a *Cone* or a *Pyramid*. To find which, take the following Theorem, which in the main is Mr. *Oughtred*'s, who at *Pag.* 99. of his admirable *Clavis*, gives this and two others for the ſame Purpoſe.

Given
B, the Side of the greater Baſe,
b, the leſſer Baſe's Side,
A, the Height of the *Fruſtum*,
} Tho' below I ſuppoſe B and *b* to repreſent the Areas of the two Baſes.

Whole Height $a + A = H$.



First, To find a, ſay, As $B - b : b :: A : \frac{b\,A}{B - b}$ or $\frac{b\,A}{X}$. Now $B\,H = 3$ times the whole Pyramid, becauſe any Priſm is 3 times a Pyramid of the ſame Baſe and Height with it, by 7 *e* 10 *Euclid*, and $b\,a = 3$ times the upper Pyramid. Wherefore $\frac{B\,H - b\,a}{3}$ equal to the *Fruſtum* of the Pyramid required; Which Theorem in Words is this:

Multiply the lower Baſe by the whole Height, and from the Product ſubſtract the upper Baſe multiply'd by the Height of the Top-piece wanting; and then one third of the Remainder ſhall give the Fruſtum.

And the ſame way you may proceed for the *Fruſtum* of a Cone; only 'twill be more difficult to find the Circular Baſes.

FUGA *Vacui*; it is a Notion of the Peripateticks, and ſome other Ancient Philoſophers, that there is an *Abhorrence in Nature of a Vacuum*; and this in *Latin* they call *Fuga Vacui*, or Nature's endeavour to avoid a *Vacuum*.

FUGILE, an Impoſthume in the Ears. *Blanchard.*

FUGITIVES *Goods*, are the proper Goods of him that flieth upon Felony, which after the Flight lawfully found, do belong to the King or Lord of the Mannor.

FUGUE, in Muſick, is ſome Point conſiſting of 4, 5, 6, or any other Number of Notes begun by ſome one ſingle Part, and then ſeconded by a third, fourth, fifth and ſixth Part (if the Compoſition conſiſts of ſo many) repeating the ſame or ſuch like Notes, ſo that the ſeveral Parts follow, or come in one after another in the ſame manner, the leading Parts ſtill flying before thoſe that follow.

FUGUE-DOUBLE, is when two or more different Points move together in a *Fugue*, and are alternately interchanged by ſeveral Parts.

FULIGINOUS *Vapours*, according to ſome, are thick, impure, and ſooty *Vapours*.

FULMINATING *Powder*: See *Aurum Fulminans*, and *Pulvis Fulminans*.

FULMINATION, the ſame with *Detonation*; which ſee.

FUMIGATIO *Chymica*, is an Eroſion of Metal by Smoak or Vapour.

FUMIGATION, is making one Body receive the Smoak of another, in order to impregnate it with the more Volatile Parts of the Body burnt.

FUNCTION, the (ſame that Action) is, in reference to any Operation of the Organical Parts of an Animal Body, an effective Motion produced in the Part by the proper Aptitude, or Fitneſs of ſuch Part for the Uſes the Author of Nature deſigned it.

FUNDUS *Plantæ*, the Botaniſts call that the Bottom of a Plant, where the Stalk and Root juſt meet and join.

FUNGUS, is a ſoft ſpungy Fleſh which grows upon Wounds.

FUNICULAR *Hypotheſis*, was advanced by *Franciſcus Linus*, againſt the Notion of the Spring and Weight of the Air; and he ſuppoſes, That the Suſpenſion of the Mercury in the Torricellian Experiment, is not cauſed by the Weight of the Atmoſphere preſſing on the Mercury in the Baſin, but by a kind of *Funiculus* of ſome very fine and thin Subſtance; which being exceedingly rarified by a forcible Diſtenſion, is continually contracting it ſelf up, or becoming more diſtended according to the different Temperament of the external Air, and by this Means occaſions the riſing and falling of the Quickſilver in the Barometer.

But 'tis ſtrange that this little Rope or String at the Top would be able to ſuſtain all the Mercury requiſite to form a Column of 30 Inches in length; and that as Part will run out of the Tube when there is more Mercury in it, ſo none at all ſhould run out after it is come to its due length: Since Mercury is a Fluid Body, how comes the *Funiculus* to turn it into a ſolid one? And by its little Strings hold it ſo altogether, that none can run out?

FUNICULUS, *Inteſtinum*, *Laqueus*, or *Ductus Umbilicalis*, the Navel-ſtring, is a Membranous Channel or Conduit in the *Fœtus*, which reaches from the Navel to the *Placenta* in the Womb; it contains two Arteries, one Vein, and the Urinary Paſſage in the *Fœtus*, ſaith *Blanchard*. Indeed the Umbilical Veſſels between the Navel and the *Placenta* are wrapt up in a Production of the *Chorion* and the *Ammion*, which is generally about a Foot and an half long, that the Motion of the *Fœtus* may not pull the *Placenta* from the Womb: The Uſe of this Navel-ſtring is to carry the Mother's Blood by the Veins to the *Fœtus*, for its Nouriſhment; and that which is unfit for this Purpoſe, is carried back by the Arteries to the *Placenta*, while the *Fœtus* is ſtill ſupplied with more from the Vein; ſo that there is a continual Circulation of Blood between the Mother and the *Fœtus*.

FURCALE *Os*, the ſame with *Furcula*.

FURCELLA, the ſame with *Furcula*.

FURCHE, ſo the Heralds call the Form of this kind of *Croſs* in a Coat of Arms.

FURCULA *Superior*, is the upper Bone of the *Sternum* or Breaſt-bone; others call it *Jugulum*. *Blanchard.*

FURFURATION, or *Furfures*, is when Dandriffs fall from the Head in Combing; it comes for the moſt part from that Skin which is under the Hair; alſo from the Beard and Eye-brows. *Blanchard.*

FURFURES, the Scales that fall from the Head, and ſometimes from Skin of the other Parts of the Body, occaſion'd by the Separation of the *Cuticula* or Scarf-ſkin from the *Cutis*, or true Skin. *Blanchard.*

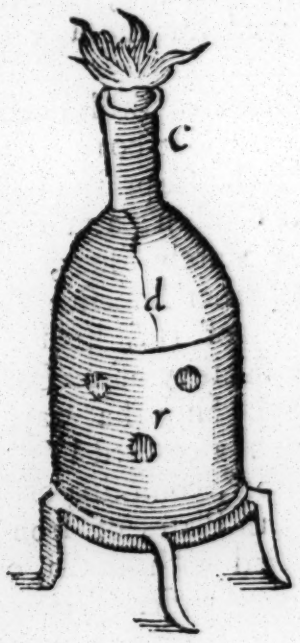
FURLE,

FURLE, the Sea Word for wrapping up and binding any Sail close to the Yard, which is done first by haling up the Braces, and then wrapping the Sail close together, and so binding it fast to the Yard with the Caskets, and Furling-lines. This was formerly written *Farthel*, because the Sail is thus made up in a Bundle or Farthel; but 'tis now every where corrupted into the Word *Furle*.

FURLING-LINES, are small Lines made fast to the Top-sails, Top-gallant-sails, and to the Misen-yard-Arms, to furle up those Sails. Indeed the Misen hath but one Furling-Line, but all the rest have two, one at each end.

FURNACE, the Chymists have several sorts of Furnaces, as the *Reverberatory*; which see under that Word: A *Wind Furnace*, or *Furnace for Fusions*, which is so called, because the Wind comes forcibly to blow the Coals, in order to *Melt* or *Fuse* the Matter in the *Crucible* or *Coppel*. This Furnace for *Fusions*, is in form just like the Reverberatory, only less, and there is no need of laying the two Cross Bars there mention'd. They frequently also use *Moveable Furnaces*, whose make is like that of the Reverberatory, and they are made of a Paste consisting of three parts of Powders of broken Pots, and two parts of Clay well temper'd together with Water.

Lemery gives the following Figure of a small moveable Furnace for *Fusions*.



c The Chimney.

d The Dome, consisting of two pieces.

r Three Registers or Holes, to let in the Air to come to the Fire.

FURNITURE *of a Dial*, are such Lines as are drawn thereon for Ornament; as the *Parallels of Declination*, *Length of the Day*, *Azimuths*, *Points of the Compass*, *Babylonish and Jewish Hours*, &c.

FURRING *of a Ship*, is laying on double Planks on her Sides; this is done after the Ship is built, and is by the Sailors called *Plank upon Plank*: But there is another way of *Furring* which is more properly so called; and that is, when a Ship's Planks are ripped, and new Timbers are put on the former Timbers, and on them other Planks; which is done sometimes to make a Ship bear her Sails the better.

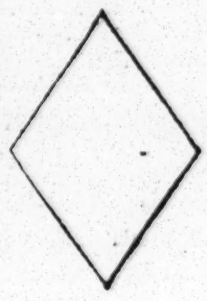
FURRS, in Heraldry, are used in the Doublings of the Mantles pertaining to a Coat of Arms, and sometimes to the Coat it self: They are usually of two Colours; as *Ermins* and *Ermines*, which are black and white: *Erminois* and *Pean*, which are black and yellow: *Vairy*, which is white and blue: *Verry*, which is yellow and red, or the like colours.

FURUNCULUS, a Boyl, is an acute Swelling as big as a Pigeon's Egg, attended with an Inflammation and Pain, especially when it begins to corrupt and putrifie; when it is open'd, and the Matter let out, part of the Flesh underneath is turned into Corruption of a whitish and reddish colour, which some call the Ventricle of the *Furunculus*; there is no danger in it, tho' you apply no Remedy to it; for it ripens of it self, and bursts; but the Pain makes it more eligible to apply a Remedy, because that frees the Patient sooner from his Trouble. *Blanchard.*

FUSAROLE, is a small round Member in Architecture, cut in form of a Collar, with somewhat long Beads under the *Echinus*, or Quarter Round of Pillars of the *Dorick*, *Ionick*, and *Composite Orders*.

FUSE or *Fusel* of a Bomb, or Granado-shell, is that which makes the whole Powder, or Composition in the Shell take Fire, to do the designed Execution; 'tis usually a Wooden Pipe or Tap filled with Wild-fire, or some such Composition, and is design'd to burn so long, and no longer, as is the Time of the Motion of the Bomb from the Mouth of the Mortar to the Place where it is to fall; which Time Mr. *Anderson* makes to be about 27 Seconds; so that the Fuse must be contrived either from the Nature of the Wild-fire, or the length of the Pipe which contains it, to burn just that Time.

FUSIL, in Heraldry is a Rhomboidical Figure; more slender then a Lozenge. Thus,



And sometimes thus;

The latter of which seems to be the true Figure, for the Fusil was anciently a kind of Spindle used in Spinning.

The Word Fusil also signifies a Fire-lock; whence comes our Word *Fusileers*, *i. e.* Soldiers carrying only Fire-Arms, and without Pikes.

FUSILIERS, are (in an Army) the same with Musqueteers, and are so called from the Word *Fusil*, which signifies sometimes a Musket.

FUSILLY, in Blazon, is when the Field of an Escutcheon is divided throughout into *Fusils*, as thus:

He beareth *Fusil Sable and Ermin.*

The like is to be understood of *Lozengy*, or *Fretty*, respect being had to the Figure.

FUSION, in Chymistry, is the same as *Melting*; so that their Furnace for melting of Metals is called the Furnace for *Fusions*. The *Cause of Fusion*, or the Reason of melting Metals, &c. is this, That by the Force of the Heat or Fire, the Cohesion of the Parts is dissolved, and the Metalline Particles being disjoined, and having a Figure proper to slide over one another's Surfaces, are moved with a most rapid Motion, and so put on the Form or Appearance of a Fluid.

FUSY, is that Part of a Watch about which the Chain or String is wrapped, and is that which the Spring draweth, being in Form commonly taper. In larger Works going with Weights it is Cylindrical, and is called the Barrel.

To find what Number of Turns the *Fuſy* will have, uſe this Proportion:

As the Beats of the Balance in one Turn of the Great-Wheel or *Fuſy*, (ſuppoſe 26928) : Is to the Beats of the Balance in one Hour (20196) :: So the Continuance of the Watches going in Hours (ſuppoſe 16) : To the Number of the Turns of the *Fuſy* (12).

That is, 26928 : 20196 :: 16 : 12.

FUTTOCKS, are the Compaſſing Timbers in a Ship; which make her Breadth; thoſe below next the Keel are called her *Ground Futtocks*; the other the *Upper Futtocks*.

GAL GAN

GABEL, according to ſome of our Ancient Records, Statutes, Charters, &c. ſignifies a Rent, Cuſtom, or Duty yielded or done to the King, or any other Lord, not by Contract or Bargain, but impoſed by the Will of the Lord. Both the Word and Thing it ſelf is grown quite out of Faſhion in *England*, where no Duty can be impoſed upon the Subject but by Act of Parliament; but in *France* it is ſtill practiſed, where it ſignifies an Exciſe upon Salt, and is a very heavy one.

GABIONS, a Term in Fortification, ſignifying Baskets made of Oſier-Twigs, equally wide at the Top and Bottom, about four Foot in Diameter, and from five to ſix high; which being filled with Earth, are ſometimes uſed as Merlons for the Batteries, and ſometimes as a Parapet for the Lines of Approach, when it is requiſite to carry on the Attacks through a Stony or Rocky Ground, and to advance them with extraordinary Vigour. They ſerve alſo to make Lodgments in ſome Poſts, and to ſecure other Places from the Shot of the Enemies, who nevertheleſs endeavour to ſet the Gabions on Fire with Pitch'd Faggots, to render them uſeleſs.

GAGE, when one Ship is to Windward of another, ſhe is ſaid to have the *Weather-gage* of her: The Seamen call alſo trying how much Water a Ship draws, *Gaging*, or rather *Gauging of her*; and it is thus done; They drive a Nail into a Pike near the End, and then put down this Pike by the Rudder till the Nail ketch hold under it, for then as many Feet as the Pike is under Water, is the *Ship's Gage*, or the Depth of Water ſhe draws.

GAGE, in Common Law, ſignifies a Pawn or Surety: See more in *Wage*.

GAGE-POINT: See *Gauge-Point*.

GALAXY, or *Via Lactea*: See *Milky-Way*.

GALE, the Sea Word for the blowing of the Wind at Sea: When the Wind blows not ſo hard but that a Ship can carry her Top-ſails a Trip, (that is, hoiſed up to the higheſt) then they ſay it is a *Loom Gale*; when it blows very ſtrong, they ſay it is a *ſtiff*, or *ſtrong*, or at leaſt, a *freſh Gale*; but when it blows ſo hard and violently that a Ship cannot bear any Sail, they ſay it blows a *Storm*. When two Ships are near one another at Sea, and there being but little Wind blowing, one of them finds more of it than the other, they ſay that the Ship *Gales* away from the other.

GALEA, is a Pain in the whole Head, ſo called from the Likeneſs of the Place, becauſe it takes in, or encompaſſes the whole Head like an Helmet; in *Latin Galea*. *Blanchard*.

GALEA is likewiſe uſed when the Head of the *Fœtus* is clothed with Part of the Membrane called *Amnion*, as it comes into the World; they ſay then it hath a *Galea*. *Blanchard*.

GALENICK-MEDICINE, is that Phyſick which is built upon the Principles of *Galen*, and therefore they are *Galeniſts* who embrace the Foundations of that Art, which are fetched from *Galen* and his Principles; though 'tis now frequently oppoſed to the Chymical Method of Practice, which, they ſay, is much ſhorter. *Blanchard*.

GALL: See *Bile*.

GALL-BLADDER, the ſame with *Folliculus Fellis*.

GALLACTOPHORI, are *Ductus*'s which carry Milk, and convey the Chyle (as ſome Modern Authors have fancied) a ſtrait way from the Guts to the Glandules of the Breaſts; yet the Arteries are more properly ſo called, becauſe they carry the Chyle along with the Blood to the Breaſts, wherein the Milk is ſeparated and reſerved for the Uſe of the *Fœtus*.

GALLERY, in a Ship, is that Beautiful Frame which is made upon the Stern without-board, into which there is a Paſſage out of the Captain's Cabbin, which is called the Great Cabbin; and theſe Galleries are indeed rather for Stately Shew, and the Captain's Pleaſure, than any other Benefit; for in Ships of War all open Galleries of this kind are to be avoided, in regard of the Facility of an Enemy's Entrance, and boarding of the Ship that way.

GALLERY, in Fortification, is a covered Walk, the Sides whereof are Musket-proof, conſiſting of a Double Row of Planks lined with Plates of Iron; the Top being ſometimes covered with Earth or Turf, to hinder the Effect of the Artificial Fire of the Beſieged. Theſe Galleries are frequently made uſe of in the Moat already filled with Faggots and Bavins, to the end that the Miner may approach ſafe to the Face of the Baſtion, when the Artillery of the oppoſite Flank is diſmounted.

GALREDA, a thick viſcous Juice that is extracted by boiling from the Griſtly Parts of Animals, and is uſually called a *Gelly*.

GANG: To Man the Boat, in the Sea Phraſe, is to put a Gang of Men (which is a Company) into her: They are commonly called the Coxſwain's Gang who hath the Charge of her.

GANGWAY, ſignifies all the ſeveral Entrances, Ways, or Paſſages from one Part of the Ship to the other; and whatſoever is put in any one of theſe Paſſages, are ſaid to be laid or put in the *Gangway*.

GANGLION, is an Humour in the Tendinous and Nervous Parts, proceeding from a Fall, Stroke, or otherwiſe: It reſiſts if ſtirred; if preſſed upon the Side, is not diverted, nor can be turned round. *Blanchard*.

GANGRENE, is a Cadaverous Corruption of a Part, attended with a beginning of Stink, Blackneſs, and Mortification. *Blanchard*.

GARB, the Term in Heraldry for a Wheat-Sheaf.

GARBOARD-PLANK, the first Plank of a Ship Fastened on her Keel; as

GARBOARD-STRAKE, is the first Seam in a Ship next to the Keel.

GARD DU-CORD, or *Gard-du-Gut*: See *Gardecaut*.

GARDECAUT, or *Gard-du-cord*, is that which stops the *Fusy* of a Watch when wound up, and for that end is driven up by the String; some call it *Guard-Cock*, others *Gard-du-Gut*.

GARDEYNE DEL EGLISE, or *Church-Wardens*, are Officers chosen in every Parish to have the Care and Custody of the Church Goods; and they may have an Action for the Goods of the Church, and divers other things they may do for the Benefit of the Church: They are to join with the Overseers for the making of Rates, and other Provision for the Poor of the Parish.

GARDIAN, or *Guardian*, signifies generally him that hath the Custody or Charge of any Person or thing; but most commonly him that hath the Education or Protection of such People as are not of sufficient Discretion to guide themselves and their Affairs, being indeed as largely extended as *Tutor* and *Curator* among the *Civilians*; for whereas *Tutor* is he that hath the Government of a Youth until he come to fourteen Years of Age; and *Curator*, he that hath the imposition and ordering his Estate afterwards, until he attain to the Age of five and twenty Years; or that hath the Charge of a Frantick Person during his Lunacy; both these with us are called *Guardians*.

A *Tutor* is either *Testamentarius*, or *à Prætore datus ex Lege Atilia*; or lastly, *Legitimus*: So we have three sorts of *Guardians* in *England*, one ordained by the Father in his last Will, another appointed by the Judge, the third cast upon the Minor by the Law and Custom of the Land.

As to the first of these, a Man having Goods or Chattels, may appoint a *Guardian* to the Body or Person of his Child, by his Last Will and Testament, until he come to the Age of fourteen Years, and to the disposing and ordering of his Estate so long as he thinks meet, which is commonly to one and twenty Years of Age. The same he may do of Lands not holden *in Capite*, or by Knight's-Service; but the ancient Law in this Case is very much altered, and in all Cases gives the Father Power to appoint a *Guardian* for his Child; but if the Father order no *Guardian* to his Child, the Ordinary may appoint one to manage his Goods and Chattels till the Age of fourteen Years; at which time he may chuse him another *Guardian*, as by the Civil Law he may his *Curator*; for this Rule holds, that is, *Invito Curator non datur*. And for his Lands the next a-kin on that Side, by which the Land cometh not, shall be *Guardian*, who was formerly called *Guardian in Soccage*.

GARDIAN, or *Guardian of the Spiritualties*, is he to whom the *Spiritual Jurisdiction* of any Diocese is committed during the Vacancy of the See. And the *Guardians* of the *Spiritualties* may either be *Guardian* in Law, or *Jure Magistratus*, as the Archbishop of any Diocese within his Province; or *Guardians* by Delegation, as he to whom the Archbishop or Vicar-General doth for the time depute.

GARDIAN, or rather *Warden of the Cinque Ports*, is a principal Magistrate that hath the Jurisdiction of those Havens in the South-East part of *England*, which are commonly called, *The Cinque Ports*; that is, the five *Ports* or *Havens*; who there hath all that Jurisdiction that the Lord High Admiral of *England* hath in Places not exempt.

GARGAREON, the same with the Epiglottis, or Cover of the Wind-pipe; which see.

GARGARISM, is a Liquid Medicine which is used to cleanse the Mouth and the adjacent Parts, by gargling or moving it up and down in the Throat without swallowing; and it is either a Decoction, wherein convenient Syrups are dissolved, or distilled Waters mixed with Syrups, and sometimes with Mineral Spirits. *Blanchard*

GARLAND, in a Ship, is that Collar of Rope which is wound about the Head of the Main-mast, to keep the Shrouds from galling.

GARNET, is a Tackle in a Ship, having a Pendant coming from the Head of the Main-mast, with a Block strongly seized to the Main-stay just over the Hatch-way; in which Block is reeved the Runner, which hath an Hook at one End, in which is hitched the Slings; and at the other End is a Double Block, in which the Fall of the Runner is reeved, that so by it any Goods or Casks that are not overheavy, may be haled and hoised into, or out of the Ship; when this *Garnet* is not used, it's fastened along by the Stay at the Bottom of it.

GARNISHEE, is taken for the Party in whose Hands Money is attached within the Liberties of the City of *London*, so used in the Sheriff of *London*'s Court, because he has had *Garnishment* or Warning, not to pay the Money, but to appear and answer to the Plaintiff's Creditor's Suit.

GARNISHMENT, in Law, is a Warning given to one for his Appearance, for the better furnishing of the Cause and Court; as if one is sued for the Detinue of certain Evidences and Charters, and saith, That the Evidences were delivered to him, not only by the Plaintiff, but another also; therefore prayeth that that other may be warned to plead with the Plaintiff, Whether the said Conditions be performed or no? And in this Petition he is said to pray *Garnishment*: *New Book of Entries*, Fol. 211. Col. 3.

GARRISON, is a certain number of Officers and Soldiers that defend a Place.

GARTER, a Term in Heraldry, signifying the Moiety or half of a *Bend*: See *Bend*.

GAS, a Word used by *Van Helmont*, and seems designed to signify in general a Spirit not capable of being coagulated: But he uses it loosely in many Senses; as he calls the Vital Principle in Man, *Gas Vitale*; that Sulphureous or Arsenical, or any other way noxious Damp which is found in some Mines, he calls *Gas Pingue Sulphureum*: Nay, sometimes he calls the Air its *Gas Ventosum*, as he doth Water *Gas Salium*: and in short, speaks very unintelligibly and inconsistently about it, as the Chymist's Manner is in other things.

GASTEROCNEMIUM, is the Calf of the Leg, whence its Muscles are called *Gasterocnemii*, from their swelling like a Belly: Therefore two of these Muscles are called *Gasterocnemii*.

GASTEROCNEMIUS *Externus*, also *Gemellus*, is a Muscle of the *Tarsus*, so called, (because with the *Soleus* or *Internus* of that Name) it composes the Calf of the Leg: It is also called *Gemellus*, from its being as it were double. It has two distinct Fleshy Originations, from the superior and hindmost Parts of each Tubercle of the lower Appendage of the Thigh Bone, which in their Descent are each dilated into two large Fleshy Bellies, the innermost of which is thickest and largest, having each a differing Series of Fleshy Fibres, and join to each other near where they make a broad strong Tendon,

don, which narrowing it self, joins with the great Tendon of the *Gasterocnemius Internus*, four Fingers breadth above its Insertion to the *Os Calcis*. When this Muscle acts, the Foot is said to be extended or pulled backwards, which Motion of it is very necessary in Walking, Running, Leaping, and Standing on Tiptoe, &c. Hence it is, those that walk much, that carry heavy Burthens, Chairs, &c. and who wear low-heel'd Shooes, have these Muscles larger than others.

GASTEROCNEMIUS *Internus*, is a Muscle of the Foot, which is placed under the *Gasterocnemius Externus* and *Plantaris*. It is also called *Soleus* from its Figure, resembling a Sole-Fish. It's externally fleshy Part is covered with a Transparent Tendinous Expansion, which makes it appear of a livid Colour. Its Beginning is partly Tendinous, but chiefly Fleshy from the hindermost Part of the upper Appendix of the *Fibula*, and Back-part of the *Tibia*, that is below the Insertion of the *Subpoplitæus*, and increasing to a large Fleshy Belly composed of various Orders of Fleshy Fibres, some of them underneath aptly expressing the Figure of the Top of a Feather, whose *Stamina* here being Tendinous, join with the great Tendon, which is about a Finger's Breadth in Length, and inserted to the superior and hindmost Part of the *Os Calcis*. The Foot, together with the Toes, being as it were a Leaver to the whole Body, ought therefore to be attended with Muscles of great Strength to extend it; wherefore we find these Muscles so much to exceed the *Antagonist*, the *Tibæus Anticus*, as well in the advantageous Construction of their differing Series of Fleshy Fibres, as their Magnitude and Insertion at the Extremity of the *Os Calcis*, whereby they are not only rendred serviceable in Walking, Running, Leaping, &c. but do also support the *Tibia* in Standing, lest the superincumbent Pressure of the Weight of the Body should make them incline forwards at their Articulations with the *Talus*.

GASTROEPIPLOICA, is the Vein and Artery which goes to the Ventricle and Cawl.

GASTRORHAPHIA, is a Connexion or a Suture in the Wounds of the Abdomen.

GASTROTOMY, the cutting of the Abdomen: See *Cæsarean Section*.

GATE *of the Sea*, or a *Sea-Gate*, is when two Ships lie aboard one another in a Wave or Billow, and by that Means sometimes become Rib-broken.

GAVEL, in Law, signifies Tribute, Toll, Custom, Yearly Rent, Payment, or Revenue, of which there are several Kinds, as *Gavel-Corn*, *Gavel-Malt*, *Out-Gavel*, *Gavel-Fodder*, &c.

GAVELET, is a special and ancient kind of *Cessavit* used in *Kent*, where the Custom of *Gavel-kind* continueth, whereby the Tenant shall forfeit his Lands and Tenements to the Lord of whom he holdeth, if he withdraw from him his due Rents and Services. Mr. *S.* in his *History of Gavel-kind* says, That this *Gavelet* was not a Rent or Service, but signified a Rent or Service withheld, denied, or detained, causing the Forfeiture of the Tenement to the Lord; with which the Lord *Coke* agrees, where he says, That *Gaveletum* is as much as to say, to cease, or to let to pay the Rent. And it seems this Writ lay in *London* as well as *Kent*.

GAVEL-KIND, signifies, in Law, a Custom, whereby the Land of the Father is equally divided at his Death among all his Sons, or the Land of the Brother at his Death equally divided among all his Brethren, if he have no Issue of his own. This Custom is still in force in divers Places of *England*, especially in *Kent*, *Urchenfield* in *Herefordshire*, and elsewhere, though with some Difference: And all *Gavel-kind* Land in *Wales* are made descendable to the Heirs, according to the Course of the Common Law. In *Gavel-kind*, tho' the Father be hanged, the Son shall inherit; for their Custom is,

The Father to the Bough, the Son to the Plough.

GAUGE-POINT, of a Solid Measure, is the Diameter of a Circle, whose Superficial Content is equal to the Solid Content of the same Measure: Thus, the Solid Content of a Wine Gallon being 231 Cubick Inches, if you conceive a Circle to contain so many Inches, you may easily find the Diameter of it, which shall be the *Gauge-Point* for *Wine Measure*: After the like Manner the *Gauge-Point* for *Ale Measure*, &c. is found. Vid. Windgate's *Rule of Proportion*, *Ch.* 10.

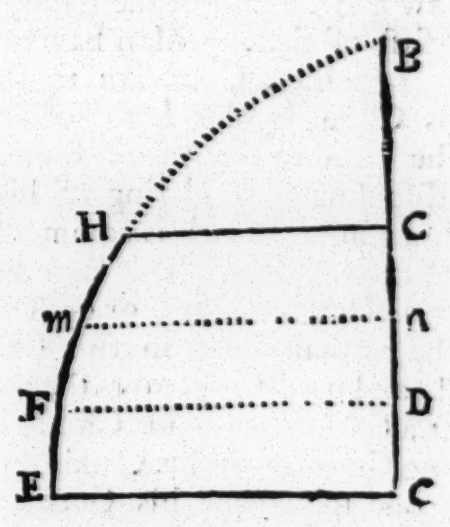
GAUGING, is the finding the Capacities or Contents of all sorts of Vessels which hold *Liquids*, *Powders*, *Meal*, *Corn*, &c.

If these are of a Square form like hollow Cubes or Parallelopipids, &c. such as many sorts of *Backs*, *Coolers*, *Fats*, &c. their Content is easily found, by multiplying the Area of the Base by the perpendicular Altitude, as you find the Solidity of Parallelopipids and Prisms.

If they are of a Cylindrical Figure, as Bushels, Gallons, &c. you must, as near as you can, find the Area of the Circular Base, and multiply that by the perpendicular Altitude as before.

If they are *Casks* of the usual Form of our Hogsheads, Barrels, &c. Mr. *Oughtred* considers them as Segments of a *Spheroid*, cut off by two Planes perpendicular to the Axis.

And then Mr. *Caswell* thus easily deduces his Theorem for measuring Wine and Ale Casks:



Suppose CEB a Quadrant of an Ellipsis, whose Semi-Axes are CB and CE; and let the Ratio of the Semi-Parameter to CB, be as l to t: And let EC, ED, mn, HG, be considered as the Radii of Circles, which when turned round the Axis, BC shall form a *Spheroid*: Therefore the Elemental Circle

$$\left.\begin{array}{rl} DF & = l \\ \odot\, nM & = \frac{l}{t} \times \\ \odot\, GH & = t \end{array}\right\} \begin{array}{l} \odot\, CB - \odot\, CD \\ \odot\, CB - Cn \\ \odot\, CB - CG \end{array}$$

Wherefore the Frustum of the Spheroid is $= \frac{l}{t}\, p \times CB - \frac{1}{2} \odot CG : = \frac{1}{3}\, p \times \frac{l}{t} \odot CB - \frac{l}{t} \odot CG =$

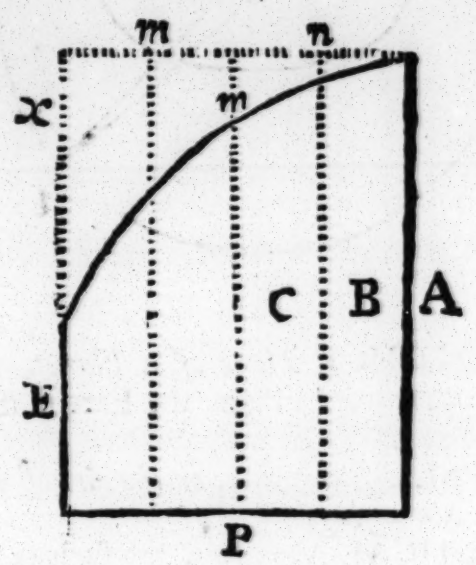
$$\overline{\left|\tfrac{1}{3}\, p \times 2 \odot CE + \odot HG\right|}$$

Which

Which laſt is Mr. *Oughtred*'s Theorem; in Words thus:

Add twice the Area of the Circle at the Bung, to the Area of the Circle of the Head; and then multiply that Sum by one Third of the Length of the Cask, (which p *ſtands for here, as being a Perpendicular to the Planes of theſe Circles) the Product is the Content of the Veſſel in Cubick Inches.*

But perhaps, ſaith Mr. *Caſwell*, moſt of our Casks had better be conſidered as *Fruſta* of a *Parabolick Spindle*; and then the Ground of their Menſuration he thus deduces.



Suppoſe *A* the Axis of a Parabola, and *P* an Ordinate to that Axis, divided into innumerable Parts by *B*, *C*, &c. drawn parallel to the Axis, whoſe Differences from *A*, ſuppoſe *n*, *m*, &c.

$$\text{That is, } \begin{cases} B = A - n \\ C = A - m \\ E = A - x \end{cases}$$

$$\text{Therefore } \begin{cases} B^2 = A^2 - 2An + nn \\ C^2 = A^2 - 2Am + mm \\ E^2 = A^2 - 2Ax + xx \end{cases}$$

But A^2, A^2, &c. is a Series of *Equals*, therefore $= p\,A^2$, and $2An$, $2Am$, &c. (by the Nature of the Parabola) is a Series of *Secundans*, therefore $= p \times \frac{2}{3} Ax$. And nn, mm, xx, is a Series of *Quartans*, therefore $= \frac{1}{3} p\,xx$.

Therefore the Fruſtum of a *Pyramidoid*, made of A^2, B^2, C^2, &c. is $= P \times A^2 - \frac{2}{3} Ax + \frac{1}{3} xx = \frac{1}{3} P\,x : \frac{1}{3} xx + 2A^2 + (A^2 - 2Ax =) E^2 - xx = \frac{1}{3} P \times : 2A^2 + E^2 - \frac{2}{3} xx$.

Therefore if a Segment of a *Parabola*, cut off by a Line parallel to the Axis, be turn'd about its ordinately Applicate *P*; the Fruſtum of the Acute *Parabolick Conoid*, ſo generated, or as ſome call it, a *Parabolick Spindle*, is $= \frac{1}{3} P \times : 2 \odot A + \odot E - \frac{2}{3} \odot x$.

So that the Fruſtum of a *Parabolick Spindle*, is leſs than the Fruſtum of the *Spheroid* of the ſame Baſe and Height by $\frac{7}{3} \odot x \times \frac{1}{3} P$; and for the moſt Part gives the Capacity of Casks nearer the Truth than the Theorem of *Oughtred*, who ſuppoſes Casks to be Fruſta of *Spheroids*; or than that of others, *by multiplying the Circles at the Bung and Head into half the Length of the Cask*, which ſuppoſes it to be a *Parabolick Conoid*: Or laſtly, than with others, to ſuppoſe them for Fruſta of *Cones*; which is fartheſt of all from the Truth.

The Common Rule for all Ale or Wine Casks, is to take the Diameters at the Bung and at the Head; by which you muſt find the Areas of the Circle there; then you muſt take $\frac{2}{3}$ of the Area of the Circle at the Bung, and $\frac{1}{3}$ of the Area of the Circle at the Head, and add them together into one Sum, which Sum multiplied by the internal Length of the Cask, gives the Content in Solid Inches: Which you may turn into Gallons, by dividing by 282 for Ale, and 231 for Wine Gallons.

But certainly 'tis eaſier and ſhorter to uſe the Theorem, as Mr. *Oughtred* expreſſes it, as aboveſaid, *viz*, $\frac{1}{3} p \times 2 \odot CE + HG$, than to make Fractions of the Areas of thoſe Circles, as in the common way.

GAYNAGE, in our Law, ſignifies moſt properly the Profit that comes by the Tillage of the Land held by the baſer kind of Soke-men.

GAZONS, in Fortification, are Pieces of freſh Earth covered with Graſs cut in Form of a Wedge, about a Foot long, and half a Foot thick, to line Parapets and the Tranſverſes of Galleries.

GEMELLES, the Term in Heraldry for the bearing of Bars by Pairs or Couples in a Coat of Arms: As,

He beareth *Gules on a Chevron Argent, three Bars Gemelles Sable*, by the Name of *Throgmorton*.

GEMELLUS, is a Muſcle of the Cubit, ſo called from its double Origine; it ariſeth firſt Tendinous from the ſuperior Part of the inferior *Coſta* of the *Scapula* internally, and as it paſſeth between the two round Muſcles, it grows Fleſhy, and in its Deſcent joineth with its other Beginning, which ariſes broad and Fleſhy from the upper and back-part of the *Os Humeri*, under the Deltoid Muſcle; and being Tendinous on the outſide, and Fleſhy within, is ſo inſerted to the ſuperior and external Part of the *Ulna*, called *Olecranum* and *Ancon*, or the Elbow. Its Uſe is to extend the *Cubit*: If we examine the two Beginnings of this Muſcle, we ſhall find them interwoven with various Orders of Fibres, whereby it is rendred capable of performing the Extenſion of the *Cubit* with a greater Strength; which appears in Tumblers when they are walking on their Hands, who by an immediate Extenſion of their *Cubits*, can return to their Feet.

GEMINI, a Muſcle ſerving to move the Thigh outwards.

GEMINI, one of the 12 Signs of the *Zodiack*, being the Third in Order; alſo a Conſtellation of that Name.

GEMINOUS *Arteries*, ſo ſome call the two ſmall Arteries which deſcend to the Joint of the Knee, between the Proceſſes of the Thigh-bones.

GEMMA, among the Botaniſts, is the Turgid Bud of any Tree when it is beginning to bear. 'Tis called alſo *Oculus*.

GENA *Mala*, is the Part of the Face from the Noſe to the Ears: Alſo the Chin and the Jaw-bone is ſometimes ſo called, which is either upper or lower. *Blanchard*.

GENERATING *Line or Figure*, in Geometry, is that which by its Motion or Revolution produces any other Figure Plane or Solid. Thus a Right Line moved any way parallel to it ſelf, *generates* a Parallelogram: if round a Point in the ſame Plane, with one End faſtened in that Point, it *generates* a Circle.

One entire Revolution of a Circle in the ſame Plane, *generates* the Cycloid; the Revolution of a Semicircle round its Diameter, *generates* a Sphere, &c. Sir *Iſaac Newton* uſes the Word

GENERATED, or *Genited Quantity*, in a very large Senſe, for whatever is produced either in Arithmetick by the Multiplication, Diviſion, or Extraction of Roots; or in Geometry by the Invention of the Contents, Areas, and Sides; or of Extream and Mean Proportionals, without Addition and Subſtraction.

GENERATION, is the Production of any thing in a Natural Way, which before was not in Being: For when in any Parcel of Matter there is produced ſuch a Concurrence of all thoſe Accidents which ('tis agreed) are neceſſary and ſufficient to conſtitute a *determinate Species* of things Corporeal; we then ſay a Body belonging to that Species is generated. So that here, properly ſpeaking, no *New Subſtance*, but only a new *Eſſential Denomination*, *Modification*, or *Manner of Exiſtence* is produced or generated: And when that Union of Accidents which denominates a Body generated, is deſtroyed and diſſolved, that Body loſing its Eſſential Modification is ſaid to be Corrupted.

GENEROSA, a Law Term for a Gentlewoman; if ſhe be really ſo, and named *Spinſter* in any Original Writ, Appeal, or Indictment, ſhe may abate and quaſh the ſame; for ſhe hath as good Right to that Addition, as a Baroneſs or Dutcheſs have to theirs: The ſame may be ſaid of *Generoſus*, a Gentleman. 2 *Inſt.* 668.

GENESIS, in Geometry, is the Formation of any Plane or Solid Figure by the Motion of ſome Line or Surface, which Line or Surface is always called the *Deſcribent*; and that Line according to which the Motion is made, is called the *Dirigent*.

GENICULUM, in Botany, is the Knot or Joint in the Stalk of any Plant.

GENIOGLOSSUM, is a Pair of Muſcles proceeding inwardly from the Fore-part of the Lower Jaw, under another Pair called *Geniohoydes*, and enlarging themſelves, are faſtened into the Baſis of the Tongue: Theſe ſerve to pull the Tongue forward, and to thruſt it out of the Mouth.

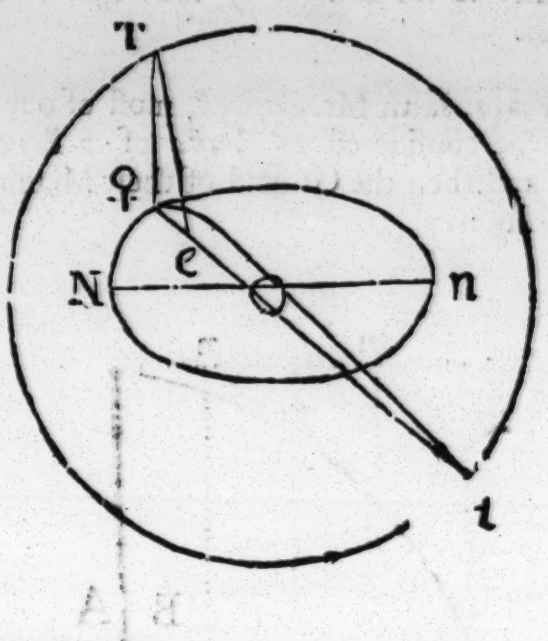
GENIOHYOIDEUS, is a Muſcle of the *Os Hyoides*, which, with its Partner, is ſhort, thick, and fleſhy, ariſing from the internal Parts of the Lower Jaw-bone called the Chin, and dilating themſelves, are ſoon leſſened again, and inſerted to the ſuperior Part of the Fore-bone of the *Os Hyoides*. Theſe acting, pull the *Os Hyoides*, &c. both upwards and forwards, and aſſiſt the *Glanioglossa* in thruſting the Tongue out of the Mouth.

GENUS, in Logick, is an Idea ſo common and univerſal, that it extends it ſelf alſo to other *Univerſal Ideas*. Thus a Right-lined Figure of four Sides, is a *Genus*, in reſpect of a *Parallelogram* or a *Trapezium*. And in like manner Subſtance is the ſame in reſpect of *Subſtance extended*, which is a Body; and *Thinking Subſtance*, which is a Spirit. The Logicians divide *Genus* into *Summum* or the higheſt *Genus*, which hath nothing above it to be a *Species* of: And *Subalternate*, which is ſometimes, or in ſome reſpects, a *Genus*, and in others a *Species*.

GEOCENTRICK, ſignifies any Planet or Orb that has the Earth for its Center, or the ſame Center with the Earth.

GEOCENTRICK *Latitude* of a Planet, is its Latitude ſeen from the Earth; or the Inclination of a Line connecting the Planet and the Earth, to the Plane of the Earth's (or true) Ecliptick: Otherwiſe 'tis the Angle which the aforeſaid Line (connecting the Planet and the Earth) makes with the Line, which is drawn perpendicular to the Plane of the Ecliptick.

Thus in the Figure annexed, the Angle ♀ ♈ *e* is the Meaſure of the Planet ♀, her Geocentrick Latitude when the Earth is in ♈, and the Angle *et* ♀, the Meaſure of it when the Earth is in *t*.



GEOCENTRICK *Place of a Planet*, is ſuch as it would appear to us from the Earth, if our Eye were there fixed.

GEODÆSIA, *Surveying, or the Art of meaſuring Land*: See *Surveying*.

GEODÆTICAL *Numbers*, are ſuch as are conſidered according to thoſe Vulgar Names or Denominations, by which Money, Weights, Meaſures, &c. are generally known, or particularly divided by the Laws and Cuſtoms of ſeveral Nations.

GEOGRAPHICAL *Mile*, is the *Sea Mile*, or *Minute*, being one 60th Part of a Degree of a great Circle on the Earth's Surface.

GEOGRAPHY, is a Deſcription of the whole Globe of the Earth, or known Habitable World; together with all its Parts, Limits, Situations, and other remarkable things relating thereto.

GEOMETRICAL, or *Algebraical Curves*, are ſuch, as that when their Nature or Property comes to be expreſſed by an Equation, the two variable Quantities in that Equation (as *x* and *y*, the *Abſciſſa* and *Ordinate*, are called in the Doctrine of Fluxions) are both, or do both denote ſtreight Lines, then that is truly a Geometrical or Algebraical Curve.

But when one of the Variable or Flowing Quantities in ſuch an Equation denotes a *Curve-Line*, then that Curve is called a *Tranſcendent Curve*.

GEOMETRICAL-PLANE: See *Plane*.

GEOMETRICAL *Progreſſion or Proportion*: See *Progreſſion*.

GEOMETRICAL *Solution of a Problem*, is when the Thing is ſolved according to the Rules of Geometry, and by ſuch Lines as are truly Geometrical and agreeable to the Nature of the Problem.

Thus *Des Cartes*'s Way of finding two Mean Proportionals is a *Geometrical Solution*, becauſe done according to the Nature of the Problem, which is a Solid one; and alſo becauſe performed by the *Periphery of a Circle* and the *Parabola*, which are truly Geometrical Curves, and agreeable to the Nature of the propoſed Problem: But then the Solution of it by *Diocles* is not *Geometrical*, becauſe both the *Ciſſoid* (by which he performs it) is no true Geometrical Curve, and alſo being a Line of the *Second Gender* (as they call it) it is proper only to a *Surſolid Problem*.

GEOME-

GEOMETRICK *Places:* See *Places Geometrical.*

GEOMETRY, originally ſignifies the Art of meaſuring the Earth, or any Diſtances or Dimenſions on or within it; but 'tis now uſed for the *Science of Quantity, Extenſion, or Magnitude, abſtractedly conſidered, without any regard to Matter.*

Geometry, very probably, had its firſt Riſe in *Egypt*, where the *Nile* annually overflowing the Country, and covering it with Mud, obliged Men to diſtinguiſh their Lands one from another, by the Conſideration of their Figure; and to be able alſo to meaſure the Quantity of it, and to know how to plot it and lay it out again in its juſt Dimenſions, Figure, and Proportion: After which 'tis likely a farther Contemplation of thoſe Draughts and Figures, help'd them to diſcover many excellent and wonderful Properties belonging to them, which Speculation continually was improving, and is ſtill to this very Day.

GEOMETRY is uſually divided into *Speculative* and *Practical:* The former of which contemplates and treats of the Properties of continued Quantity abſtractedly: And the latter applies theſe Speculations and Theorems to Uſe and Practice, and ro the Benefit and Advantage of Mankind. See Vol. II.

GERMINATION, is the growing or ſprouting out of Vegetables, or of any Parts of them.

GIBBOUS, is a Term uſed in reference to the enlightened Parts of the Moon, while ſhe is moving from Full to the Firſt Quarter, and from the laſt Quarter to Full again; for all that Time the dark Part appears horned and *falcated*, and the light one bunched out, Convex, or *Gibbous.*

GIFT-ROPE, is the Boat-Rope, which is faſtened to the Boat when ſhe is *ſwifted*, in order to her being towed at the Stern of a Ship.

GILD, or *Guild*, in Law, ſignifies a Tribute, or ſometimes an Amerciament; and ſometimes alſo a Fraternity or Company combined together, with Orders and Laws made among themſelves by the Prince's Licenſe.

GILLA *Vitrioli*, is only a Purification of White Vitriol, by diſſolving it in the Phlegm of Vitriol, and then filtrating the Solution, and either cryſtallizing it, or evaporating *ad ſiccitatem*, to gain the Salt or *Gilla*, which accordingly will be in the Form either of Cryſtals, or a dry Salt at the Bottom.

GINGLIMUS, is an Articulation of a Bone when it both receives and is received: Of this Articulation there are three ſorts.

The Firſt is when the End of a Bone has two Protuberances and one Cavity, and the End of the Bone which is articulated with it has two Cavities and one Protuberance, as the *Humerus* and the *Ulna*; or when a Bone at one Extremity receives another Bone, and at its other Extremity it is received by the ſame Bone, as the *Radius* and *Ulna.*

The Second Sort is when a Bone at one End receives another Bone, and at the other End is received by a third Bone, as the *Vertebræ* do.

The Third is when a Bone has a Cavity which receives the long Proceſs of another Bone, which Proceſs turns in the Cavity like the Axle-tree in a Wheel, as the ſecond *Vertebræ* of the Neck is articulated with the firſt; but this is no true *Ginglimus.*

GIRDING-GIRT: The Seamen ſay a Ship is *Girt*, or hath a *Girding-Girt*, when her Cable is ſo tight, or ſtrained, that upon the running of the Tide, ſhe cannot go over it with her *Stern part*, but will lie a-croſs the Tides.

GIVEN, is a Word often uſed in Mathematicks, and ſignifies ſomething which is ſuppoſed to be known: Thus, if a Magnitude be known, or that we can find another equal to it, they ſay, 'Tis a *given Magnitude*, or that ſuch a thing is *given in Magnitude.* If the Poſition of any thing be ſuppoſed as known, they ſay, *Given in Poſitions:* Thus, if a Circle be actually deſcribed upon any Plane, they ſay, its Center is *given in Poſition*; its Circumference is *given* in Magnitude; and the Circle both in *Poſition* and *Magnitude.* But a Circle may be *given in Magnitude only*; as when only its Diameter is given, but the Circle not actually deſcribed. If the Kind or Species of any Figure be given, they ſay, *Given in Specie.* If the Ratio between any two Quantities is known, they are ſaid to be *given in Proportion.* See *Barrow*'s Definitions and Propoſitions of *Euclid*'s *Data*, at the End of the Elements put forth by that Great Geometrician, *Anno* 1678.

GLACIALIS *Humor:* See *Humores Oculi.*

GLACIATION, the turning of Water, or any other Liquor, into Ice: See *Freezing.*

GLACIS, a ſloaping Bank in Fortification: It ſignifies a very gentle Steepneſs, but is more eſpecially taken for that which rangeth from the Parapet of the *Cover'd-way* to the Level on the Side of the Field.

GLAND: See *Glandula.*

GLANDULA: A *Glandule* is a Subſtance of a peculiar Nature, Fleſhy, White, or Gray; and it is two-fold: *Adventitious*, as thoſe Kernels which are ſometimes under the Arm-holes, and in the Neck, as the *King's-Evil*; a Swelling in the *Larynx* and middle of the Wind-pipe, *&c.* Or *Perpetual* and *Natural*, as the *Thymus*, *Pancreas*, *Glandula Pinealis*, *&c.* The *Perpetual* is again two-fold, either *Conglobated* in one entire Piece, which ſends the ſeparated Humour into the Veins, as the Pituitary Glandule, the *Pinealis*, the Glandules of the Meſentery, of the Groins, *&c.* Or *Conglomerated* in a Cluſter, which convey the Juice by their own Channels into ſome notable Cavities of the Body; as the *Pancreas*, the *Glandules of the Breaſt*, the *Salival Glandules*, *&c.*

There are alſo diſcovered by Dr. *Havers* a ſort of *Glands*, which he calls *Mucilaginous Glands*; which ſee under *Mucilaginous.*

GLANDULA *Guidonis*, is a Tumor like a *Glandula*, ſoft, ſingle, moveable, without Roots, and ſeparated from the adjacent Parts.

GLANDULA *Pinealis:* See *Conarium.*

GLANDULA *Pituitaria*, is a little Body in the *Sella Equina*, a Place in the Brain ſo called, cover'd over with the *Rete Mirabile* in many Brutes, but not in Men: It receives the Serous Humour from the *Infundibulum* and the *Rete Mirabile*, which it ſends into the Jugular Veins and the Lymphatick Veſſels.

GLANDULÆ *Lumbares*, are three Glands deſcribed by *Bartholin*, and by him ſo named, by reaſon of their lying upon the Loins: He thus deſcribes them, *Pag.* 191. of his *Anat. Edit.* 1674.

The two largeſt lie one upon another betwixt the deſcending *Cava* and *Aorta*, in that Angle which the Emulgents make with the *Cava:* The third being ſmaller ſtands over theſe, under the Appendices of the Diaphragm. They have Communication, or are knit to one another by ſmall Lacteal Branches, eſpecially the two larger.

He once thought them to ſupply the Place of the common Receptacle in Man; that not being ſo plain in him as in ſeveral Brutes: But ſince a Receptacle is acknowledg'd as well in Men as Brutes, Dr. *Wharton*'s Opinion concerning their Uſe ſeems more probable, *viz.*

That they ſupply the Place of thoſe larger Glands that are found in the Meſenteries of Brutes, but are not Natural to Men: And for this Reaſon he preſumes, That all ſuch Animals as want thoſe greater Glands in the Meſentery, have theſe *Lumbares* as well as Men.

GLANDULÆ *Odoriferæ* are certain ſmall Glandules diſcovered by that Accurate Anatomiſt Dr. *Tyſon*, in that Part of the *Penis* where the *Præputium* is contiguous to the *Balanus*; and he gives them this Name from the great Scent which their ſeparated Liquor emits: In ſuch Perſons as have the Prepuce longer than ordinary, theſe Glands are not only more, but larger, and ſeparate a greater Quantity of their Juice, which lodging there, often grows Acid, and corrodes the Glands: Theſe are very conſpicuous in moſt Quadrupeds, eſpecially in Dogs and Boars.

GLANDULÆ *Renales, ſeu Capſulæ Atrabilares*, are Glands which lie between the *Aorta* and the Kidneys, a little above the Emulgent Veſſels: They are two in Number, one on each Side, wrap'd up in Fat: They ſometimes change their Situation, and their Figure is alſo various; for in ſome they are Round, in others Oval, Square, Triangular, of a Trapezial or Irregular Figure; the Right is ordinarily bigger than the Left, and each about the Bigneſs of a *Nux Vomica*. Their Uſe is not certainly known; they ſeem to ſeparate a Liquor from the Arterial Blood before it goes to the Kidneys, for the liquifying the Blood which is thick after it comes from them.

GLANS, in Botany, is that which being contained within a ſmooth but hard Bark, and containing but one Seed, hath its Hinder-Part (which adheres to the Tree) covered with a kind of Cup, while the Fore-part is bare; as Acorns, &c. but properly *Glans* is the Fruit without the Cup.

GLANS, the ſame with *Balanus* and *Suppoſitorium*.

GLANDULUM *Corpus*, the ſame with *Proſtata*.

GLANDULOSA *Tunica Inteſtinorum*: See *Papillæ Inteſtinorum*.

GLASS *of Antimony*: See *Regulus of Antimony*.

GLASSY *Humour of the Eye*: See *Vitreous Humour*.

GLASSY *Tunicle*: See *Vitreous Tunicle*.

GLAUCOMA, is a Fault in the Eye, or a Tranſmutation of the Cryſtalline Humour into a Gray or Sky Colour.

GLAUCOSIS, the ſame with *Glaucoma*.

GLEBE-LAND, *Church-Land*, is moſt commonly taken for Land belonging to a Pariſh-Church beſide the Tythe.

GLENE, the ſame with *Pupilla*; alſo the Cavity of a Bone which receives another within it.

GLENOIDES, are two Cavities in the lower Part of the firſt Vertebre of the Neck.

GLOBE or *Sphere*, is a round ſolid Body, every Part of whoſe Surface is equally diſtant from a Point within it, called its Center: and it may be conceived to be formed by the Revolution of a Semicircle round its Diameter.

When ſuch a Body as this hath all the Parts of the Earth and Sea drawn or delineated on its Surface, like as in a Map, and placed in their Natural Order and Situation, it is called the *Terreſtrial Globe*.

But if on its Surface it hath the fixed Stars and the Images of the Conſtellations drawn, together with the Circles of the Sphere below deſcribed, 'tis then called the *Celeſtial Globe*.

And when the following Circles are ſuppoſed to be deſcribed on the Convex Surface of a Sphere, which is hollow within, and after this you imagine all Parts of the Sphere's Surface to be cut away, except thoſe Parts on which ſuch Circles are deſcribed, then that Sphere is called an *Armillary Sphere*, becauſe it appears in the Form of ſeveral Circular Rings or Bracelets put together in a due Poſition.

There are Ten Eminent Circles upon the Globe or of the Sphere; Six of which are called *Greater*, and the Four other *Leſſer Circles*.

A *Great Circle* of the Sphere is that whoſe Plane paſſeth through the Center of the Sphere, and divides it into two equal Parts or Hemiſpheres.

A *Leſſer Circle* is that which is parallel to a *Greater*, as the *Tropicks* and the *Polar Circles* are to the *Equator*, and as the *Circles of Altitude* are to the *Horizon*.

Or *Leſſer Circles* are ſuch as do not divide the Globe into two equal Parts.

The Greater Circles are,

I. The *Horizon*, which is a broad wooden Circle encompaſſing the Globe round about, having two Notches, the one in the North, the other in the South Part of it, for the Brazen *Meridian* to ſtand in.

There are uſually accounted two *Horizons*:

Firſt, The *Viſible*, or *Senſible*, which you may conceive to be made by ſome great Plain, or the Surface of the Sea; and which divides the Heavens into two *Hemiſpheres*, the one above, the other (apparently) below the Level of the Earth.

This Circle determines the Riſing and Setting of the Sun, Moon, or Stars, in any particular Latitude; for when any one of them comes juſt to the Eaſtern Edge of the *Horizon*, then we ſay it Riſeth; and when it doth ſo at the Weſtern Edge, we ſay it Setteth. And from hence alſo the Altitude of the Sun and Stars is accounted, which is their Height in Degrees above the Horizon.

II. The other *Horizon* is called the *Real* or *Rational*, and is a Circle which encompaſſes the Earth exactly in the Middle, and whoſe Poles are the *Zenith* and *Nadir*; that is, two Points in its Axis, each 90 Degrees diſtant from its Plain (as the Poles of all Circles are) and the one exactly over our Heads, and the other directly under our Feet. This is the Circle which the Wooden Horizon on the Globe repreſents.

On which *Broad Horizon* ſeveral Circles are drawn, the innermoſt of which is the Number of Degrees of the *Twelve Signs* of the *Zodiack*, *viz.* 30 to each Sign: For the Ancient Aſtronomers obſerved the Sun in his (apparent) Annual Motion, to deſcribe always one and the ſame Line in Heaven, and never to deviate from this Track or Path to the North or South, as all the other Planets did more or leſs; and becauſe they found the Sun alſo to ſhift, as it were backward, through all the parts of this Circle or Path, ſo that in his whole Year's Courſe he would *Riſe*, *Culminate*, and *Set* with every Point of it; they diſtinguiſhed the fixed Stars that appeared in or near this Circle into *Twelve Conſtellations* or Diviſions, which they called *Signs*; and becauſe they were moſt of them uſually drawn in the Form of Animals, they called this Circle by the Name of the *Zodiack*, and the very middle Line of it the *Ecliptick*: And ſince every Circle was divided into 360 Parts or Degrees, a

twelfth

twelfth Part of that Number muſt be 30, the Degrees in each Sign.

Next to this you have the Names of thoſe Signs; next to this the Days of the Month, according to the *Julian Account*, or *Old Stile*, *with the Calendar*; and then another *Calendar* according to the *Foreign Account*, called the *New Stile*.

And without theſe is a Circle divided into Thirty two equal Parts, which make the Thirty two Rhombs or Points of the Mariner's Compaſs, with the firſt Letters of the Names annexed; and ſince a Thirty ſecond Part of 360 Degrees is 11 Degrees 15 Minutes, they account that each ſingle Point of the Compaſs is 11 Degrees 15 Minutes.

The Uſes of this Circle in the Globe are,

1. To determine the Riſing and Setting of the Sun, Moon, or Stars, and to ſhew the Time of it by the help of the Hour-Circle and Index; as ſhall be ſhewed hereafter.

2. To limit the Increaſe and Decreaſe of the Day and Night: For when the Sun riſes due Eaſt, and ſets Weſt, the Days are equal.

But when he Riſeth and Setteth to the North of the Eaſt and Weſt, the Days are longer than the Nights; as on the contrary, the Nights are longer than the Days, when the Sun Riſeth and Setteth to the Southward of the Eaſt and Weſt Points of the Horizon.

3. To ſhew the Amplitude of the Sun, or of any Star; and alſo, on what Point of the Compaſs it Riſeth and Setteth.

II. The next *Great Circle* is the *Meridian*, which is repreſented by the Brazen Frame or Circle in which the Globe hangs and turns: This is divided into four Nineties, or 360 Degrees, beginning at the *Equinoctial*. 'Tis called the *Meridian*, becauſe when the Sun comes to the South Part of this Circle, 'tis then *Meridies*, *Mid-Day*, or *High-Noon*, and then the Sun hath its greateſt Altitude for that Day, which therefore is called the *Meridian Altitude*. The Plane of this Circle is perpendicular to the *Horizon*, and paſſeth through the South and North Points thereof through the *Zenith* and *Nadir*, and through the Poles of the World. In it, each way from the *Equinoctial* on the *Celeſtial Globe*, is accounted the North or South Declination of the Sun or Stars; and on the *Terreſtrial*, the Latitude of a Place North or South; which is all one Quantity with the Elevation or the Height of the Pole above the Horizon: Becauſe the Diſtance from the *Zenith* to the *Horizon*, being the ſame as that between the *Equinoctial* and the *Poles*, if from each you imagine the Diſtance from the *Pole* to the *Zenith* to be taken away, the Latitude muſt remain equal to the *Pole's Height*.

There are Two Points of this Circle, each 90 Degrees from the *Equinoctial*, which are called the *Poles of the World*; and a Diameter from thence continued through the Center of either Globe, is called the *Axis of the Earth* or *Heavens*, on which they are ſuppoſed to turn round.

Theſe *Meridians* are various, and change according to the Longitude of Places; for as ſoon as ever a Man moves but one Degree, or but a Point to the Eaſt or Weſt, he is under a new Meridian: But there is (or ſhould be) one fix'd, which is called the *Firſt Meridian*.

And this on ſome Globes paſſes through *Gratioſa*, one of the *Azores* Iſlands; but the *French* place the firſt Meridian at *Fero*, one of the *Canary* Iſlands.

The Poles of the Meridian are the Eaſt and Weſt Points of the Horizon.

On the *Terreſtrial Globe* there are uſually drawn Twenty four Meridians, one through every 15 Degrees of the Equator, or through every 15 Degrees of Longitude.

The Uſes of this Circle are,

Firſt, To ſet the Globe to any particular Latitude, by a proper Elevation of the Pole above the Horizon of that Place: And,

Secondly, To ſhew the Sun or Stars Declination, right Aſcenſion, and greateſt Altitude; of which more below.

III. The next *Great Circle* is the *Equinoctial*, as it is called on the Celeſtial, and *Equator* on the Terreſtrial Globe. This is a great Circle, whoſe Poles are the Poles of the World: It divides the Globe into two equal Parts or Hemiſpheres, as to North and South; and it paſſes through the Eaſt and Weſt Points of the Horizon, and at the Meridian is always as much raiſed above the Horizon, as is the Complement of the Latitude of any particular Place. Whenever the Sun cometh to this Circle, it makes equal Days and Nights all round the Globe, becauſe it always Riſeth then due Eaſt, and Sets due Weſt, which it doth at no other Time of the Year. All Stars alſo which are under this Circle, or which have no Declination, do always Riſe due Eaſt, and Set full Weſt.

All People living under this Circle (which in Geography, or rather by Navigators, is called the *Line*) have the Days and Nights conſtantly equal; and when the Sun is in the Equinoctial, he will be at Noon in their Zenith, or directly over their Heads, and ſo their erect Bodies can caſt no Shadow.

From this Circle, both ways, the Sun or Star's Declination on the Celeſtial, or Latitude of all Places on the *Terreſtrial Globe*, is accounted on the Meridian: And ſuch leſſer Circles as run through each Degree of Latitude or Declination parallel to the Equinoctial, are called Parallels of Latitude, or Parallels of Declination.

Through every 15 Degrees of this Equinoctial the Hour-Circles are drawn at Right Angles to it on the *Celeſtial Globe*, and all paſs through the Poles of the World, dividing the Equinoctial into 24 equal Parts.

And the *Equator* on the *Terreſtrial Globe* is divided by the Meridian into 36 equal Parts; which Meridians are equivalent to the Hour-Circles on the other Globe.

IV. The *Zodiack* is another *Great Circle* of the *Sphere*, dividing the Globe into two equal Parts: When the Points of *Aries* and *Libra* are brought to the Horizon, it will cut *that* and the Equinoctial obliquely, making with the former an Angle equal to the Sun's greateſt Meridian Altitude in any Latitude; and with the Equinoctial, an Angle equal to 23 Degrees and 30 Minutes, which is the Sun's greateſt Declination. This Circle by Aſtronomers is accounted as a kind of broad one, and is like a Belt or Girdle round the Globe: Through the Middle of it is drawn a Line called the *Ecliptick*, or *Via Solis*, the *Way of the Sun*; becauſe the Sun never deviates from it in its Annual Motion, as the Planets do all more or leſs, whence it hath its Breadth.

This Circle is mark'd with the Characters of the *Twelve Signs*, and on it is found out the Sun's Place, which

which is under what Star or Degree of any of the *Twelve Zodiacal Conſtellations* he appears to be at Noon. By this are determined the Four Quarters of the Year, according as the Ecliptick is divided into four equal Parts; and according as the Sun goes on here, he hath more or leſs Declination.

Alſo from this Circle the Latitude of the Planets and fixed Stars are accounted from the Ecliptick towards its Poles.

The Poles of this Circle are 23 Degrees 30 Minutes diſtant from the Poles of the World, or of the Equinoctial, and by their Motion round the Poles of the World, are the Polar Circles deſcribed.

In theſe Poles of the Ecliptick all the Circles of Longitude which are drawn through the Zodiack do determinate, as the *Meridians* and *Hour-Circles* do in the Poles of the World, and as the *Azimuth* or *Vertical Circles* do in the *Zenith* and *Nadir*.

V. If you imagine two *Great Circles* paſſing both through the Poles of the World, and alſo one of them through the *Equinoctial Points*, *Aries* and *Libra*, and the other through the *Solſtitial Points*, *Cancer* and *Capricorn:*

Theſe are called the two *Colures*, the one the *Equinoctial*, the other the *Solſtitial Colure*. Theſe will divide the Ecliptick into four equal Parts or Quarters, which are denominated according to the Points where theſe paſs through, called the four Cardinal Points, and are the firſt Points of *Aries*, *Libra*, *Cancer*, and *Capricorn*.

Theſe are all the Great Circles.

VI. If you ſuppoſe Two Circles drawn parallel to the Equinoctial, at 23 Degrees 30 Minutes diſtant from it, one towards the North, the other towards the South, theſe are called the *Tropicks*, becauſe the Sun appears, when in them, to turn backward from his former Courſe; the one the Tropick of *Cancer*, and the other, the Tropick of *Capricorn*, becauſe they are under theſe Signs.

VII. If two other Circles are ſuppos'd to be drawn through 23 Degrees 30 Minutes, reckoned on the Meridian from the Polar Points, theſe are called the *Polar Circles:* The Northern is the Artick, and the Southern the Antartick Circles, becauſe oppoſite to the former:

Theſe are the Four Leſſer Circles.

And theſe on the *Terreſtrial Globe* the Ancients ſuppoſed to divide the Earth into five *Zones*, viz. two *Frigid*, two *Temperate*, and the *Torrid Zone*.

Beſides theſe Ten Circles lately deſcribed, which are always drawn on the Globe it ſelf, there are ſome other neceſſary Circles to be known, which are barely imaginary, and ſuppoſed only to be drawn upon the Globe.

1. *Meridians*, or *Hour-Circles*, which are great Circles meeting all in the Poles of the World, and croſſing the Equinoctial at Right Angles; theſe are ſupplied by the Meridian, Hour-Circle, and Index.

2. *Azimuths*, or *Vertical Circles*, which likewiſe are *Great Circles of the Sphere*, and meet in the *Zenith* and *Nadir*, as the Meridians and Hour-Circles do in the Poles: Theſe cut the Horizon at Right Angles, and on theſe is reckoned the Sun's Altitude when he is not in the Meridian. They are repreſented by the Quadrant of Altitude, which being fix'd at the Zenith, is moveable about round the Globe through all the Points of the Compaſs.

3. There are alſo *Circles of Longitude* of the Stars and Planets, which are Great Circles paſſing through the Pole of the Ecliptick, and in that Line determining the Stars or Planets Place or Longitude reckoned from the firſt Point of *Aries*.

4. *Almacanters*, or *Parallels of Altitude*, are Circles having their Poles in the Zenith, and are always drawn parallel to the Horizon. Theſe are *Leſſer Circles of the Sphere*, diminiſhing gradually as they go farther and farther from the Horizon.

In reſpect of the Stars there are alſo ſuppoſed to be *Parallels of Latitude*, which are parallel to the Ecliptick, and have their Poles the ſame with thoſe of that Circle.

5. *Parallels of Declination* of the Sun or Stars, which are leſſer Circles, whoſe Poles are the Poles of the World, and are all drawn parallel to the Equinoctial, either North or South; and theſe (when drawn on the *Terreſtrial Globe*) are called *Parallels of Latitude*.

DEFINITIONS.

1. *Latitude of any Place*, is an Arch of the Meridian of that Place, intercepted between its Zenith and the Equator; and this is the ſame with an Arch of the Meridian, intercepted between the Pole and the Horizon; and therefore it is often expreſſed by the Poles Height, or Elevation of the Pole: The Reaſon of which is, That from the Equator to the Pole, there always being the Diſtance of 90 Degrees, and from the Zenith to the Horizon the ſame Number, and each of theſe 90 Degrees containing within it the Diſtance between the Zenith and the Pole; that Diſtance therefore being taken away from both, muſt leave the Diſtance from the Zenith to the Equator, equal to the Diſtance between the Pole and the Horizon, or to the Elevation of the Pole above the Horizon.

2. *Latitude of a Star or Planet*, is an Arch of a Great Circle reckoned on the Quadrant of Altitude, laid through the Star and Pole of the Ecliptick, from the Ecliptick towards its Pole.

3. *Longitude of a Place*, is an Arch of the Equator intercepted between the Meridian of the Place and the firſt Meridian: Or it is more properly the Difference, either Eaſt or Weſt, between the Meridians of any two Places, accounted on the Equator.

4. *Longitude of a Star*, is an Arch of the Ecliptick, accounted from the beginning of *Aries* to the Place where the Stars Circle of Longitude croſſeth the Ecliptick; ſo that it is much the ſame as the Stars Place in the Ecliptick, accounted from the beginning of *Aries*.

5. *Amplitude of the Sun*, or of a *Star*, is an Arch of the Horizon intercepted between the true Eaſt or Weſt Points of it, and that Point upon which the Sun or Star riſes or ſets.

6. *Right Aſcenſion of the Sun*, or of a *Star*, is that part of the Equinoctial reckoned from the beginning of *Aries*, which riſeth or ſetteth with the Sun or Star in a Right Sphere: But in an Oblique Sphere it is that Part or Degree of the Equinoctial which comes to the *Meridian* with it, (as before) reckoned from the beginning of *Aries*.

1. *A Right or Direct Sphere*, is when the Poles are in the Horizon, and the Equator in the Zenith. The Conſequence of being under ſuch a Poſition of the Heavens as this (which is the Caſe of thoſe who live directly under the Line) is, That the Inhabitants have no Latitude nor Elevation of the Pole: They can nearly ſee both the Poles of the World: All the

Stars

Stars in the Heavens do once in 24 Hours Riſe, Culminate, and Set with them; the Sun always Riſes and Deſcends at Right Angles with the Horizon, which is the Reaſon they have always equal Day and Night, becauſe the Horizon doth exactly biſect the Circle of the Sun's Diurnal Revolution.

2. *A Parallel Sphere*, is where the Poles are in the Zenith and Nadir, and the *Equinoctial* in the Horizon; which is the Caſe of ſuch Perſons, if any ſuch there be, who live directly under the North or South Poles.

And the Conſequences of ſuch a Poſition are, That the Parallels of the Sun's Declination will alſo be Parallels of his Altitude, or Almacanters to them. The Inhabitants can ſee only ſuch Stars as are on their Side the Equinoctial; and they muſt have 6 Months Day, and 6 Months continual Night every Year; and the Sun can never be higher with them than 23 Degrees 30 Minutes, (which is not ſo high as it is with us on *February* 10th.)

3. An *Oblique Sphere*, is where the Pole is elevated to any Number of Degrees leſs than 90: And conſequently the Axis of the Globe can never be at Right Angles to, nor in the Horizon; and the Equator, and Parallels of Declination, will all cut the *Horizon* Obliquely, from whence it takes its Name.

Oblique Aſcenſion of the Sun, or Stars, is that Part or Degree of the Equinoctial reckoned from the beginning of *Aries*, which Riſes and Sets with them in an Oblique Sphere.

Aſcenſional Difference, is the Difference between the *Right* and *Oblique Aſcenſion*, when the Leſſer is ſubſtracted from the Greater.

On the Terreſtrial Globe.

1. A Space upon the Surface of the Earth, reckoned between two Parallels to the Equator, wherein the Increaſe of the longeſt Day is a Quarter of an Hour, is by ſome Writers called a *Parallel*.

2. And the Space contained between two ſuch Parallels, is called a *Climate*: Theſe *Climates* begin at the *Equator*; and when we go thence North or South, till the Day become half an Hour longer than it was before, they ſay, we are come into the *Firſt Climate*; when the Days are an Hour longer, than they are under the *Equator*, we are come to the *Second Climate*, &c. Theſe Climates are accounted in Number 24, reckoned each way towards the Poles.

The Inhabitants of the Earth are divided into three Sorts, as to the falling of their Shadows.

1. *Amphiſcii*, who are thoſe which inhabit the *Torrid Zone*, or live between the Equator and Tropicks, and conſequently have the Sun twice a Year in their Zenith; at which time they are *Aſcii*, i. e. have no Shadows, the Sun being Vertical to them. Theſe have their Shadows caſt to the Southward, when the Sun is in the Northern Signs; and to the Northward, when the Sun is in the Southern Signs, reckoned in reſpect of them.

2. *Heteroſcii*, who are thoſe whoſe Shadows fall but one way; as is the Caſe of all ſuch as live between the Tropick and Polar Circles: For their Shadows at Noon are always to the Northward in North Latitude, and to the Southward in South Latitude.

3. *Periſcii*, are ſuch Perſons that inhabit thoſe Places of the Earth that lie between the Polar Circles and the Poles, and therefore have their Shadows falling all manner of ways, becauſe the Sun at ſome times of the Year goes clear round about them.

The Inhabitants of the Earth, in reſpect of one another, are alſo divided into three Sorts.

1. *Periœci*, who are ſuch as inhabiting the ſame Parallel (not a *Great Circle*) are yet directly oppoſite to one another, the one being Eaſt or Weſt from the other exactly 180 Degrees, which is their Difference of Longitude: Now theſe have the ſame Latitude and Length of Days and Nights, but exactly at contrary Times; for when the Sun Riſeth to one, it Sets to the other.

2. *Antœci*, who are Inhabitants of ſuch Places, as being under a Semicircle of the ſame *Meridian*, do lie at equal Diſtances from the *Equator*, one towards the North, and the other towards the South.

Now theſe have the ſame Degree of Latitude, but towards contrary Parts, the one North, and the other South; and therefore muſt have the Seaſons of the Year directly at contrary Times one to the other.

3. *Antipodes*, who are ſuch as dwell under the ſame Meridian, but in two oppoſite and equi-diſtant Parallels, and in the two oppoſite Points of thoſe two Parallels; ſo that they go Feet againſt Feet, and are diſtant from each other an entire Diameter of the Earth, or 180 Degrees of a Great Circle.

Theſe have the ſame Degree of Latitude, but the one South, the other North, and accounted from the *Equator* a quite contrary way; and therefore theſe will have all Things, as Day and Night, Summer and Winter, directly contrary to one another.

PROBLEMS.

I. *To find the Latitude of any Place.*

Bring the Place to the Braſs Meridian, and the Degrees of that Circle, intercepted between the Place and the Equinoctial, are the Latitude of that Place either North or South.

Then to fit the Globe ſo that the *Wooden Horizon* ſhall repreſent the Horizon of that Place, elevate the Pole as many Degrees above the *Wooden Horizon*, as are the Latitude of that Place, and it is done; for then will that Place be in the Zenith.

If after this you rectify the Globe to any particular Time, you may by the Index know the Time of Sun-riſing and Setting with the Inhabitants of that Place, and conſequently the preſent Length of their Day and Night, &c.

PROBLEM II.

To find the Longitude of Places.

Bring the Places ſeverally to the Braſs Meridian and then the Number of Degrees of the *Equinoctial*, which are between the Meridians of each Place, are their *Difference of Longitude* either Eaſt or Weſt.

But if you reckon it from any Place where a *Firſt Meridian* is ſuppoſed to be placed, you muſt bring that *Firſt Meridian* to the Brazen one on the Globe; and then turning the Globe about, till the other Place come thither alſo, reckon the Number of Degrees of the *Equinoctial*, intercepted between that *Firſt Meridian*, and the proper one of the Place, and that is the Longitude of that Place, either Eaſt or Weſt.

PROBLEM III.

For the Diſtances of Places on the Terreſtrial Globe.

See the *Problem* on the Celeſtial Globe, *For finding the Diſtance between two Stars.*

PROBLEM IV.

To find what Places of the Earth the Sun is Vertical to at any time aſſigned.

Bring the Sun's Place, found in the Ecliptick on the Terreſtrial Globe, to the Brazen Meridian, and note what Degree of the Meridian it cuts; then by turning the Globe round about, you will ſee what Places of the Earth are in that Parallel of Declination, (for they will all come ſucceſſively to that Degree of the Brazen Meridian) and thoſe are the Places or Parts of the Earth to which the Sun will be Vertical that Day; whoſe Inhabitants will then be *Aſcii*; that is, their erect Bodies at Noon will caſt no Shadow.

Problems on the Celeſtial Globe.

Suppoſe *May* the 10th, 1701, the Sun's Place to be juſt at the Entrance into the firſt Degree of *Gemini*.

PROBLEM I.

To rectify the Globe: Or, To render it in the General fit to reſolve any Problem; which Rectification *therefore is always ſuppoſed to be the firſt thing done: To do which,*

Bring the Sun's Place, found in the Ecliptick on the Globe, to the *Meridian*, and the Hour-Index to 12 at Noon.

PROBLEM II.

For the Sun's Declination.

Bring the Sun's Place for that Day, (which here and below is ſuppoſed to be given) to the *Meridian* as before, and then the Degrees of the *Meridian*, reckoned from the Equinoctial either North or South, are the *Sun's Declination* at Noon, either North or South, according to the Time of the Year, *viz.* from *March* the 10th to *September* the 12th, North; and thence to *March* again South: And the *Declination* for *May* the 10th will be 20 Degrees and about 12 Minutes North.

PROBLEM III.

For his Amplitude either Riſing or Setting.

Bring the Sun's Place to the *Horizon*, either on the Eaſt or Weſt Side, and the Degrees of the Horizon, accounted from the Eaſt Point, either North or South, are the *Amplitude* required; *viz. May* the 10th, the Sun's *Amplitude* will be 34 Degrees to the North of the Eaſt.

And at the ſame Time you have in the outer Circle of Rhombs the Point which the Sun Riſes or Sets upon, N. E. by E. or N. W. by W.

PROBLEM IV.

For his Right Aſcenſion.

Bring the Sun's Place to the *Meridian*, and the Number of Degrees intercepted between the beginning of *Aries*, and that Degree of the Equinoctial, which comes to the *Meridian* with the Sun, is the *Right Aſcenſion.*

If you would have it in Time, account every 15 Degrees to be an Hour, and every Degree to be 4 Minutes.

N. B. The Reaſon of bringing the Sun's Place to the *Meridian* in this Problem, is to ſave the Trouble of putting the Globe into the Poſition of a *Right Sphere*: For properly Right Aſcenſion is that Degree of the Equinoctial which Riſes with the Sun in a *Right Sphere*. But ſince the Equator is always at Right Angles to the *Meridian*, if you bring the Sun's Place thither, it muſt in the Equinoctial cut his Right Aſcenſion: Thus in the Inſtance of *May* the 10th, the Sun's Right Aſcenſion will be 59 Degrees, or 4 Hours wanting 4 Minutes.

PROBLEM V.

For the Oblique Aſcenſion.

Bring the Sun's Place to the *Horizon* on the Eaſt-ſide, and the Number of Degrees intercepted between that Degree of the Equinoctial which is now come to the *Horizon*, and the beginning or firſt Point of *Aries* is the *Oblique Aſcenſion*. Thus, *May* the 10th, the Sun's *Oblique Aſcenſion* is 30 Degrees 15 Minutes.

Of thoſe two *Aſcenſions* take the Leſſer from the Greater, the Remainder will be,

PROBLEM VI.

The Aſcenſional Difference.

Which therefore is the Difference in Degrees between the Right or Oblique Aſcenſion, or the Space between the Sun's Riſing and Setting, and the Hour of Six: Wherefore his Aſcenſional Difference turned into Time, will give the Time of the Sun's Riſing or Setting before or after Six. Thus, from 59 Degrees take 30 Degrees 15 Minutes, there will remain 28 Degrees 45 Minutes, the *Aſcenſional Difference* in Degrees, and in Time 1 Hour 55 Minutes; and ſo much doth the Sun Riſe before Six, and Set after it.

PROBLEM VII.

For the Sun's Riſing or Setting.

Bring his Place to the Horizon, either Eaſt or Weſt, and the Hour-Index ſhall ſhew the Time either of his Riſing or Setting accordingly; which, *May* 10th, is 5 Minutes after 4 in the Morning, and and 5 Minutes before 8 at Night.

The Time of the Sun's Setting doubled, gives the Length of the Day, which then will be 15 Hours 50 Minutes; and the Time of this Riſing doubled, gives the Length of the Night, which, *May* 10th, is 8 Hours 10 Minutes.

PROBLEM VIII.

For the Sun's Meridian Altitude, or Depreſſion at Midnight.

Bring his Place to the *Meridian*, above the *Horizon*, for his Noon Altitude, which will ſhew the Degrees of it accounted there from the *Horizon*; which, *May* the 10th, will be 58 Degrees 42 Minutes. For his Midnight Depreſſion, below the North Point of the *Horizon*, you muſt bring the Point in the Ecliptick, oppoſite to the Sun's preſent Place, to the South Part of the Meridian above the Horizon; and the Degrees there intercepted between that Point and the Horizon, are his Midnight Depreſſion:

Depreſſion; which, *May* the 10th, will be 18 Degrees 42 Minutes.

PROBLEM IX.

For the Sun's Altitude at any Time of the Day given.

Rectify the Globe, and *fit the Quadrant of Altitude*; that is, ſcrew the Braſs Quadrant of Altitude to the Zenith; or in our Latitude, ſcrew it ſo that the graduated Edge cut 51 Degrees 30 Minutes on the Meridian, reckoned from the Equinoctial.

Then turn about the Globe till the Index ſhew the Time propoſed, and ſtay the Globe there; after which bring the Quadrant of Altitude to cut the Sun's Place in the Ecliptick, and then that Place or Degree of the Ecliptick ſhall ſhew the Sun's Altitude on the Quadrant.

Thus, *May* the 10th, the Sun's Altitude at Nine a Clock in the Morning will be 43 Degrees 30 Minutes.

PROBLEM X.

To find the Sun's Hour or Altitude when he is due Eaſt or Weſt above the Horizon.

Rectify the Globe, and *fit the Quadrant of the Altitude*; then bring the Quadrant to cut the true Eaſt Point, and next turn the Globe about till the Sun's Place in the Ecliptick cut the graduated Edge of the Quadrant; for then that Place will ſhew the Altitude and the Index of the Hour.

Thus, *May* the 10th, the Sun will be Eaſt at 5 Minutes paſt Seven in the Morning, and his Altitude then is 26 Degrees.

PROBLEM XI.

To find the Sun's Altitude or Time of the Day on any Azimuth given: Or, When the Sun is on any given Point of the Compaſs.

Set the Quadrant of Altitude to the Azimuth given, then turn the Globe till his Place in the Ecliptick touch the graduated Edge of the Quadrant; ſo ſhall that Place give the Altitude on the Quadrant, and the Hour-Index the Time of the Day.

Example.

May the 10th, the Azimuth being 60 Degrees from the South toward the Eaſt, or the Point of the Compaſs which the Sun is then on, being S. E. by E. and near half a Point more Eaſterly; his Altitude will be (nearly) 46 Degrees, and the Hour of the Day a little more than a Quarter paſt Nine in the Morning.

PROBLEM XII.

To find the Declination and Right Aſcenſion of any Star.

Bring the Star to the *Meridian*, and then the Degrees intercepted between the Equinoctial and the Point of the Meridian cut by the Star, are its Declination; and the Meridian cuts and ſhews its *Right Aſcenſion* on the Equinoctial, accounting it from the beginning of *Aries*.

PROBLEM XIII.

To find the Longitude and Latitude of any Star.

Bring the Solſtitial Colure to the Braſs Meridian, and there fix the Globe; then will the Pole of the Ecliptick be juſt under 23 Degrees 30 Minutes, accounted from the Pole above the North Point of the Horizon, and upon the ſame Meridian; there ſcrew the Quadrant of Altitude, and then bring its graduated Edge to the Star aſſigned, and there ſtay it; ſo will the Star cut its proper *Latitude* on the *Quadrant*, reckoned from the Ecliptick; and the Quadrant will cut the Ecliptick in the Star's *Longitude*, or its Diſtance from the firſt Point of *Aries*.

PROBLEM XIV.

To find the Time of any Star's Riſing, Setting, or Culminating, i. e. being on the Meridian.

Rectify the Globe and *Hour Index*, and bring the Star to the Eaſt or Weſt Part of the Horizon, or to the Brazen Meridian, and the Index will ſhew accordingly the Time of the Star's *Riſing*, *Setting*, or *Culminating*, or of its being on the Meridian.

Thus, *May* the 10th, *Arcturus* will be on the Meridian at about $\frac{1}{4}$ of an Hour after 10 at Night; *Cor Leonis* will be *Setting* about one in the Morning; and the firſt Star in the Head of *Aries* will be *Riſing* about an Hour after.

PROBLEM XV.

To know, at any Time aſſigned, what Stars are Riſing or Setting; what are on the Meridian, and how high they are above the Horizon; and on what Azimuth or Point of the Compaſs they are; by which means the real Stars in the Heaven may eaſily be known by their proper Names, and rightly diſtinguiſhed one from another.

Rectify the Globe, and *fit the Quadrant of Altitude*, and ſet the Globe, by the Means of the Compaſs, due North and South; then turn the Globe and Hour-Index to the Hour of the Night aſſigned; ſo will the Globe, thus fix'd, repreſent the Face or Appearance of the Heavens for that Time.

Whereby you may readily ſee what Stars are in or near the Horizon; what are on or near the Meridian; which are to the North, or which to the South, &c. And the Quadrant of Altitude being laid over any particular Star, will ſhew its *Altitude* and *Azimuth*, and on what Point of the Compaſs it is; whereby any Star may eaſily be known, eſpecially if you have a Quadrant, or any ſuch Inſtrument, to take the Altitude of any real Star ſuppoſed to be known by the Globe, to ſee whether it agree with that Star which is its Repreſentative on the Globe or not.

PROBLEM XVI.

Given the Sun's Place, and any Star's Altitude, to find the Hour of the Night.

Rectify the Globe and *fit the Quadrant*, then move the Globe to and fro till the Quadrant cut the Star in its given Altitude, for then the Hour-Index will ſhew the Hour of the Night: And thus may

the Hour of the Night be known by a Star's Azimuth, or its Azimuth from its Altitude.

Example.

May the 10th, the Sun being in the firſt Degree of *Gemini*, I take the Altitude of *Lucida Lyra*, which I find to be 51 Degrees, or I find its *Azimuth* to be two Degrees to the Northward of the Eaſt; then bringing the Quadrant of the Altitude to cut that Star in 51 Degrees of *Altitude*, I find the Hour-Index points at Eleven a Clock at Night; as it would alſo have done had the Star been brought to the Azimuth on the Globe.

PROBLEM XVII.

To find the Diſtance between any Two Stars.

If the Stars lie both under the ſame Meridian, bring them to the Brazen Meridian, and the Degrees between them there reckoned are their true Diſtance.

Thus *Capella*, or the Star in the Left Shoulder of *Auriga*, and *Rigel*, which is in *Orion*'s Left Thigh, are nearly under the ſame Meridian; and being both brought to the Brazen Meridian of the Globe, their Diſtance there will be found to be 54 Degrees.

If they are both in the Equinoctial, or have both the ſame Declination, *i. e.* are both in the ſame Parallel, then bring them one after another to the Brazen Meridian, and the Degrees of the Equinoctial intercepted between them, when thus brought to the Meridian ſeverally, are their Diſtance.

If the Stars are neither under the ſame Meridian, nor parallel, then either lay the Quadrant of Altitude from one to the other, (if it will reach) and that will ſhew the Diſtance between them in Degrees; or elſe take the Diſtance with Compaſſes, and apply that to the Equinoctial, or to the Meridian.

Which Method of Proceeding alſo will ſhew the Diſtance of any Two Places on the Terreſtrial Globe in Degrees; and by Multiplication by 70, you will have it in Miles. Wherefore to find how far any Place on the Globe is from another, you need only take the Diſtance between them on the Globe with a pair of Compaſſes; and applying the Compaſſes to the Equator at the beginning of *Aries*, or at the firſt Meridian, you will there find the Degrees; which multiply by 70, and that will turn it into Miles.

Thus the Diſtance between *London* and *Jamaica* being on the Globe 69 Degrees, I multiply that by 70, and it gives me 4830 Miles; and ſo far is *Jamaica* diſtant *directly* from *London*, or in an Arch of a Great Circle.

GLOBULUS *Naſi*, is the lower cartilaginous moveable Part of the Noſe.

GLOSSOCOMIUM, is a Chyrurgeon's Inſtrument for broken Limbs; ſo called from the Shape of a Merchant's little Caſket, which was formerly carried upon the Back. *Blanchard.*

GLOTTIS, is the Chink of the *Larynx*, which is covered by the *Epiglottis*.

GLUTÆI, are Six Muſcles which move the Buttocks, on each Side three.

GLUTÆUS *Major*, a Muſcle of the Thigh, ſo called from its being the largeſt Muſcle of thoſe which compoſe the Buttocks: It has a large Semi-circular Beginning, forwards meerly Tendinous from near two Thirds of the External Parts of the Spine of the *Os Ilium*; backwards its Origination is thick and fleſhy from the poſterior Part of the Spine, and hindermoſt part of the *Sacrum* laterally, and the whole *Os Coccygis*; as alſo from a broad Ligament that's extended between the two laſt named Bones and the Tubercle of the *Os Iſchium*; its Fleſhy Fibres deſcending diſgregately, in an almoſt Semi-circular manner, become Tendinous as they approach the great *Trochanter*, where it's united with its firſt deſcribed Tendinous Beginning, deſcending over the External Part of the great *Trochanter*, and after being joined with the Tendon of the *Membranoſus*, proceeds to cover and ſtrictly embrace all the External Muſcles of the *Tibia*, like as the External Tendon doth of the *Biceps* of thoſe of the *Cubit*: But the other part of it proceeding from the Fleſhy Body of this Muſcle, is largely inſerted to the *Linea Aſpera*, on the back Part of the *Os Femoris*, near four Finger's Breadth below the great *Trochanter*.

The firſt deſcribed Tendinous Beginning of this Muſcle doth not only ſerve to ſupport its Fleſhy Body, but its Fibres interſecting thoſe of the *Membranoſus*, as they cover all the Muſcles of the *Tibia*, do more adequately include them, whereby they are corroborated in their Action: When this Muſcle acts, it pulls the Thigh directly backwards.

GLUTÆUS *Medius*, a Muſcle of the Thigh, which lies chiefly under the Tendinous Beginning of the *Glutæus Major*, and ariſing Fleſhy from almoſt the whole External Part of the *Os Ilium*, in its deſcent becomes thicker and fleſhy, and is inſerted by a ſhort ſtrong Tendon to the Superior and External Part of the great *Trochanter* in a Semi-circular Manner. Mr. *Cowper* thinks this Muſcle is employed to turn the Thigh inwards, though others ſay it ſerves to extend it.

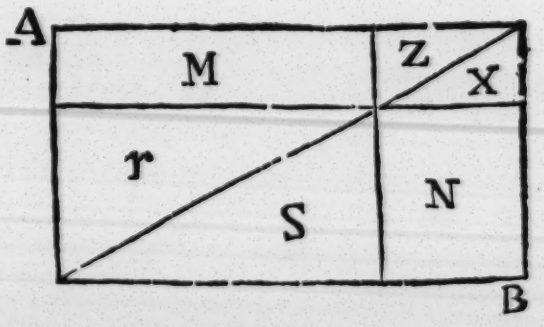
GLUTÆUS *Minor*, is a Muſcle of the Thigh, which lies totally under the *Glutæus Medius*, it being ſo much leſs than that, as that is than the *Glutæus Major*. It ariſeth Semi-circular, Broad, and Fleſhy from the *Dorſus Ilij*; from hence its Fleſhy Fibres deſcend to their partly Tendinous and partly Fleſhy Inſertion, like the *Medius*, at the Superior Part of the Root of the great *Trochanter*.

The Fibres of this running Parallel with thoſe of the *Medius*, aſſiſt it in all its Actions: They alſo aſſiſt in ſtrengthening the Articulation of the Thigh-bone, with the *Coxa*, more ſtable in ſtanding erect.

GLUTIA, are Two Prominences of the Brain, called *Nates*.

GLUTOS is the greater *Rotator* (an *Apophyſis*) in the upper Part of the Thigh-bone, named *Trochanter*. *Blanchard.*

GNOMON, in a Parallelogram, is a Figure made of the two Complements, together with either of the Parallelograms about the Diagonal.



Thus here, in the Parallelogram *AB*, the *Gnomon* is $M+z+x+N$, or $M+r+s+N$.

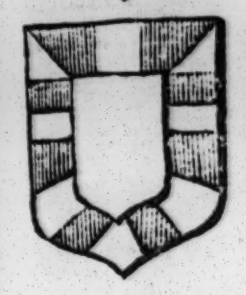
GNOMON, in *Dialling*, ſignifies the *Style*, *Pin*, or *Cock* of a Dial, the Shadow whereof pointeth out the Hours.

The

The *Gnomon* of every *Dial* is ſuppoſed to repreſent the *Axis of the World*; and therefore the two Ends or Extremities thereof muſt directly anſwer to the *North* and *South Pole*.

GNOMONICKS, the ſame with *Dialling*.

GOARING; the Seamen ſay a Sail is cut *Goaring*, when 'tis cut ſloping by degrees, and is broader at the *Clew* than at the *Earing*, as all *Top-ſails* and *Top-gallant Sails* are.



GOBONATED, a Term in Heraldry for a Bordure of this Form; which is neither *Checky*, nor *Counter-componed*, but of a different Diviſion from both.

GOLDEN-NUMBER: See *Cycle of the Moon*.

To find the Golden-Number.

To the Year add 1, and divide the Sum by 19, the Remainder is the *Golden-Number*.

Example.

To 1701 add 1, the Sum 1702 divide by 19, the Remainder 11 is the *Golden-Number* for that Year.

GOLDEN-RULE: See *Rule of Three*.

GOLDEN *Sulphur of Antimony*, is made by boiling the Droſs, ariſing in the making of *Regulus of Antimony*, in a little more than its Weight of common Water, in an Earthen Pot for about half an Hour, and then ſtraining the Liquor, there is Vinegar poured upon it, on which a Reddiſh or Gold-colour Powder will precipitate: It muſt be gathered by Filtration and dried; 'tis an Emetick; the Doſe from 2 to 6 Grains.

GOMPHOS, is when the Pupil of the Eye, going beyond a little Skin of the *Tunica Uvea*, is like that Swelling of hard Fleſh in the Corner of the Eye called *Clavus*. *Blanchard*.

GOMPHOSIS, or *Conclavatio*, is when one Bone is faſtened into another like a Nail, as may be ſeen in the Teeth. *Blanchard*.

GONARGA, the Gout in the Knee..

GOOD-A-BEARING, or *Good-behaviour*, in Common Law, ſignifies an exact Carriage or Behaviour of a Subject to the King and his Liege-people, whereunto Men upon their evil Courſe of Life, or looſe Demeanor, are ſometimes bound: He that is bound to this, is more ſtrictly bound than to the Peace; for the Peace is not broken without an Affray, but this Surety, *de bono geſtu*, may be forfeited by the Number of a Man's Company, or by his or their Weapons or Harneſs.

GOOSE-WING: When a Ship ſails before a Wind, or with a Quarter Wind, and in a freſh Gale, the Seamen ſometimes, to make the more haſte, do *unparal* the Miſſen-yard, and then they launch out both Sail and Yard over the Quarter on the Lee-ſide, fitting Guyes at the further End, to keep the Yards ſteddy with a *Boom*, and this booms out the Miſſen-ſheet, and all this they do to give the Ship the more way, which otherwiſe, with theſe Winds, the Miſſen-ſail could not do, and this Sail ſo fitted is called a *Gooſe-wing*, and ſometimes a ſtudding Sail.

GORGE, *Gulla*, or *Neck*, in Architecture, is the narroweſt part of the *Tuſcan* or *Dorick* Capitals, lying between the *Aſtragal* above the Shaft of the Pillar and the Annulets. It is alſo a kind of Concave Moulding, larger, but not ſo deep as a *Scotia*, which ſerves for Compartments, Chambrances, &c.

GORGE, in Fortification, is the Entrance of the Platform of any Work.

GORGE, in all other Out-Works, is the Interval betwixt their Wings on the Side of the great Ditch: But it ought to be obſerved, that all the *Gorges* are deſtitute of *Parapets*, becauſe if there were any, the Beſiegers having taken Poſſeſſion of a Work, might make uſe thereof, to defend themſelves from the Shot of the Place; ſo that they are only fortified with *Palliſadoes* to prevent a Surprize.

GORGE *of a Baſtion*, is nothing elſe but the prolonging of the *Curtains* from their Angle with *Flank* to the Center of the *Baſtion* where they meet: But when the Baſtion is flat, its *Gorge* is a right Line which terminates the Diſtance comprehended between two Flanks.

GORGE *of the Ravelin*, or of a *Half-Moon*, is the Space contained between the Extremities of the two Faces on the Side of the Place.

GORGED, the Herald's Term for the Bearing of Crown, Coronet, or ſuch like thing about the Neck of a Lion or a Swan, &c. for then they ſay the Lion or Cygnet is *Gorged* with a Ducal Coronet, &c.

GOTHICK, in Architecture, is an Order ſo far different from the Ancient Proportions and Ornaments, that its Columns are either too maſſy in a Form of vaſt Pillars, or as ſlender as Poles, having Capitals without any certain Dimenſions, carved with the Leaves of *Brank-Urſin*, *Thiſtles*, *Coleworts*, &c.

GRACILIS, is one of the Muſcles of the Legs, ſo called from being the moſt ſlender of them: It ariſeth ſomewhat broad, partly Tendinous and partly Fleſhy from the *Os Pubis* internally, between the firſt and ſecond deſcribed Heads of the *Triceps*, and in its ſtreight Deſcent in the Inſide of the Thigh grows narrow, and becomes Tendinous a little above the *Sartorius*, and is ſo inſerted (immediately beneath it) to the *Tibia*. It aſſiſteth in bending the Thigh and Leg inwards.

GRAMINEOUS *Herbs*, amongſt the Botaniſts, are ſuch as have a long narrow Leaf, and no Foot-ſtalk.

Theſe Biſhop *Wilkins* (in his Real Character) ranges into ſuch as are either,

1. *Frumentaceous*, *i. e.* whoſe Seed is uſed by Men for Food, either Bread, Drink, or Broth; ſuch as Wheat, Rye, Barley, &c. Or,

2. Not *Frumentaceous*, more properly called Graſſes, which have an hollow-jointed Stalk not branched, and a Stamineous Flower: See *Gramina* and *Graſſes*. The *Frumentaceous Herbs* are ſometimes called *Cercoles*.

GRAMMAR, is the Art of Speaking and Writing any Language truly. It takes its Name from the Greek Word *Gramma*, which ſignifies a Letter, becauſe it treateth primarily of the Formation of Articulate Sounds, which are repreſented by Letters.

GRANADO, is a little hollow Globe or Ball of Iron, or other Metal, about two Inches and a half in Diameter, which being filled with fine Powder, is ſet on fire by the means of a ſmall Fuſee faſtened to the Touch-hole; as ſoon as it is kindled, the Caſe flies into many Shatters, much to the Damage of all

that ſtand near. Theſe *Granadoes* ſerve to fire cloſe and narrow Paſſages, and are often thrown with the Hand among the Soldiers to diſorder their Ranks, more eſpecially in thoſe Poſts where they ſtand thickeſt; as in *Trenches*, *Redoubts*, *Lodgments*, &c.

GRAND-ASSIZE: See *Aſſize*.

GRAND-CAPE: See *Cape* and *Attachment*.

GRAND-CLIMACTERICKS: See *Climacterical Year*.

GRAND-DISTRESS, is ſo called, becauſe of the Quality and Extent thereof; for thereby the Sheriff is commanded, *Quod diſtringat tenentem, ita quod nec ipſe nec aliquis per ipſum ad eam anum apnat, donec habuerit aliud præceptum, & quod de exitibus eorundem nobis reſpondeat, & quod habeat corpus ejus*, &c.

This Writ lies in two Caſes, either when the Tenant or Defendant is Attached, and ſo return'd, and appears not, but makes Default; then a *Grand-Diſtreſs* is to be awarded: Or elſe when the Tenant or Defendant hath once appeared, and after makes Default, then this Writ lies by the Common Law in lieu of a *Petit-Cape*.

GRANIVOROUS, are thoſe Animals that feed upon Corn and other Seed.

GRANT, in Law, ſignifies a Gift in Writing of ſuch a thing as cannot aptly be paſſed or conveyed by Word only, as Rents, Reverſions, Services, Advowſons in Groſs, Common in Groſs, Tythes, &c. Or made by ſuch Perſons as cannot give but by Deed, as the King and all Bodies Politick: Which Difference is often in Speech neglected, and then it is taken generally for every Gift whatſoever, made of any thing by any Perſon; and he that *granteth* is named *Grantor*, and he to whom it is made, the *Grantee*. A thing is ſaid to lie in *Grant*, which cannot be aſſigned without Deed, 3 *Rep.* 63.

GRANULATION, in Chymiſtry, ſignifies pouring a melted Metal Drop by Drop into cold Water, that ſo it may *granulate* or congeal into ſmall Grains. The beſt way is to pour the Metal through an Iron-Cullender, or through a new Birchen Broom.

GRAPHOIDES, a long, ſharp, and ſlender Appendix of the Temple-Bones, ſomewhat bow'd like a Cock's-Spur: Alſo the Muſcle called *Digaſtricus*.

GRAPHOIDES, is a Proceſs like the Pen for a Table-book; about the Baſis of the Brain it inclines backward.

GRAPNEL, is a kind of Anchor for Boats or Gallies to ride by: They differ from other Anchors, in that they have four Flukes and no Snack, though there are ſome with three Flukes, with which they uſe to *ſweep* for Hawſars or ſmall Cables: In Men of War alſo theſe Grapnels, or at leaſt a lighter kind of them, are uſed to be thrown into an Enemy's Ship, in order to catch hold of ſome of her Gratings, Rails, Gunwales, &c. this is done in order to boarding of her.

GRATINGS, in a Ship, are ſmall Ledges of ſawed Plank framed one into another like a Lattice or Priſon-grate, lying on the Upper-Deck between the Main-maſt and Fore-maſt, ſerving for a Defence in a cloſe Fight; and alſo for the Coolneſs, Light and Contrivance of the Ship's Company.

There is alſo another Grating in the Head of a Ship, where the Neceſſary-Houſe ſtands.

GRAVE-ACCENT, in Grammar, ſhews when the Voice is to be depreſs'd, and is expreſs'd thus, (`).

GRAVEDO, the ſame with *Corryza*.

GRAVELLED-ASHES, are the Lees of Wine dried and burn'd to Aſhes: So that they are a kind of Calcined Tartar.

GRAVING *of a Ship*, is bringing her firſt aground, and then burning off (with Reeds, Broom, &c.) all the Filth and Foulneſs that ſticks to her Sides without-board, in order to *pay* her anew.

GRAVITAS *Acceleratrix*: See *Vis Centripeta*.

GRAVITY, or as it may be called, the *Vis Centripeta*, is that Quality by which all Heavy Bodies tend towards the Center of the Earth, accelerating the Motion as they come nearer towards it. And this Admirable and Univerſal Law of Nature is that which (generally ſpeaking) keeps all Bodies in thoſe Places and Stations which they are deſigned for.

About the Cauſe of this great and Catholick Affection of Matter, there have been various Sentiments.

1. *Ariſtotle* will have all Earthy Bodies, by a Natural Inclination, to tend towards the Center of the Earth, as to their proper Place, *Sub Concava Lunæ*: But it hath been proved over and over, that there is no ſuch thing as *Poſitive* or *Abſolute Gravity* or *Levity*.

2. *Copernicus* aſſerts Gravity to be an Innate Principle in all the Parts of Matter, when they are by any Means ſeparated from their Wholes, to reduce themſelves thither again the neareſt way, or in Right Lines. But this is not to aſſign any Phyſical Cauſe of this great Effect, but only to ſay Bodies deſcend, becauſe they are heavy, or becauſe they deſcend.

They alſo that explain Gravity by *Univerſal Attraction*, do only give us another Word, but no Idea of the Cauſe of Gravity.

3. *Gaſſendus* and *Kepler*, and many others, define Gravity to be a Motion impreſſed on all Bodies by a certain Magnetick Attraction of the Earth or Globe, to which any Body deſcends.

Theſe will have the Earth to be one great *Magnet* or *Loadſtone*, continually ſending out Magnetical Effluvia, which lay hold on all Bodies, and draw them towards the Earth: See *Gilbert* and *Kircher de Magnete*.

4. *Des Cartes* ſuppoſes the Particles of his Celeſtial Matter, by being reflected from the Surface of the Earth, and conſequently aſcending up again, from thence to drive down into their Places the Terreſtrial Bodies which they find above them, *Sect.* 20, 21, 22, 23. of his *Principia Philoſoph.*

But 'tis very difficult to conceive, and, I think, implies a kind of Contradiction, that Bodies ſhould be forced downwards by a continual Impulſe of other Matter tending upwards, and acting upon all Parts uniformly and equally.

The Ingenious Mathematician Mr. *Keil* of *Baliol-College*, *Oxon*, hath alſo ſufficiently overthrown this Hypotheſis in the Preface to his *Introductio ad Veram Phyſicam*.

5. *Voſſius*, and ſome others, will needs have the Diurnal Motion of the Earth round its Axis to be the Cauſe of the Deſcent of heavy Bodies: Whereas 'tis demonſtrable, from Experiment and the Doctrine of the Laws of Motion, That the Reverſe of Gravity would thence enſue: For all Bodies moving circularly, do always endeavour to recede *ab Axe Motus*; and all looſe Bodies would then be caſt off from the Earth in a Tangent to the Parallel Latitude of any Place.

6. Others

6. Others miſtaking the Effect for the Cauſe, will have the Preſſure of the Atmoſphere to occaſion Gravity, or the Deſcent of heavy Bodies: But 'tis plain by Experiments made *in Vacuo*, That the Atmoſphere, like all other Fluids, doth hinder the Deſcent of heavy Bodies, rather than further them or cauſe them; for a Feather *in Vacuo* will deſcend as faſt as a Bullet or Stone in the open Air.

7. The Learned Dr. *Hook*, in his *Micrographia*, *P.* 22. ſeems to think, that by ſuppoſing our Globe of Earth, Air, and Water, environ'd round with a Fluid very ſubtle and heterogeneous to them all, and which can freely pervade the Pores, not only of Glaſs, but even of the cloſeſt Metals; the Endeavour of this Fluid to detrude all Earthly Bodies from it, may, by that and ſome other Properties, make all Bodies move towards the Center of the Earth: And he ſaith he can prove, by many Experiments, that there is ſuch a Fluid. But this Opinion appears to be Defective on the ſame Account that the *Carteſian* is; which ſee.

8. The Learned Mathematician Capt. *Edmund Halley*, owns Gravity to be an Effect unſolvable by any Philoſophical Hypotheſis; and Modeſtly and *Religiouſly* reſolves it into the immediate Will of our All-wiſe Creator, who by appointing this Law throughout all the Material World, keeps all Bodies in their proper Places and Stations, which, without it, would ſoon fall to Pieces and be utterly deſtroyed. *Philoſoph. Tranſact. N.* 197.

Sir *Iſaac Newton*, *Book* 2. *Prop.* 19. *Corol.* 5. obſerves very well, That of all Bodies conſidered within the Confines of any Fluid, there is a twofold *Gravity*, the one *True* and *Abſolute*, the other *Apparent*, and *Vulgar*, and *Comparative*.

Abſolute Gravity, is the *whole Force* by which any Body tends downwards; but the *Relative* or *Vulgar* is the Exceſs of Gravity in any Body above the Specifick Gravity of the Fluid, whereby it tends downwards more than the Ambient Fluid doth.

In reference to *Abſolute Gravity*, the Parts of all Fluids and all Bodies do really gravitate in their proper Places, and therefore by their joint Weights do make the Weight of the Whole: For every heavy Whole is an Heavy Body, as we find by Experience in Veſſels filled with all Kinds of Liquors; and the Weight of any Whole is equal to, becauſe compounded of, the Weight of all its Parts.

The latter Kind of Gravity is ſuch, that in reference to it, Bodies do not gravitate in their Places, or rather do not, when compared one with another, *pre-gravitate*; but by hindring one another in their mutual Endeavour to deſcend, do remain in their proper Places all one as if they were not heavy at all. Thoſe Things which do not pre-gravitate in the Air, Water, &c. the Vulgar take to have no Gravity; and only judge thoſe to be heavy Bodies which they ſee pre-gravitate or deſcend, becauſe they cannot be ſupported by the ordinary Gravitation of the Fluid, or by its Preſſure all manner of ways.

So that the Notion of Weight among the Vulgar, is only the Exceſs of any Bodies Weight above that of Air: And conſequently they account thoſe things to be *Light*, which being leſs heavy than Air, are ſupported by it, or buoyed up in it.

Whereas theſe *Comparatively* light Bodies are not ſo *really*, ſince in *Vacuo* it hath been found by Experiment, that they deſcend as faſt as other heavy Bodies do in the Air, (Vid. *Mr.* Boyle's *Experiments of his Air Pump.*)

The Properties of Gravity are very well enumerated by Capt. Halley, *in* Numb. 179. *of* Philoſophical Tranſactions.

1. That by it all Bodies deſcend towards a Point, which either is, or is very near to the Center of Magnitude of the Earth and Sea; about which the Sea forms it ſelf into a Spherical Surface, and the Prominences of the Land, conſidering the Bulk of the Whole, differ but inſenſibly therefrom.

2. That this Point or Center is fixed within the Earth, or at leaſt hath been ſo ever ſince we have any Authentick Hiſtory: For a Conſequence of its Shifting, though never ſo little, would be the overflowing of the Low-Lands on that Side the Globe towards which it approached.

And this he thinks would well account for the Univerſal Deluge, To have the Center of Gravitation to be removed for a Time towards the Middle of the then inhabited World.

And he ſaith, That a Change of its Place but the 2000th Part of the Radius of our Earth, would be ſufficient to lay the Tops of the higheſt Hills under Water.

3. That in all Places equi-diſtant from the Center of the Earth, the Force of Gravity is nearly equal.

But indeed all Places on the Earth's Surface are not at equal Diſtances from the Center; becauſe, as Sir *Iſaac Newton* hath proved, the Equatorial Parts are ſomething higher than the Polar Parts; the Difference between the Earth's Diameter and Axis being about 34 *Engliſh* Miles, which hath been confirmed by the Neceſſity of making a Pendulum ſhorter (in thoſe Places) before they will ſwing Seconds.

4. Gravity equally affects all Bodies, without regard either to their *Bulk*, *Figure*, or *Matter*: So that abſtracting from the Reſiſtence of the Medium, the moſt *Compact* and *Looſe*, the *Greateſt* and *Smalleſt* Bodies would deſcend equal Spaces in equal Times, as appears from the quick Deſcent of very light Bodies in the exhauſted Receiver. Whence a very great Difference may be obſerved betwixt Gravity and Magnetiſm; the latter affecting only Iron, and that towards its Poles; the former all Bodies alike in every Part.

Hence alſo may be concluded there is no ſuch Thing as poſitive Levity, thoſe Things which appear light being only comparatively ſo. And whereas ſeveral Things riſe and ſwim in Fluids, 'tis only becauſe they are not, bulk for bulk, ſo heavy as thoſe Fluids: Nor is there any Reaſon why *Cork* for Inſtance, ſhould be ſaid to be light, becauſe it ſwims on *Water*, any more than *Iron*, becauſe it will ſwim on *Mercury*.

5. That this Power increaſes as you deſcend, and decreaſes as you aſcend from the Center of the Earth; and that in Proportion of the Squares of the Diſtances therefrom reciprocally: So, as for Inſtance, at a double Diſtance to have but a Quarter of the Force, &c. which is highly agreeable to Reaſon,

n, becauſe the gravitating or attracting Power muſt needs be exerted more vigorouſly in a ſmall Sphere, and more feebly in a greater, in Proportion, as it is contracted or expanded. Wherefore ſeeing the Surfaces of Spheres are to one another, as the Squares of their Radij, their Power at ſeveral Diſtances will be as the Squares of thoſe Diſtances reciprocally; and then its whole Action upon each Spherical Surface, be it great or ſmall, will be always equal.

Mr. *Hugens*, in the laſt Propoſition of his Fourth Part of his Book *De Horologio Oſcillatorio*, ſhews by Experiments moſt accurately made, That *Gravity* is that Force by which a Body, placed any where near the Surface of the Earth, is impelled towards the Center after the Rate of $15\frac{1}{12}$ of *Paris* Feet in a Second of Time.

The very Learned and Ingenious Capt. *Halley*, in his Diſcourſe about the Cauſe of Springs in *Philoſ. Tranſact. N.* 192. ſeems to think, That there may be ſome Matter which may have a *Conatus* directly contrary to that of Gravity; as is, ſaith he, the Caſe in Vegetation, where the Sprouts tend directly upwards, or againſt the Perpendicular.

GRAVITY *of Bodies*, is either *Specifick* or *Abſolute*: See *Specifick Gravity*.

GREAT-BEAR: See *Urſa Major*.

GREAT *Circles of the Globe or Sphere*, are thoſe whoſe Plane paſſing thro' the Center of the Sphere, divides it into two equal Parts or Hemiſpheres; of which there are Six drawn on the Globe, *viz.* the *Meridian*, *Horizon*, *Equator*, *Ecliptick*, and the two *Colures*: which ſee.

GREEN-CLOTH, or *Counting-Houſe of the King's Houſhold*, is ſo called, becauſe the Table ſtands always covered with a *Green-Cloth*: Here ſit the Lord-Steward, Treaſurer of the King's Houſe, Comptroller, Maſter of the Houſhold, Cofferer, two Clerks of the *Green-Cloth*, and two Clerks Comptrollers, for Daily taking the Accounts of all Expences of the Houſhold, making Proviſions and ordering Payment for the ſame, for the good Government of the King's Servants, and paying the Wages of thoſe below Stairs.

GREEN-WAX, in Law, ſignifies the Eſtreats of Fines, Iſſues, and Amerciaments in the Exchequer, under the Seal of that Court made in *Green-Wax*, to be levy'd in the County: See *Foreign Apposer*.

GREGORIAN-YEAR, *The New Account*, or, *New Stile*, inſtituted upon the Reformation of the Calendar by Pope *Gregory* XIII. (from whom it takes the Name) in the Year 1582; whereby Ten Days being taken out of the Month of *October*, the Days of their Months go always Ten Days before ours: As for Inſtance, their Eleventh is our Firſt Day: Which *New Stile*, or *Account* is uſed in moſt Parts beyond the Seas; and is called from Pope *Gregory*, the *Gregorian Account*.

GRENADO: See *Grenado-Shell*.

GRIPE *of a Ship*, is the *Compaſs* or *Sharpneſs* of her *Stem* under Water, and chiefly towards the Bottom of the *Stem*: And the Deſign of ſhaping her ſo, is to make her Gripe the more, or keep a good Wind; for which end ſometimes a Falſe Stem is put on upon the true one.

GRIPE alſo is the Sea Phraſe for a Ship's being apt to run her Head or Noſe too much into the Wind, for then they ſay *She Gripes*. And there are two Cauſes of this Effect; either over-loading a Ship a-head, the Weight of which preſſes her Head ſo down, that it is not apt to fall off from the Wind; or elſe the *Staying* or *Setting* her Maſts too much aft, which will always be Fault in a ſhort Ship that draws much Water, and will cauſe her to be continually running into the Wind: But in *Floaty Ships*, if the Maſts be not ſtayed very far aft, they will never keep a good Wind.

GROMETS, in a Ship, are ſmall Rings faſtened to the upper Side of the Yard of a Ship, by Staples, to tie unto it, or to faſten the *Laskets*.

GROUND-TACKLE, is the Sea Term for a Ship's Anchor, Cables, *&c.* in general; or whatever is neceſſary to make her ride ſafe at Anchor in proper Ground.

GROUND-TIMBERS, in a Ship, are thoſe Timbers which lie on her Keel, and are faſtened to it with Bolts through the Keelſon. They are ſo called, becauſe the Ship lies at reſt upon them when ſhe is a-Ground.

GROUNDING *of a Ship*, is bringing of her on Ground to be trimmed, made clean, ſcrubbed, or have ſome Leak ſtopp'd in her.

GRY, according to Mr. *Lock*, is a Meaſure containing $\frac{1}{10}$ of a Line: A Line is $\frac{1}{10}$ of an Inch, an Inch $\frac{1}{10}$ of a Philoſophical Foot, and a Philoſophical Foot is $\frac{1}{2}$ of a Pendulum, whoſe *Diadromes* or *Vibrations*, in the Latitude of 45 Degrees, are each equal to one Second of Time, or $\frac{1}{60}$ of a Minute.

GRYPHUS, a ſort of crooked Pincers uſed by Surgeons.

GUARDANT, the Term in Heraldry for a Lion born in a Coat of Arms, when his Face is turned towards the Spectator, and he appears in a Poſture of Guard or Defence (as it were) of himſelf.

GUARD-COCK: See *Gardecaut*.

GUDGIONS, in a Ship, are the Eyes drove into the Stern Poſt, into which the Pintles of the Rudder go, to hang her on.

GUEST-ROPE, is that Rope by which the Boat is kept from *Steeving*, or going too much in and out, as ſhe lies in the Tow of a Ship.

GULA or *Gullet*: See *Oeſophagus*.

GULBE, in Architecture, the ſame with *Gorge*.

GULES, ſo the Heralds call the Red Colour in the Arms of Gentlemen; but in thoſe of the Nobility they call it *Ruby*; and in Sovereign Princes Coats *Mars*. 'Tis expreſſed in Engraving by perpendicular Strokes or Hatches, thus,

GULF, in Geography, is a Part of the Ocean or Great Sea, which runs up into the Land thro' narrow Paſſages, which are called *Streights*; as the *Gulf* of *Florida* in *America*, the *Arabian Gulf* or *Red-Sea* in *Africa*, the *Perſian Gulf* in *Aſia*, and the *Gulf* of *Venice*, or the *Adriatick Sea* in *Europe*.

GUMMA *Gallicum*, is by ſome the Term for the eating out of a Bone in the *French Pox*.

GUNTER'S-LINE, is the common Line of *Numbers*, invented firſt by Mr. *Gunter*, and ſo commonly known that there is no need of a Deſcription of it here; it being not only done by the Inventor in his Book of the Sector, but alſo by *Everard*, *Brown*, *Partridge*, in their Sliding Rules, and almoſt every one that hath written of Practical Mathematicks. *See* Vol. II.

GUNTER'S-QUADRANT, is an Inſtrument made in Wood or Braſs, curiouſly contrived to find the Hour of the Day and Azimuth, with moſt Propoſitions of the Globe; as alſo Heights and Diſtances.

You have a full Deſcription of it in Mr. *Gunter*'s Book of the Sector; but 'tis by no means ſo good to find the Hour of the Day as Mr. *Collins*'s Quadrant: See *Quadrant*.

GUNTER'S-SCALE, called by the Common Seamen uſually, *The Gunter*, is a large plain Scale, with the Lines of Artificial Sines and Tangents fitted ſo to a Line of Numbers, that they can by the Compaſſes work all Queſtions in plain Dialling, *&c.* with tolerable Exactneſs, if the Scale be large and good. It hath its Name for being the Invention of the above-named Mr. *Gunter*, and is now commonly put on all our Scales, and on our Sectors, where they are uſually called, *The Artificial Lines*.

GUNWALE, or *Gunnel* of a Ship, is that Piece of Timber which reaches on either ſide of the Ship from the Half-Deck to the Fore-caſtle, being the uppermoſt *Bend* which finiſheth the upper Works of the Hull in that Part, and wherein they put the Stanchions which ſupport the Waſte-Trees; and this is called the *Gunwale*, whether there be Guns in the Ship or no: And the lower Part of any *Port*, where any Ordnance are, is alſo termed the *Gunwale*.

GURGULIO, the ſame with *Cion*, or the *Epiglottis*; which ſee.

GUTTA *Roſacea*, is a Redneſs with Pimples, wherewith the Cheeks, Noſe, and whole Face is deformed, as if it were ſprinkled with red Drops: Theſe Pimples or Wheals often increaſe to that degree, that they render the Face rough and horrid, and the Noſe monſtrouſly big.

GUTTA-SERENA, or *Amauroſis*, is a Dimneſs, or even total Loſs of the Sight, cauſed by a Watery Humour flowing down from the Brain upon the Optick Nerves.

GUTTÆ, or *Drops*, in Architecture are certain Parts in Form of little Bells, which, to the Number of Six, are put below every *Triglyph* in the *Architrave* of the *Dorick* Order. They are ſo called by Architects from their Shape, repreſenting the *Drops* of Water, which having run along the *Triglyphs*, ſtill hang under the Cloſure between the Pillars.

GUTTAL-CARTILAGE, in Anatomy, is that which includes the third and fourth Griſtle of the *Larynx*, which ſeem to be but one, by reaſon of the common Membrane with which they are covered.

GUTTE *de l' Eau*, Drops of Water; theſe in Heraldry they paint Argent or White.

GUTTE *de Larmes*, when they are Drops of Tears, and theſe in Heraldry are painted Blue or Azure.

GUTTE *de Or*, Drops of melted Gold; all which kinds are ſometimes born in Eſcutcheons.

GUTTE *de Sang*, the Term in Heraldry for Drops of Blood born any how in a Coat of Arms; if the Drops are of any other Subſtance, they are called accordingly.

GUTTORIS *Os*, the ſame that is called *Hyoides Os*.

GUVE *de Ronde*, a Term in Fortification, ſignifying the ſame as a ſimple or a *ſingle Tenaille*: See *Tenaille*.

GUY; a *Guy* in a Ship, is any Rope uſed to keep off things from bearing or falling againſt the Ship Side when they are to be hoiſted in: Thus, if any thing is to be haled in over the Gunwale, it is gently eaſed in by a *Guy-Rope* faſtened uſually to the Stanchions of the Waſte-Trees.

That Rope alſo which is made faſt to the Foremaſt at one End, and is reeved thro' a ſingle Block ſeized to the Pendant of the Winding-Tackle, and then again reeved through another ſeized to the Foremaſt, and whoſe Uſe is to hale forward the Pendant of the Winding-Tackle, is alſo called a *Guy*.

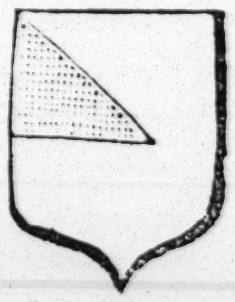
GYMNASTICKS, that Part of Phyſick which treats of the Rules that are to be obſerved in all ſorts of Exerciſes, in order to the Preſervation of Health. This is ſaid to be invented by one *Herodicus*, born at *Selymbra* a City of *Thrace*, or, as ſome ſay, at *Leutini* in *Sicily*; He was Brother to *Georgius* the Famous Rhetorician and Philoſopher.

This *Herodicus* was at firſt Maſter of an Academy, where young Gentlemen came to learn Warlike and Manly Exerciſes; and whom he obſerving to be very Healthful on *that Account*, he made *Exerciſe* become an Art, in reference to the Recovery of Men out of Diſeaſes, as well as preſerving them from them, and called it *Gymnaſtick*, which he made a great Part of his Practice of Phyſick: But *Hippocrates*, who was his Scholar, blames him ſometimes for his *Exceſſes* in this kind of Phyſick, and his want of Judgment in preſcribing this Method of Cure in Fevers, *&c.* And *Plato*, in his *Phædr.* exclaims againſt him with great warmth on this Account, and ſaith, he uſed to enjoin his Patients to walk from *Athens* to *Megara*, (which is about 25 Miles) and to come home again on Foot as they went, as ſoon as ever they had once but touch'd the Walls of the City.

GYNÆCIA, in general, are the Accidents incident to Women; but *Hippocrates* takes them more ſtrictly for the Courſes. *Blanchard*.

GYNÆCOMASTUM, is the growing of the Breaſts. *Blanchard*.

GYRON, an Ordinary in Heraldry, conſiſting of two ſtreight Lines iſſuing from divers Parts of the Eſcutcheon, and meeting in the Feſſe Point; thus,



He beareth: *Sanguine a Gyron iſſuing from the Dexter Point Or.*

HABEAS *Corpora*, is a Writ that lies for the bringing in a Jury, or ſo many of them as refuſe to come upon the *Venire facias*, for the Trial of a Cauſe brought to iſſue.

HABEAS *Corpus*, is a Writ which a Man Indicted for a Treſpaſs before Juſtices of Peace, or in a Court of any Franchiſe, and being apprehended and impriſoned for the ſame, may have out of the King's-Bench, to remove himſelf thither at his own Coſts, and to anſwer the Cauſe there.

And the Order of this Caſe is, firſt to procure a *Certiorari* out of the *Chancery*, directed to the ſaid Juſtices for the removing of the Indictment into the King's Bench; and upon that, to procure this Writ to the Sheriff, for the cauſing of his Body to be brought at a Day.

HABENDUM, is a Word of Form in a Deed or Conveyance, every of which muſt have two Parts, *viz.* the *Premiſes*, and the *Habendum*.

The Office of the *Premiſes* is to expreſs the Names of the Grantor, Grantee, and the Thing granted.

The Office of the *Habendum* is to limit the Eſtate ſo, that the general Implication of the Eſtate, which (by Conſtruction of Law) paſſeth into the *Premiſes*, is by the *Habendum* controlled and qualified.

HABERE *facias Seiſinam*, is a Writ Judicial, which lieth where a Man hath recovered Lands in the King's-Court, directed to the Sheriff, and commanding him to give *Seiſin* of the Land recovered. This Writ is ſometimes iſſuing out of the Records of a Fine, executory, directed to the Sheriff of the County where the Land lieth, and commanding him to give the Cogniſee, or his Heirs, *Seiſin* of the Land whereof the Fine is levied, which Writ lieth within the Year after the Fine or Judgment, upon a *Scire facias*, and may be made in divers Forms.

There is alſo a Writ called *Habere facias Seiſinam, ubi Rex habuit annum, diem, & vaſtum*; which lies for the Delivery of Land to the Lord of the Fee, after the King has taken his Due of Lands of him that was convicted of Felony.

HABERE *facias viſum*, is a Writ that lies in divers Caſes, where view is to be taken of the Lands or Tenements in queſtion.

HABITUDE, is a Diſpoſition of the Mind or Body, acquir'd by reiterated or repeated Acts; as Skill and Knowledge in the Sciences, Virtue, Vice, Excellence in Painting, Writing, Dancing, *&c.*

HÆLOSIS, according to ſome, is a reflected Inverſion of the Eye-lid.

HÆMALOPS, the Extravaſation of Blood about the Eye, occaſion'd by a Blow or Contuſion, commonly called a *Blue Eye:* Alſo the Redneſs of the Eyes proceeding from an Inflammation, or the Diſtenſion of the Blood-Veſſels in the Eye, or that which we call a *Blood-ſhotten Eye*.

HÆMATOSIS, the ſame with *Sanguification*; it is performed in all the Parts of the Body, and not in any peculiar Part, as the Heart, Liver, Spleen, as ſome formerly imagined: See *Blood*.

HÆMODIA, a painful Numneſs of the Teeth, proceeding from the Irritation of the Membranes that ſurround their Roots, or of the Nerves that are diſperſed through their Subſtance. 'Tis uſually occaſioned by the eating of Acid Fruits, or the Vomiting of Acid Humours: We commonly ſay in *Engliſh*, that the Teeth are ſet on Edge.

HÆMOPTYSIS, is the ſpitting of Blood from the Lungs, which proceeds either from a ſweating out at the Glandules of the *Larynx*, with which its *Tunick* is cloathed within; to wit, when the Openings of the Arteries are too much relaxed; or from ſome great Veſſels that are broke, or out of the little Bladders of the Lungs themſelves. *Blanchard.*

HÆMORHAGIA, is a Flux of Blood at the Noſtrils, Mouth, or Eyes, *&c.*

HÆMORRHOIDES, are Swelling Inflammations in the *Rectum*, or about the Fundament, red and painful, which ſometimes ſend forth Blood or Matter. *Blanchard.*

HEMORRHOIDICAL-VEINS, are either *Internal* or *External*.

The *Internal* are Branches of the third and laſt Diviſion of the *Vena Meſenterica*, which is it ſelf the right Branch of the *Porta:* This is ſpread thro' the Middle of the *Meſenterium*, and goes to that Part of the *Colon* which lies on the Left Side to the *Rectum*, and thence down to the *Anus*.

The *External Hemorrhoidal-Veins* ariſe from the *Vena Hypogaſtrica*, and ſometimes from a double Branch of it ſpreading about the *Sphincter* of the *Anus*; and this Hypogaſtrick-Vein is, in it ſelf, Part of the Internal Branch of the *Vena Iliaca*.

HÆREDE *Abducto*, is a Writ that lieth for a Lord, who having the Wardſhip of his Tenant under Age, by Right cannot come by his Body, for that he is conveyed away by another.

HÆREDE *deliberando alii qui habet cuſtodiam terræ*, is a Writ directed to the Sheriff, willing him to command one, having the Body of him that is Ward to another, to deliver him to him, whoſe Ward he was by reaſon of his Lord.

HÆRETARE, in Law, ſignifies to give a Right of Inheritance, or make the Donation Hereditary to the Grantee and his Heirs.

HÆRETICO *Comburendo*, is a Writ that lies againſt him that is a Heretick; *viz.* that having once been convicted of *Hereſy* by his Biſhop, and having abjured it, afterwards falling into it again, or into ſome other, is thereupon committed to the Secular Power. Sir *Edward Coke*, in his 12th *Report*, *Fol.* 93. is of Opinion, that this Writ lies not at this Day.

HAILE; to *haile* a Ship, is either to call to her to know from whence ſhe is, and whither ſhe is bound; or elſe to ſalute her, and wiſh her Health.

HALE; to *hale* a Ship, is the ſame thing as what we call *pulling a-ſhore*.

HALF-MOON, in Fortification, is an Outwork that hath only two Faces, forming together a Saliant-Angle, which is flanked by ſome Part of the Place, and of the other Baſtions.

Theſe *Half Moons* are ſometimes raiſed before the Curtain, when the Ditch is a little wider than it ought to be; in which Senſe 'tis much the ſame with a Ravelin, only the Gorge of an *Half-Moon* is

is made bending in like a Bow or Crescent, and is most times used to cover the Point of a Bastion, whereas Ravelins are placed before the Curtain; but they are Defective, as being ill Flanked.

HALLIARDS, in a Ship, are those Ropes by which they hoise up all her Yards. The Cross-Jack and the Sprit-sail Yard indeed have no *Halliards*, because they are always slung; tho' in small Craft, or Vessels, they have *Halliards* to the Sprit-sail Yard.

HALO, or *Halos*, is a certain Meteor in Form of a bright Circle or Ring that surrounds the Sun, Moon, or Star, but more especially the Moon.

These *Halo's* or Crowns do sometimes appear colour'd like the Rainbow: And our Incomparable Sir *Isaac Newton* gives a Hint of the Solution of this Phænomenon in his Opticks, *Pag.* 111. shewing that it arises from the Sun or Moon's shining thro' a thin Cloud, consisting of Globules of Hail or Water all of the same Size. And he gives you two Observations of his own, of the actual Appearance of colour'd *Halo's*; one about the Sun, *June* 1692; the other round the Moon, *Febr.* 19. 1694, at Night.

HALO, is a reddish Spot or Circle of Flesh which surrounds each Nipple in the Breasts of Women.

HANDSPIKE, is a Wooden Leaver, with which, at Sea, they *Traverse* the Ordnance, or heave withal in a *Windlass* to weigh up the Anchor.

HARIOT, or *Heriot*, in Law, is taken for the best Cattle that a Tenant hath at the Hour of his Death, due to the Lord by Custom. And there is *Hariot Service* and *Hariot Custom*. *Hariot Service* is after the Death of a Tenant in Fee-simple; and *Hariot Custom* is after the Death of a Tenant for Life. Also *Hariot Service* is often express'd in the Grant of a Man, that he holds by such Service to pay *Hariot* at the Time of his Death, that holdeth in Fee-simple. *Hariot Custom* is when *Hariots* have been paid Time out of Mind by Custom, and this may be after the Death of a Tenant for Life: And for this the Lord may distrain and seize; but of right, neither the Lord nor Officer should take *Hariot*, before it be presented at the next Court holden after the Tenant is dead, that such a Beast is due for a *Hariot*. If the Lord purchase Part of the Tenancy, *Hariot Service* is extinguish'd; but it is not so in *Hariot Custom*. And if the Lord ought to have a *Hariot* when his Tenant dieth, and the Tenant deviseth away all the Goods, yet the Lord shall have the *Hariot*, for the Law preferreth the Custom before the Devise.

HARMONIÆ, is, in some Authors, an Anatomical Term, and signifies the same with *Mendosa Sutura*, *viz.* a jointing together the Bones of the Head, particularly those of the Nose and Palate, by a streight Line.

HARMONICAL *Proportion*, or *Musical*, is when, of four Numbers, As the First: Is to the Fourth :: So is the Difference of the First and Second : To the Difference of the Third and Fourth.

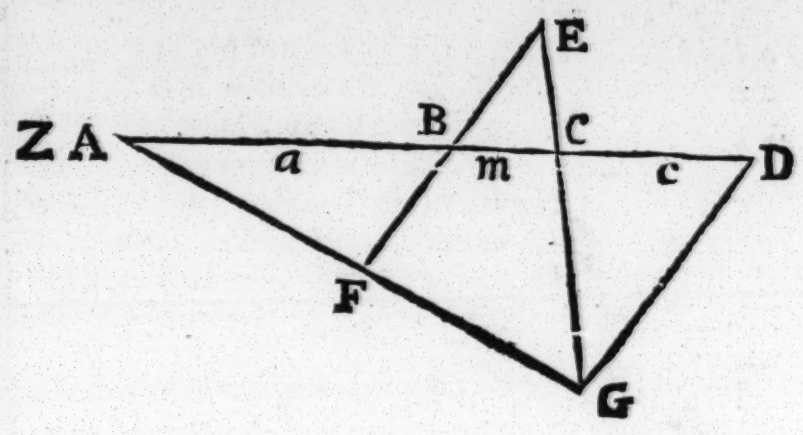
As 5 : 8 : 12 : 30, are *Musical Proportionals*, because 5 : 30 :: 8 — 5 : 30 — 12 :: 3 : 18.

Suppose in *Species* the four Terms A, M, N, E, let it be, $A : E :: M - A : E - N$.

Wherefore $AE - AN = ME - AE$. These Terms being rightly ordered, 'twill be $\frac{AN}{2A - M} = E$; and $\frac{EM}{2E - N} = A$.

In Words thus:

If the Rectangle, contained under the first and third Terms, be divided by the Excess of twice the first above the second; the Quotient will be the fourth Term in *Harmonical* or *Musical Proportion*: Wherefore it is necessary the Terms should be so given, that the double of the first may exceed the second.



A Right Line, as AD, is said to be divided *Harmonically*, if being cut into 3 Parts, AB, BC, and CD, the Case be so, that as the Whole AD (or Z:) is to either Extream a or c :: so shall the other Extream be : to the indeterminate Part m: That is,

$Z : a :: c : m$
$Z : c :: a : m$ } Wherefore $Zm = ac$.

And to divide any given Right Line thus *harmonically*, as suppose AD;

From either End of it draw a Right Line, as DG, making an Angle with it, and of any Length: Connect the End of this Line with the other End A, by drawing AG; and then taking any Point, as B, at pleasure, in the given Line there draw EF parallel to DG, and in it take BE equal to BF; then draw EG, and that shall find the Point C required; and then calling, as above, the whole Line $Z : AB = a : BC = m$, and $CD = C$: I say $Z : a :: c : m$.

For the Triangles ADG, ABF, and BEC are all similar; and consequently $AD : AB :: DG : BF$:: or as DG: to $BF = BE$; but as $DG : BE :: CD : BC$; (by working about the equal Angles D and EBC:) Wherefore, by Equality, $AD : AB :: CD : CB$; that is, $Z : a :: c : m$. *Q.E.D.*

And from hence 'tis plain, That the Ratio of the whole Line AD to the Segment B, may be taken at pleasure: But that the intermediate Part BC, must be less than either AB or CD.

HARMONY, is an agreeable or pleasing Union between two or more Sounds, continuing together at the same time.

Harmony is naturally produced by *Consonances*, but Art has discover'd the way to make it yet more agreeable, by the Mixture of *Dissonances*.

HARPINGS, in a Ship, is properly her Breadth at the Bow; tho' some call the Ends of the *Bends*, which are fastened into the Stem, by the same Name.

HATCHES of a Ship, are the Doors in the Midship, or between the Main-mast and Fore-mast, by which any Goods of Bulk are let down into the Hold. Hence the

HATCH-WAY, is that Place which is directly over the Hatches; so that to lay a thing into the *Hatch-way*, is to put it so that the Hatches cannot be come at, or opened.

HAURIANT, the Term in Heraldry proper to blazon Fiſhes, when they are born in any Eſcutcheon in an erect or perpendicular Poſture, as if they were putting up their Heads above the Water to breath.

HAWSER, (or *Halſer*) is a Rope conſiſting of three Strands, being a kind of a little Cable, ſerving for many Uſes on board a Ship, as to faſten the Main and Fore-ſhrouds, to warp a Ship over a Bar, *&c.*

HAWSES, of a Ship, are two round Holes under her Head or Beak, through which the Cables paſs when ſhe is at Anchor. They ſay a Ship hath a *Bold Hawſe*, when the Holes are high above Water. A *Freſh Hawſe*, is when there is a Suſpicion that the Cables are fretted in the Holes. To *Fresk the Hawſe*, is to lay new Pieces upon the Cable in the *Hawſe*. They call it *burning in the Hawſe*, when the Cable endures an extraordinary Streſs. *Clearing the Hawſe*, is untwiſting the Cables, which, by reaſon of the Ship's winding, are intangled one with another.

HEAD-ANGLES: See *Angles*.

HEAD-LINES, in a Ship, are the Ropes of all Sails which are next to the Yards, and by which the Sails are made faſt to the Yards.

HEAD-SAILS, are thoſe Sails in a Ship which belong to the Fore-maſt and Bolt-ſprit, becauſe they govern the Head of the Ship, and do make it fall off and keep out of the Wind; theſe, in Quarter Winds, are the chief drawing Sails.

HEAD-SEA, is when a great Wave, or Billow of the Sea comes right a-head of a Ship as ſhe is in her Courſe.

HEART: See an Anatomical Deſcription of it under the Word *Cor*.

HEAT, one of the Four Primary Qualities, and ſeems to conſiſt only, or at leaſt *chiefly*, in the local Motion of the ſmall Parts of a Body Mechanically modified by certain Conditions, of which the Principal is the vehement and various Agitations of thoſe ſmall inſenſible Parts.

In which Deſcription it appears, there are theſe Three Conditions neceſſary to produce *Heat*;

1. That the ſmall Parts be vehemently and rapidly agitated, or moved, in a much greater Degree than is neceſſary to produce the Quality we call *Fluidity*.

2. That the *Determinations* of the inſenſible Corpuſcles thus vehemently agitated, be alſo *very various*, ſome moving up, ſome down, ſome to the Right Hand, others to the Left, *&c.* And hence, though Air and Water are, we find often, very vehemently moved, as in Tempeſts and Cataracts; yet there is no reaſon to expect that they ſhould grow hot upon this Motion, becauſe the *Vehemency* belongs to the Progreſſive Motion of the whole Body; and notwithſtanding that, yet the Parts it conſiſts of may not any thing near be ſo much quickned in their Motions, made according to other various Determinations, as to grow ſenſibly hot; but in Bodies very hot or enkindled, the rapid Motion of the inſenſible Parts ſeems to have all manner of Directions, and to be darted round, in a kind of burning Sphere, all manner of ways.

3. Tis requiſite alſo, to the Production of Heat, That the thus variouſly and vehemently agitated Particles be alſo ſo ſmall as, generally ſpeaking, to be ſingly inſenſible: For unleſs they are exceeding fine and ſubtle, they cannot penetrate readily into the Pores of Contiguous Bodies, and ſo warm or burn them.

As to the Operation of Heat upon our Senſes, the Reſult of which we often call *Heat*, it is uſually eſtimated by its Relation to the Organs of our Feeling; for we don't eſteem any Body to be hot, unleſs the Motion of its ſmall Parts be violent or brisk enough to increaſe or ſurpaſs that of the Particles of the Object: For if it be more languid in the Object than in the Sentient, we pronounce the Body to be cold; but if it be more violent in the Object than in the Sentient, we ſay the Body is hot; as any one may Experiment by putting his Hand, when cold, into warm Water; for then the Water will appear warm to him; whereas, had his Hand been hot, it would have felt cold.

The Intenſeneſs of *Heat* (as alſo of Light) always is as the Denſity of the Rays or Particles of Fire which occaſion it; and that Denſity is as the Diſtance from the Radiating Point *reciprocally*. See *Quality*.

The Learned and Curious Dr. *Slare*, in *Philoſoph. Tranſact. N.* 213. hath publiſhed ſeveral ſtrange Experiments about the Productions of Flame and Fire, from the bare Mixture of two Liquors *actually cold*; which two Liquors are a Vegetable Oil (the Kinds of which, proper for this Purpoſe, he there gives you in a Table) and a Compound Spirit of Nitre; which Spirit is made by Diſtillation (in a Retort) of equal Parts of Salt Petre and Oil of Vitriol, in a Sand Furnace with a great Fire.

And one thing is very remarkable as to his two Liquors, That tho' Gunpowder cannot be made by firing to give any Exploſion in the Exhauſted Receiver, yet theſe did ſo in a very rapid manner, blowing up the Receiver, and breaking out in a great Flame.

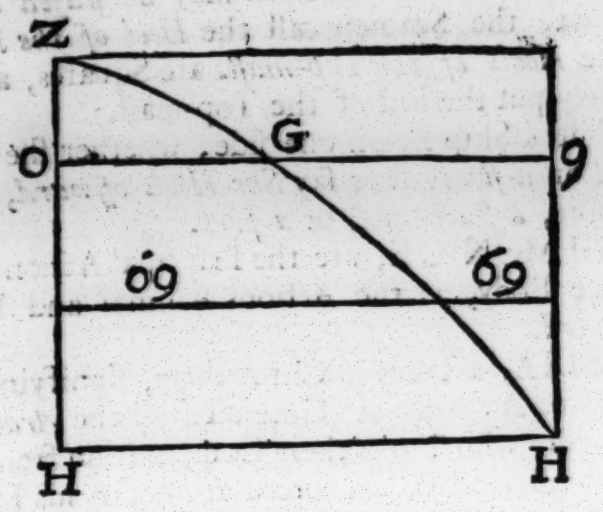
The Learned and Ingenious Captain *Halley* hath a Diſcourſe in *Philoſ. Tranſact. N.* 203. about the proportional *Heat* of the Sun in all Latitudes, and of a Method for collecting the ſame: Where he ſhews, That the Simple Action of the Sun is, as all other Impulſes or Strokes, more or leſs forcible, according to the Sines of the Angle of Incidence, or to the Perpendicular let fall on the Plane, whence the Vertical Ray (being that of the greateſt Heat) being put for *Radius*, the Force of the Sun, on the Horizontal Surface of the Earth, will be to that, as the Sine of the Sun's Altitude at any other Time.

This being allowed for true, it will then follow, That the Time of the Continuance of the Sun's ſhining being taken for a Baſis, and the Sines of the Sun's Altitudes erected thereon, as Perpendiculars, and a Curve drawn through the Extremities of thoſe Perpendiculars, the *Area* comprehended ſhall be proportionate to the Collection of the Heat of all the Beams of the Sun in that ſpace of Time.

Hence it will follow, That under the Pole the Collection of all the Heat of a Tropical Day, is proportionate to a Rectangle of the Sine of 23 Degrees and a Half into 24 Hours, or the Circumference of a Circle; that is, the Sine of 23 Degrees and a Half, being nearly $\frac{4}{7}$ of Radius, as $\frac{8}{10}$ into 12 Hours. Or the Polar *Heat* is equal to that of the Sun continuing 12 Hours above the *Horizon* at 53 De-

53 Degrees height, than which the Sun is not 5 Hours more elevated under the Equinoctial.

But that this may be the better understood, he explains it by the following Figure.



Wherein the Area ZGHH, is equal to the Area of all Sines of the Sun's Altitude under the Equinoctial, erected on the respective Hours from Sunrise to the Zenith; and the Area ♋ HH ♋ is in the same Proportion to the Heat for the same 6 Hours under the Pole on the Tropical Day; and ⊙ H H Q, is proportional to the collected Heat of 12 Hours, or half a Day under the Pole, which space ⊙ H H Q is visibly greater than the other Area HZGH, by as much as the Area HGQ is greater than the Area Z G ⊙; which that it is so, is visible to sight, by a great excess; and so much in Proportion does the Heat of 24 Hours Sun-shine under the Pole, exceed that of 12 Hours under the Equinoctial; whence, *Cæteris paribus*, it is reasonable to conclude, That were the Sun perpetually under the Tropick, the Pole would be at least as warm, as it is now under the Line it self.

But whereas the Nature of Heat is to remain in the Subject, after the Cause that heated it is removed, and particularly in the Air; under the Equinoctial, the 12 Hours absence of the Sun does very little still the Motion impress'd by the past Action of his Rays, wherein Heat consists, before he arises again; but under the Pole, the long absence of the Sun for 6 Months, wherein the Extremity of Cold does obtain, has so chill'd the Air, that it is, as it were Frozen, and cannot (before the Sun has got far towards it) be any ways sensible of his Presence, his Beams being obstructed by thick Clouds, and perpetual Fogs and Mists, and by that *Atmosphere* of *Cold*, as the Honourable Mr. *Boyle* was pleased to term it, proceeding from the everlasting Ice, which in immense Quantities does chill the neighbouring Air, and which the too soon retreat of the Sun does leave unthaw'd, to increase again, during the long Winter, that follows this short Interval of Summer.

But the differing Degrees of Heat and Cold in differing Places, depend in a great measure upon the Accidents of the neighbourhood of high Mountains, whose Height exceedingly chills the Air brought by the Winds over them; and of the Nature of the Soil, which variously retains the Heat, particularly the Sands, which in *Africa*, *Arabia*, and generally where such Sandy Desarts are found, do make the Heat of the Summer incredible to those that have not felt it.

In prosecution of his former Thought, he computed the following Table for every tenth Degree of Latitude, to the Equinoctial and Tropical Sun, by which an Estimate may be made of the intermediate Degrees.

Lat.	Sun in ♈. ♎.	Sun in ♋	Sun in ♑
0	20000	18341	18341
11	19696	20290	15834
20	18797	21737	13166
30	17321	22651	10124
40	15321	23048	6944
50	12855	22991	3798
60	10000	22773	1075
70	6840	23543	000
80	3473	24673	000
90	0000	25055	000

Then he gives the following *Corollaries*, very well worth Note.

COROLLARY I.

That the Equinoctial Heat, when the Sun becomes Vertical, is as twice the Square of the Radius; which may be proposed as a Standard to compare with, in all other Cases.

COROLLARY II.

That under the Equinoctial, the Heat is as the Sine of the Sun's Declination.

COROLLARY III.

That in the Frigid Zones, when the Sun Sets not, the Heat is as the Circumference of a Circle into the Sine of the Altitude at 6. And consequently, that in the same Latitude these Aggregates of Warmth, are as the Sines of the Sun's Declination; and at the same Declination of the Sun, they are as the Sines of the Latitudes, and generally they are as the Sines of the Latitudes into the Sines of the Declination.

COROLLARY IV.

That the Equinoctial Day's Heat, is every where as the Co-sine of the Latitude.

COROLLARY V.

In all Places where the Sun Sets, the Difference between the Summer and Winter Heats, when the Declinations are contrary, is equal to a Circle into the Sine of the Altitude at 6, in the Summer parallel, and consequently, those Differences are as the Sines of Latitude into, or multiplied by the Sines of Declination.

COR. VI.

From the foregoing Table it appears, That the Tropical Sun under the Equinoctial, has of all others the least Force: Under the Pole, it is greater than any other Day's Heat whatsoever, being to that of the Equinoctial, as 5 to 4.

From the Table, and these Corallaries, a general Idea may be conceiv'd of the Sum of all the Actions of the Sun in the whole Year, and that part of Heat that arises simply from the Presence of the Sun, be brought to a *Geometrical Certainty*.

The Heat of the Sun for any ſmall Portion of Time, is always as a Rectangle, contain'd under the Sine of the Angle of Incidence of the Ray producing Heat at that Time.

The Excellent Sir *Iſaac Newton*, at the End of his Opticks, juſt now publiſh'd, renders it probable, tho' he propoſes it but as a Query; That Flame is a Fume, Vapour, or Exhalation heated red hot; that is, ſo hot as to ſhine: Becauſe Bodies don't flame without emitting a copious Fume, and this Fume burns in the Flame.

The *Ignis Fatuus*, is a Vapour ſhining without Heat, and there ſeems to be the ſame difference between the Vapour and Flame, as between rotten Wood ſhining without Heat, and burning Coals of Fire. In diſtilling hot or ardent Spirits, if the Head of the Still be taken off, the aſcending Vapour will take Fire at the Flame of a Candle, and be turn'd into Flame; and the Flame will run along the Vapour from the Candle to the Still.

Some Bodies heated by Motion or Fermentation, if the Heat grow intenſe, fume copiouſly; and if the Heat be great enough, the Fumes will ſhine and become Flame. Metals in Fuſion uſually don't Flame for want of a copious Sulphur; except Spelter, which Fumes copiouſly, and thereby flames.

All Flaming Bodies, as Old Tallow, Wax, Wood, Foſſil-Coals, Pitch, Sulphur, *&c.* by Flaming waſte and vaniſh into burning Smoke; which Smoke, if the Flame be put out, is very thick and viſible, and ſometimes ſmells ſtrongly, but in the Flame loſes its Smell by Burning; and according to the Nature of the Smoke, the Flame is of ſeveral Colours, as that of Sulphur is Blue, that of Copper open'd with Sublimate, Green, that of Tallow, Yellow, *&c.* Smoke paſſing through Flame cannot but grow red hot, and red hot Smoke can have no other appearance but that of Flame.

As great Bodies probably conſerve their Heat the longeſt, ſo the Reaſon of it ſeems to be, That their Parts heat one another: Whence *great denſe*, and *fix'd Bodies*, when heated beyond ſuch a Degree, may emit Light ſo copiouſly, as by the Emiſſion and Reaction of its Light, and the Reflections and Reactions of its Rays within its Pores to grow ſtill hotter, till it come to ſuch a Period of Heat, as is that of the Sun: Wherefore we may ſuppoſe the Sun and fix'd Stars to be great Earths vehemently hot, whoſe Heat is conſerved by the Greatneſs of the Bodies, and the mutual Action and Reaction between them and the Light which they emit; and whoſe Parts are kept from fuming away, not only by their Fixity, but alſo by the vaſt Weight and Denſity of the Atmoſpheres incumbent upon them, and very ſtrongly preſſing them, and condenſing the Vapours which ariſe from them. *See* Vol. II.

HEAVE, at Sea, ſignifies to throw away, or to fling any thing over-board, this they call, *Heaving it over-board*; alſo turning about the Capſtan, is called, *Heaving at the Capſtan*; likewiſe when a Ship being at Anchor, riſeth and falleth by the force of the Waves, ſhe is ſaid, *To Heave and Set*.

HEAULME, (or as they write it, *Heawme*) is the Herald's Term for an Helmet, or Head-piece.

HEAVY *Bodies Deſcent*: See *Deſcent of heavy Bodies*.

HEBRAISM, is the proper Idiom of the *Hebrew* Tongue.

HECTICA, is a Continued Fever, ariſing from the very Habit of the Body, and introduced in a long Time, and has ſo rooted it ſelf into the very Conſtitution, that it is very difficult ever to cure it: For the moſt part it is accompanied with an Ulcer of the Lungs, Leanneſs, and a Cough. *Blanchard.*

HEEL; that part of the Foot of any Maſt which is pared away ſlanting on the aftward ſide of the Foot, in order that the Maſt may be *ſtayed afterward on*, the Seamen call the *Heel of the Maſt*; but the *Heels of the Top-maſts* are Squares, and in that they put the Fid of the Top-maſt.

Alſo if a Ship lie on one ſide, whether ſhe be *a-ground* or *a-float*, they ſay *She Heels offward*, or to the Shore, *a-ſtarboard*, or *a-port*.

HEGEMONICÆ, are the Principal Actions in a Humane Body, as the Actions Animal and Vital. *Blanchard.*

HEGIRA, a Term in Chronology, ſignifying the *Epocha*, or Account of Time uſed by the *Arabians* and *Turks*, who begin their Computation from the Day that *Mahomet* was forced to make his Eſcape from the City of *Mecca*, which happen'd on *Friday*, *July* 16. *A. D.* 622. under the Reign of the Emperor *Heracleus*.

HEIGHT *of a Figure*, is the Perpendicular Line drawn from the Top to the Baſe (ſometimes produced) either within the Figure or without it.

HEIGHT *of the Pole*: See *Altitude of the Pole*.

HEIR, a Word having not altogether the ſame Signification with *Civilians*; who call *Heredem, qui ex teſtamento ſuccedit in univerſum jus Teſtatoris*; as in Common Law, which calls him *Heir* that ſucceeds by Right of Blood in any Man's Lands or Tenements in Fee; for by the Common Law nothing paſſeth *Jure Hæreditatis*, but only Fee: Moveables, or Chattels immovable, are given by Teſtament to whom the Teſtator liſteth, or elſe are at the Diſpoſition of the Ordinary, to be diſtributed as he in Conſcience thinketh meet. Every *Heir*, having Lands by Deſcent, is bound by the binding Acts of his Anceſtors, if he be named, *Qui ſentit commodum, ſentire debet & onus.*

HELCYDRA, are certain little Ulcers, thick and red; and in the Skin of the Head, like the Nipples of the Breaſts, which ſend forth Matter. *Blanchard.*

HELIACAL-RISING, is when a Star, having been under the Sun's Beams, gets from the ſame ſo as to be ſeen again.

HELIACAL-SETTING, is when a Star, by the near Approach of the Sun, firſt becomes inconſpicuous; this is reckon'd in the Moon but at 17 Degrees diſtance, or thereabouts; but in other Stars, 'tis aſſoon as they get diſtant, or come near the Sun by the Space of a whole Sign.

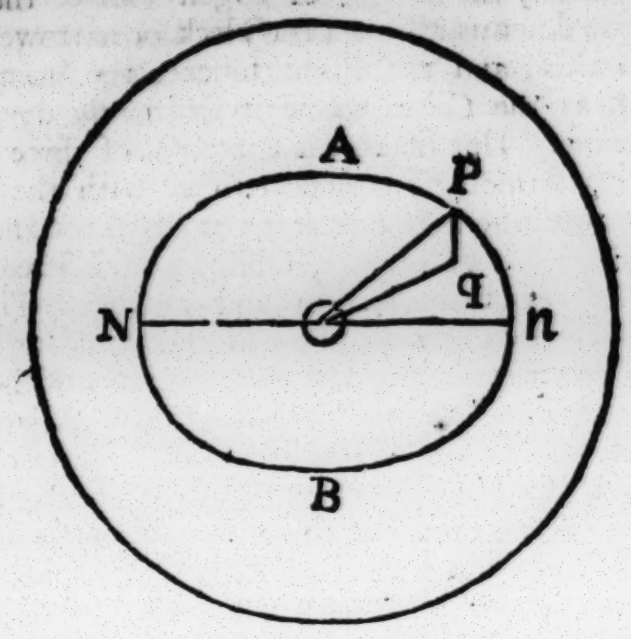
HELICE *Major* and *Minor*, the ſame with *Urſa Major* and *Minor*.

HELICOSOPHY, is the Art of Delineating all ſorts of *Spiral Lines in Plano*.

HELIOCENTRICK *Place of a Planet*, is ſaid to be ſuch, as it would appear to us from the Sun, if our Eye were fix'd in its Center.

Heliocen-

Heliocentrick Latitude of a Planet.



If the outer Circle repreſent the Orbit of the Earth round the Sun, and then the inner one be placed ſo as to be inclined to the Plane of the other (for which reaſon it appears in the form of an Ellipſis) when the Planet is in *N* or *n* (which Points are call'd its *Nodes*) it will appear in the Ecliptick, and ſo have no *Latitude*; but if it move to *P*, then being ſeen by the Sun, it will appear to decline from the Ecliptick, or to have Latitude, and the Inclination of the Line ☉ *P* to the Plane of the Ecliptick, is called the Planet's *Heliocentrick Latitude*, and the Meaſure of it is the Angle *P* ☉ *q*, ſuppoſing the Line *P q* to be perpendicular to the Plane of the Ecliptick: And this Heliocentrick Latitude will be continually increaſing till it come to the Point *A*, which they call the *Limit* or utmoſt Extent of it, and then it will decreaſe again till it come to nothing in *N*; after which it will increaſe again till it come to *B*; and laſtly, be decreaſing again till the Planet come to be in *n*, &c.

HELIOSCOPES, are a ſort of Teleſcopes fitted ſo as to look on the Body of the Sun without Offence to the Eyes.

Of theſe Dr. *Hook* hath written a little Tract, and propoſes, that by inſerting 4 Reflecting Glaſſes into a Teleſcope, the Sun's Rays ſhall come to the Eye, but with $\frac{1}{2500}$ part of their uſual Strength. And this Way the Doctor prefers to all others.

But without any ſuch long Apparatus, Mr. *Hugen*'s Way, of only uſing a Plane-Glaſs black'd at the Flame of a Lamp or Candle on one Side and placed between the Eye-Glaſs and the Eye, will anſwer the Deſign of an Helioſcope very well: The Truth of which I have often found my ſelf by Experience.

HELIX, is the Exterior Brim of the Ear, ſo called from its winding. The Interior is called *Scapha*.

HELIX, in Geometry, is the ſame with *Spiral*; which ſee.

HELLENISM, is the Imitation in *Latin*, or any other Language, of the proper Idiom of the *Greek* Tongue.

HELM, or Tiller of a Ship, is that Beam or Piece of Timber that is faſtened into the Rudder, and ſo comes forward into the Steerage, where he that ſtands at Helm ſteers the Ship, by holding the Whip-ſtaff in his Hand, a piece of Wood for that purpoſe, faſtened into the *Helm*.

The Terms of Art belonging to the Helm, are,

1. *Port the Helm*: That is, Put the Helm over to the Left Side of the Ship.

2. *Starboard the Helm*; That is, Put it to the Right ſide of the Ship.

3. *Right the Helm*, or *Helm a Mid-ſhip*; that is, Keep it even with the Middle of the Ship.

Bear up the Helm; That is, Let the Ship go more large before the Wind.

5. *Bear up round*; That is, Let the Ship go directly before the Wind, in the Middle between her two Sheets.

HELM alſo, with the Chymiſts, is the Head of any Still or Alembick, becauſe 'tis in Figure ſomething like an Helmet, or Steel Cap, uſed by the Cavalry in War: So that *to bring a thing over the Helm*, is the ſame as to force it by Fire up to the Top of the Veſſel, that it may diſtil down into the Receiver by the Noſe or Beak of the Head; and when they ſay, That ſuch a Thing cannot be brought over the Helm, they mean, 'tis of too fix'd a Nature to be raiſed into Vapour, or Salt, by the Force of Fire.

HELMINTHAGOGUES, or *Helminthicks*, are Medicines that expel Worms, or bring 'em away by Stool. *Blanchard.*

HELOS, or *Clavus*, is a round, white, callous Swelling of the Foot like the Head of a Nail, and fixed in the Roots of the hard Skin of the Foot. *Blanchard.*

HEMERALOPIA, or *Acies nocturna*, is when one ſees better in the Night than in the Day. *Blanchard.*

HEMICRANIA, is a Head-ach in either Part of the Brain.

HEMIPAGIA, the ſame that *Hemicrania.*

HEMIPLEGIA, is a Palſie on one Side below the Head, proceeding from an Obſtruction in one part or other of the Spinal Marrow; or from a Blow; whence it comes to paſs, that the Animal Spirits are obſtructed in their Paſſage. *Blanchard.*

HEMIPLEXIA, the ſame with *Hemiplegia.*

HEMISPHERE, is the Half of a Globle or Sphere when 'tis ſuppoſed to be cut thro' the Center in the Plane of one of its greateſt Circles. Thus the Equator divides the Terreſtrial Globe into the Northern and Southern Hemiſphere; and the Equinoctial, the Heavens after the ſame manner.

The Horizon alſo divides the Earth into 2 Hemiſpheres, the one Light, and the other Dark, according as the Sun is above or below that Circle.

Alſo Maps or Prints of the Heavens, Conſtellations, &c. paſted on Boards, are ſometimes called *Hemiſpheres*, but uſually *Planiſpheres*.

The Writers of *Opticks* prove, that a Glaſs *Hemiſphere* unites the Parallel Rays at the Diſtance of a Diameter and one third of a Diameter from the Pole of a Glaſs. *Molyneux Dioptr. Nov.* p. 94.

HEMITRITÆUS, an Irregular Intermitting Fever that returns every Day, but with this Difference from a Quotidian, that the Fit comes twice every other Day.

HENDECAGON, in Geometry, is a Figure that hath 11 Sides, and as many Angles.

Hendecagon, in Fortification, is taken for a Place defended by 11 Baſtions.

HENIOCHUS, one of the Northern Conſtellations of fix'd Stars: See *Auriga.*

HEPAR, the *Liver*, is a Fleſhy large *Viſcus*, placed in the Right *Hypochondrium*; its Convex and Upper-ſide reaches a little beyond the *Cartilago Xiphoides*, and touches the *Diaphragm*; its Concave and Under-ſide covers the *Pylorus*, and part of the Stomach, as alſo part of the *Colon*, all the *Duode-*

num: a part of the *Jejunum*, and of the *Omentum*; and when we are ſtanding, its loweſt Extremity reaches near to the Navel.

Its Figure is almoſt round and pretty thick; its upper Convex-ſide being ſmooth and equal, but the lower Concave one by no means ſo. In its Middle and Fore-part it is divided into two, by a Fiſſure where the Umbilical Veſſels enter. The Gall-Bladder is faſtened to its Under-ſide, where are three Eminences that the Ancients called *Portæ*, of which one paſſes for a little Lobe.

When it is full of Blood, it is of a dark red Colour; but when the Blood is waſh'd out of it, it looks pale and feels ſoft.

It is faſten'd to the Body by two Ligaments:

The firſt, which is large and ſtrong, comes from the *Peritonæum*, that covers the *Diaphragm*, and penetrating the Subſtance of the Liver, joins the *Capſula* of the *Porta*.

The ſecond is the Umbilical Vein, it comes from the Navel, and enters by the great Fiſſure of the Liver to join the *Porta*: After the Birth it degenerates into a Ligament, but is of little Uſe for the faſtening the Liver: 'Tis covered with a common Membrane from the *Peritonæum*, beſides that every Lobe and Gland has its proper Membrane: The common Membrane of the Liver being raiſed, its Subſtance appears, which is compoſed of ſeveral Lobes of Glands, of a Conick Figure, not eaſily to be diſtinguiſh'd in the Liver of Men: Theſe Lobes are diſpoſed all along the Sides of each Branch of the Veſſels in the Liver, they are every one cover'd with a proper Membrane, and ty'd to one another by other Membranes in ſuch a manner, as that they leave alſo little Intervals betwixt them, which are more viſible in Fiſh, and other imperfect Animals; every Lobe receives ſmall Veſſels, which are continued to the little Glands of which each Lobe is compoſed.

The Veſſels of the Liver, are the *Vena Cava* and the *Porta*; they are accompanied with many ſmall Branches of the Arteries, which come from the *Cæliack* and *Meſenterica Superior*, which two bring the Blood for the Nouriſhment of the Liver: The *Porta* brings the Blood full of Bile for Secretion, and the *Cava* carries back the Blood that remains from both: The *Vena Porta* and the *Cava* enter the Liver by its Concave-ſide, and are equally diſtributed through all its Subſtance: Where ever there is a Branch of the one, there is a Branch of the other; ſo that each Lobe, and each Gland in the Lobe, whether on the Convex, or on the Concave-ſide, receive the ſame Veſſels.

The *Vena Porta* diſcharges by the Extremity of its Branches, the Blood, as yet full of Bile, into the little Glands which form the Lobes, of which the *Parenchyma* of the Liver is compoſed, where being ſeparated from the Bile, which is taken up by the Bilary Veſſels (which accompany the Branches of the *Porta*) and carried to the Gall-Bladder or *Duodenum*, it is carried back by the Branches of the *Cava*: it receives its Nerves from the *Plexus Hepaticus* of the Intercoſtal Nerve.

Beſides theſe Veſſels, the Liver has Lymphatick Veſſels, moſt of which open into the conglobated Glands, near the *Porta*, on the Concave-ſide of the Liver, from thence the *Lympha* is carried by other Lymphaticks to the *Receptaculum Chyli*.

We come now to the Excretory Veſſels of the Liver; which are, the *Veſicula Fellis*, and *Porus Bilarius*: The *Veſicula Fellis*, or Gall-Bladder, is fixed to the Concave-ſide of the Liver; its Figure is like that of a Pear; 'tis of a different Bigneſs almoſt in every Subject; the biggeſt is about the Bigneſs of a little Hen's Egg; when the Liver is in its natural Situation, the bottom or largeſt Part of the Bladder is downwards, and the Neck or narroweſt Part upwards, and the Point touches the Stomach, as well as the *Colon*, where it frequently dyes them Yellow. This Bladder is compoſed of three Coats, the outermoſt is common to it with the Liver; the next which is proper to it, is thick and ſolid, compoſed of Tranverſe, Oblique, and Streight Fibres: The third is thin and nervous: This laſt Coat is cover'd within by a kind of Cruſt or Mucus, which preſerves it againſt the Acrimony of the Bile: *Malpighius* has remarked ſome little Glands between its Coats, where the Cyſtick Arteries end; which gave him Ground to think that it was the ſame in the *Porus Bilarius*. The Bile is brought into the Gall-Bladder by ſome ſmall Veſſels which ariſe from the neighbouring Glands, and uniting, form one or two Pipes which open at the Neck of the Bladder: Theſe Ducts I could never diſcover in any Liver but an Ox's, though I have reaſon to think they are likewiſe in an Human. From the Neck of the Gall-Bladder there goes a Pipe, not in a ſtreight Line with the Bladder, but as it were more depreſs'd in the Liver; it is called *Ductus Chyſticus*; ſome ſmall Bilary Ducts open likewiſe into it, and its inner Membrane has ſeveral *Rugæ*, which retard the Motion of the Bile. To this Pipe (which is about the bigneſs of a Gooſe Quill) is joyn'd another, called, *Ductus Hepaticus*, or *Porus Bilarius*; theſe two together make the *Ductus Communis Choledochus*, which goes obliquely to the lower end of the *Duodenum*, or the beginning of *Jejunum*: After it has pierced the firſt Coat, it runs near two Fingers breadth between the Coats, before it opens the Cavity of the Inteſtine; which oblique Inſertion ſerves inſtead of a Valve, to hinder the Bile to return into *Ductus Communis*, having once enter'd the Inteſtine. The Gall-Bladder has two Veins from the *Porta*, which are called *Cyſticæ Gemellæ*; it has ſome ſmall Arteries from the *Cæliaca Dextra*, and ſome Lymphaticks.

The *Porus Bilarius* is another Excretory Veſſel of the Liver; it has as many Branches as the *Vena Porta*, which it accompanies through every Lobe and Gland in the Liver; where ever there is a Branch of the one, there is a Branch of the other, and theſe two are encloſed in one common Capſule, as in a Sheath: The Uſe of this Capſule is to facilitate the Blood and Bile, by the Contraction of its Fibres. All theſe Branches unite, and make one Pipe of the Bigneſs of a ſmall Quill, which joins, as we have ſaid, at the end of the *Ductus Cyſticus*, for the carrying the Bile from the Liver to the Inteſtines, by the *Ductus Communis Cholydochus*.

The Inſertion of the *Porus Bilarius* into the *Ductus Cyſticus*, is Oblique, with its Mouth looking towards the *Ductus Communis*; by which means it is impoſſible that the Bile which comes from the *Cyſtus*, can enter the *Porus*.

The Bile which is found in the Gall-Bladder, is thinner, and different from that which is in the *Porus Bilarius*. This *Malpighius* proves by an Experiment, which is this, That having tied the *Ductus Cyſticus*, he remarked, that the Bile which came by the *Porus Bilarius* was of a different Taſte, Smell, Colour, and Conſiſtency from that in the Gall-Bladder.

The Uſe of the Bile is to ſheath or blunt the Acids of the Chyle; becauſe they being entangled with its Sulphurs, thicken it ſo, as that it cannot be ſufficiently diluted by the *Succus Pancreaticus* to enter the *Lacteal Veſſels*; this appears not only from the

the Analyſis of the Bile, which yields more of a Lixivious than of a Volatile Alkaline Salt; but likewiſe from what *Lubenhoeck* has obſerved, That of the great quantity of Acid Salts he has ſeen amongſt the Aliments of the Stomach, he never could find any in the Chyle, after it had paſſed the *Duodenum*.

Becauſe ſome Chyle is almoſt always paſſing through the *Duodenum*, therefore it was neceſſary that the Bile likewiſe ſhould be continually poured into it from the *Ductus Hepaticus*. In a Dog, whoſe *Ductus Communis Cholidochus*, was near as big as in a Man, I have gather'd it at the rate of 2 Drachms in an Hour; but becauſe a great Quantity of Aliments requires a greater Quantity of Bile, therefore according as the Stomach is more or leſs diſtended with Food, it preſſes out of the Gall-Bladder a proportionable Quantity of Gall, to be mix'd with the Chyle in the Guts. Dr. *Keil*.

HEPATICK *Medicines* are, for the moſt part, ſuch as are both *Diaphoretical* and *Diuretical*.

HEPATICA *Vena*, the ſame with *Baſilica*.

HEPATICK *Aloes*, is the fineſt ſort of Aloes, brought commonly from an Iſland in *Perſia*, called *Succotra*, whence the Name *Aloes Succotrina*: 'Tis called *Hepatick*, becauſe 'tis near the Colour of the Liver.

HEPATICUS *Morbus*, or *Hepatick Flux*, is a Dejection, of a watery ſharp Blood, like the waſhing of Fleſh, when the nervous Juice, or watery Blood, being not rightly concocted, but ſharp, is diſcharged into the Guts: Alſo when black ſhining dried Blood is driven into the Guts. The Diſeaſe is ſo called, becauſe they attributed Sanguification to the Liver. *Blanchard*.

HEPIALA: See *Epiala*.

HEPTAGON, in Geometry, is a Figure of ſeveral Sides and Angles; and is call'd a *Regular Heptagon*, if thoſe Sides and Angles be equal.

HEPTAGON, in Fortification, is taken for a Place that hath 7 Baſtions for its Defence.

HEPTANGULAR *Figure*, in Geometry, is that which conſiſteth of 7 Angles.

HEPTHEMIMERIS, is a *Cæſura* in a *Latin* Verſe, where after the third Foot there is an odd Syllable, which ſerves to help make a Foot with the next Word; as in this:

Ille latus niveum molli fultus hyacintho.

HERCULIUS *Morbus*, the ſame with *Epilepſia*.

HEREDITAMENTS, in Law, ſignifies all ſuch Things immoveable, be they corporeal, or incorporeal, as a Man may have to himſelf and his Heirs, by way of Inheritance; or not being otherwiſe bequeathed, do naturally and of courſe deſcend to him and his next Heir of Blood, and fall not within the Compaſs of an Executor or Adminiſtrator, as Chattels do. It is a Word of large extent, and much uſed in Conveyances; for by the Grant of *Hereditaments*, Iſles, Seigniories, Mannors, Houſes and Lands of all Sorts, Charters, Rents, Services, Advowſons, Commiſſions, and whatever may be inherited, will paſs.

HERETICO *Comburendo*: See *Hæretico Comburendo*.

HERISSON, in Fortification, is a Beam arm'd with a great Quantity of ſmall Iron Spikes or Nails, having their Points outward, and is ſupported by a Pivot, upon which it turns, and ſerves inſtead of a Barrier to block up any Paſſage. They are frequently placed before the Gates, and more eſpecially the Wicket-Doors of a Town or Fortreſs, to ſecure thoſe Paſſages which muſt of Neceſſity be often open'd and ſhut.

HERMETICAL *Philoſophy*, is that which pretends to ſolve and explain all the Phænomena of Nature, by the three Chymical Principles, Salt, Sulphur, and Mercury.

HERMETICAL *Phyſick*, is that Hypotheſis in the Medicinal Art, which refers the Cauſe of all Diſeaſes to Salt, Sulphur, and Mercury.

HERMETICAL *Seal*, or *Hermes's Seal*, or to Seal or Stop up any Glaſs *Hermetically*, is to heat the Neck of the Glaſs till 'tis juſt ready to melt, and then with a pair of hot Pincers to pinch or cloſe it together. This way are all *Thermometers* ſealed up, and the Chymiſts ſeal up thus a Liquor in a Matraſs, or Bolt-head, when they deſign it ſhould be long circulated in a gentle Heat.

HERMETICK *Art*, is the ſame with Chymiſtry. 'Tis ſo called from *Hermes*, or *Mercury*, whom the Chymiſts will needs aſſert to have been the firſt and moſt famous Chymiſt.

HERNIA, or *Ramex*, is properly the Falling of the Inteſtines, Cawl, &c. by the Proceſſes of the *Peritonæum* dilated into the Groin: Alſo a Protuberance of the Navel. The Falling down of the Womb is improperly ſo called; as alſo ſwelling in the *Larynx*; winding Tumours of the Spermatick Veſſels; Diſtenſions from Flatulent Matter; watery Humours, or Swellings. *Blanchard*.

HERPES, a ſpreading and winding Inflammation, is two-fold; either *Miliaris*, or *Puſtularis*, like Millet-ſeed, which ſeizes the Skin only, and itches; or *Exedens*, conſuming; which not only ſeizes the Skin, but the Muſcles underneath: The Cauſe of it is, That the Glandules of the Skin are too much ſtuffed with Salt Particles, which are kept there by others that are viſcous, whence proceed the little Ulcers like Millet-ſeed, that occaſion an itching in the Skin, which if the Peccant Humour abound, they grow into a Cruſt, and eat the Parts they lie upon. *Blanchard*.

HERSE, in Fortification, is a *Lattice*, or *Portcullice*, made in the Form of a Harrow, and beſet with many Iron Spikes. It is uſually hung by a Cord faſten'd to a Moulinet, which is cut in caſe of Surprize, or when the firſt Gate is broken with a *Petard*, to the End that the *Herſe* may fall, and ſtop up the Paſſage of the Gate, or other Entrance of a Fortreſs. Theſe *Herſes* are alſo often laid in the Roads to incommode the March as well of the Horſe, as of the Infantry.

HERSILLON, in Fortification, is a Plank ſtuck with Iron Spikes, for the ſame Uſe as the *Herſe*.

HETEROCLITES, in Grammar, are ſuch Nouns as are of different Declenſions in one Number, from what they are in the other.

HETEROCRANIA, is a Pain in one Part or other of the Head.

HETEROGENEAL *Nouns*, in Grammar, are ſuch as have one Gender in the Singular Number, and another in the Plural, as *Tartarus*, *Tartara*; *Locus*, *Loca*, &c.

HETEROGENEAL *Numbers*, are mix'd Numbers conſiſting of Whole ones (or Integers) and of Fractions.

HETEROGENEAL *Surds*, are ſuch as have different Radical Signs; as

$\sqrt[2]{aa}$: and $\sqrt[5]{}:bb:\sqrt[5]{}:7$, and $\sqrt[3]{}:19$.

How to reduce Surds to Homogeneal ones, ſee under *Surds*.

HETEROGENEAL *Light*, is by our admirable Sir *Iſaac Newton* ſaid to be that which conſiſts of Rays of differing Degrees of Refrangibility: Thus, the

the common Light of the Sun or Clouds is *Heterogeneal*, being a Mixture of all Sorts of Rays. See *Colours*.

HETEROGENEOUS *Particles*, are ſuch as are of different Kinds, Natures, and Qualities, of which, generally, all Bodies are compoſed: And therefore, when in Chymiſtry a Body is analyſed or diſſolved by the Fire, or any *Menſtruum*; if Parts or Principles of different Natures (ſuch as Salt, Oil, Spirit, Water, and Earth) can be ſeparated from it; thoſe are called *Heterogeneities* (by *Helmont*) becauſe they are all of very different Kinds or Natures from one another.

HETEROSCII, in Coſmography, are ſuch Inhabitants of the Earth as have their Shadows falling but one way; as thoſe who live between the Tropicks and Polar Circles, whoſe Shadows at Noon in North Latitude, are always to the Northward, and in South Latitude to the Southward.

HEXACHORD, a certain Interval of Muſick or Concord, commonly called a *Sixth*; and is twofold, *viz.* the *Greater* and *Leſſer*.

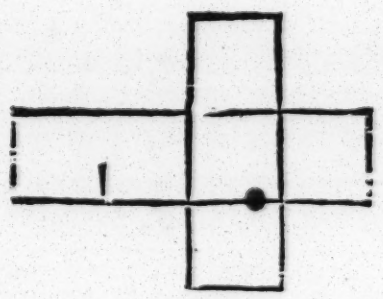
The *Greater Hexachord* is compoſed of two greater Tones, two leſſer Tones, and one greater Semi-Tone, which are five Intervals: But the *Leſſer Hexachord* conſiſts only of two Greater Tones, one Leſſer Tone, and two Greater Semi-Tones.

The Proportion of the former, in Numbers, is as 3 to 5; and that of the other, as 5 to 8.

HEXAGON, in Geometry, is a Figure of ſix Sides and Angles; and if thoſe Sides and Angles be equal, 'tis called a *Regular Hexagon*.

HEXAHEDRON, is the ſame with the Cube, being a Regular Solid of ſix equal Sides or Faces. See *Regular Bodies*.

The following Figure, being cut in Paſte-board and folded up, will repreſent the *Hexahedron* or *Cube*.



HEXASTYLE, an Ancient Building which had ſix Columns in the Face before, and ſix alſo behind, and is the ſame with the *Pſeudodipteron*.

HIDROA, are Pimples about the Secret Parts, proceeding from a ſharp Humour. *Blanchard*.

HIDRONOSUS, is a Fever, wherein the Patient ſweats extremely: The *Engliſh* call it the *Sweating-Sickneſs*. *Blanchard*.

HIDROTICK *Medicines*, are thoſe that procure and promote Sweating: See *Sudorificks*.

HIPPEUS, or *Equinus*, a Comet that ſome Writers will needs have to reſemble a Horſe: But the Shape of this kind of Comet is not always alike, as being ſometimes *Oval*, and ſometimes imitating a *Rhomboides*.

Its Train, in like manner, is ſometimes ſpread from the Front or Fore Part; and at other times from the Hinder Part: Therefore they are diſtinguiſhed into *Equinus Barbatus*, *Equinus Quadrangularis*, and *Equinus Ellipticus*.

HIPPUS, is an Affection of the Eyes, wherein they continually ſhake and tremble, and now and then twinckle, as it happens in riding. *Blanchard*.

HIRCUS, *Hirci*, or *Hirqui*, the Corners of the Eyes: See *Canthus*. *Blanchard*.

HIRCUS, a fix'd Star; the ſame with *Capella*.

HIRCUS, a Name given by ſome Writers to a ſort of a Comet encompaſſed by a kind of Main, ſeeming to be rough and hairy, by reaſon of its Rays appearing like Hairs: It is alſo ſometimes without any Train or Buſh.

HIRQUUS, the ſame with *Canthus*.

HITCH, is a Sea Word, to catch hold of any Thing with a Hook or a Rope, and to hold it faſt. Thus ſay they, when the Boat is to be hoiſed in, *Hitch the Tackles into the Rings of the Boat*; ſo *Hitch the Fiſh-hook to the Fluke of the Anchor*, when they are about to weigh the Anchor.

HOISE: See *Hoyſe*.

HOLD, of a Ship, is all that Part of it which lies between the Keelſon and the Lower-Deck; wherein, divided by Bulk-heads, are the Steward's Room, the Powder-Room, the Bread-Room, and the Boatſwain's-Room; and in a Merchant-Man, the Goods or Lading in general.

HOLD-OFF, is a Term at Sea, uſed about heaving in the Cable at the Capſtan: For if it be very ſtiff and great, or have lain long in a Slimy or Oazy Ground, unleſs that Part which is heaved in by, be haled away hard from the Capſtan, the Cable will *ſurge* or ſlip back; therefore it muſt be haled away as faſt as it comes in, that the Cable may keep cloſe about the Whelps: And this Work is called *Holding-off*, and may be done by Hand with a ſmall Cable; but in all great Ships they either *hold-off* with Nippers, or elſe bring the Cable alſo to the Jeer-Capſtan.

HOLLOW-TOWER, in Fortification, is a Rounding made of the Remainder of two Briſures, to join the Curtain to the *Orillon*, where the Small-Shot are plaid, that they may not be ſo much expoſed to the View of the Enemy. And the

HOLLOW-SQUARE, is a Body of Foot drawn up, with an empty Space in the Middle for the Colours, Drums, and Baggage, facing and covered by the Pikes every way to oppoſe the Horſe.

HOMAGE, is the Submiſſion, Promiſe, and Oath of Service and Loyalty which a Tenant makes to his Lord, when he is firſt admitted to his Land, which he holds of the Lord in Fee ('tis probably derived from the Word *Homo*:) becauſe the Form, as appointed by *Stat.* 17. *Edw.* 2. in theſe Words; When a Free-man ſhall do *Homage* to his Lord, of whom he holdeth in Chief, he ſhall hold his Hands together between the Hands of his Lord, and ſhall ſay thus;

I become your Man from this Day forth for my Life, for Member, and for Worldly Honour; and ſhall owe you my Faith for the Land I hold of you, ſaving the Faith that I owe unto our Sovereign Lord the King, and to mine other Lords.

And in this manner the Lord of the Fee, for which *Homage* is due, taketh *Homage* of every Tenant as he cometh to the Land or Fee.

HOMAGE is ſometimes uſed for the Jury in a Court-Baron, where it conſiſteth moſt commonly of ſuch as owe *Homage* unto the Lord of the Fee.

HOMAGE *Anceſtral*, is where a Man and his Anceſtors, time out of Mind, held their Land of their Lords and his Anceſtors by *Homage*: And if ſuch Lord have received *Homage*, he is bound to acquit the Tenant againſt all other Lords above him, of every manner of Service. And if the Tenant

nant hath done *Homage* to his Lord, and is impleaded, and vouches the Lord to Warranty, the Lord is bound to warrant him; and if the Tenant loſe, he ſhall recover in Value againſt the Lord ſo much of the Lands as he had at that time of the Voucher, or any time after.

HOMAGIO *Reſpectuando*, is a Writ directed to the Eſcheator, commanding him to deliver Seiſin of Lands to the Heir that is full Age, notwithſtanding his *Homage* not done, which ought to be performed before the Heir have Livery, or his Lands, except there fall out ſome reaſonable Cauſe to hinder it.

HOMICIDE, in Common Law, ſignifies the Killing of a Man, and it is divided into *Voluntary* and *Caſual*.

Homicide Voluntary, is that which is deliberate, and committed of a ſet Mind and Purpoſe to kill, and is either with a precedent Malice, or without: The former is Murder, and is a Fellonious Killing, through Malice prepenſed, of any Perſon living in this Realm under the King's Protection: See *Murder*, *Man-ſlaughter*, *Chance-medley*.

Homicide Caſual, is either *merely Caſual* or *mixt*.

Merely Caſual, is when the Slayer kills a Man by pure Miſchance, being about his lawful Occaſions: as in the Caſe of an Axe ſlipping out of a Man's Hand, or falling off while he is felling a Tree.

But 'tis accounted *Mixt*, when there is Negligence, or ſome other unwarrantable Circumſtance, ſeized with the Action.

HOMINE *capto in Withernamium*, is a Writ to take him that hath taken any Bond-man or Woman, and let him or her out of the Country, ſo that he or ſhe cannot be replevied according to Law.

HOMINE *eligendo ad cuſtodiendam peciam ſigilli pro mercatoribus æditi*, is a Writ directed to a Corporation, for the Choice of a new Man to keep the one Part of the Seal, appointed for *Statutes-Merchant*, when the other is Dead.

HOMINE *replegiendo*, is a Writ to bail a Man out of Priſon: In what Caſe it lies, ſee the *New Book of Entries*.

HOMOCENTRICK, the ſame with *Concentrick*.

HOMOGENEAL, ſignifies of the ſame Kind or Sort, or that which differs not in Nature, &c. The ſame with *Homogeneous*.

HOMOGENEAL *Numbers*, are thoſe of the ſame Nature and Kind; And

HOMOGENEAL *Surds*, are ſuch as have one commo Radical Sign; As

$$\sqrt[3]{:27}, \text{ and } \sqrt[3]{:3}.$$

HOMOGENEOUS *Particles*, are ſuch as are all of the ſame Kind, Nature, and Properties: As the Parts of pure Water, of mere Earth without Salt in it; or the Parts of the finer Metals, ſuch as Gold, Silver, &c. 'Tis uſed in Oppoſition to *Heterogeneous*: which ſee.

HOMOGENEAL *Light*, is that whoſe Rays are all of one Colour and Degree of Refrangibility, without any Mixture of others: See *Colours*.

HOMOGENEUM *Comparationis*, ſo *Vieta* calls the *Abſolute Number* in a Quadratick or Cubick, &c. Equation; and this Number always poſſeſſeth one Side of the Equation, and is the Product of the Roots multiplied one into another; therefore *Oughtred* expreſſes it by this Character Æ, becauſe 'tis a Rectangle between the two Roots *A* and *E*. The Reaſon of the Name is, that all the Roots, which being multiplied into one another, do produce the Abſolute Number, muſt be Homogeneous one to another: See *Abſolute Number*.

HOMOIOMERICAL *Principles* of *Anaxagoras*: This Ancient Philoſopher ſuppoſed, that there were in all mixt Bodies, (ſuch as Fleſh, Fruits, &c.) determinate Numbers of ſuch *Similar Principles*, as when they came to become Parts (*ex. gr.*) of an Animal Body, would there make ſuch Maſſes and Combinations as their Nature required, *viz.* the *Sanguinary Particles* would then meet all together, and make *Blood*; the *Urinous Particles* would conſtitute *Urine*; the *Oſſeous* ones *Bones*; the *Carneous* ones *Fleſh*, &c.

HOMOLOGOUS, in Geometry, ſignifies thoſe Quantities which are alike to one another in *Reaſon*; as when we ſay, there is the ſame *Reaſon* of *A* to *B*, as of *C* to *D*: Here *A* is Homologous to *C*, as *B* to *D*, becauſe of the Similitude between Antecedents and Conſequents: So that the two Antecedents, and the two Conſequents, are the Homologous Terms in any Proportion; and when Triangles are Similar, the Sides which are the two Antecedents or the two Conſequents, are called the Homologous Sides: And ſuch Triangles are always to one another as the Squares of ſuch Homologous Sides, as you will find proved under *Triangles*.

HOMOLOGOUS *Things*, in Logick, are ſuch as agree only in Name, but are of very different Natures; and therefore are the ſame with what they otherwiſe call Equivocal Terms.

HOMOPLATA, *Scapulæ Spatulæ*, *Scapulæ Apertæ*, the Shoulder-Blades, are two large, broad, and triangular Bones, which conſtitute the Breadth of the Shoulder; thin, eſpecially in the Middle, but thick in its Proceſſes, and are ſituated on each Side of the Upper and Back-part of the *Thorax*; the upper Edge of them is called *Coſta Superior*; their lower *Coſta Inferior*. Each has three Proceſſes; of which, the Firſt runs all along the Middle of their Outſide, and is called their *Spine*, whoſe End, which receives the *Clavicula*, is called the *Acromion*, or the Shoulder-point. *Caracoides*, or *Anchoralis*, is the Name of the Second Proceſs; as the Third is called *Cervix*: Theſe two latter are tied together by a ſtrong Ligament, which ſerves to keep the Head of the *Humerus* in the Cavity of the *Cervix*. The Uſe of the *Homoplata*, or *Scapulæ*, is to receive the Extremities of the *Claviculæ* and *Humeri* for the eaſier Motion of the Arm, and to give Eaſe to the Muſcles which move it.

HOMOTONA, is a continued Fever that acts always alike. *Blanchard*.

HONOUR-POINT, in an Eſcutcheon: See *Eſcutcheon*.

HONEY-COMBS, are certain Holes or Cavities within the Body of a great Gun, wherein there is Danger of ſome Sparks of Fire being lodged, or Pieces of Cartridges, where they uſe Paper Cartridges.

HOOKS, of a Ship, are all thoſe forked Timbers which are placed directly upon the Keel, as well in her *Run*, as in her *Rake*.

HOOP-WHEEL: See *Detent-Wheel*.

HOPLO *Chryſma*, the *Armarium* or *Weapon Salve*: See *Armarium*.

HORDEATUM, is a liquid Medicine taken inwardly, prepared of Barley beat and boil'd, with the Addition of ſuitable and well-ſtrained Liquors; to which are frequently added Almonds, and the Seeds of White Poppies, &c. *Blanchard*.

HORDEOLUM, the ſame with *Critha*.

HORIZON, is that Great Circle which divides the Heavens and the Earth into two Parts or Hemiſpheres, diſtinguiſhing the upper from the lower: It's either *Senſible* or *Apparent*, or the *Rational* or *True Horizon*,

The *Senſible* or *Viſible Horizon*, is that Circle which limits our Sight, and may be conceived to be made by ſome great Plain, or the Surface of the Sea.

It divides the Heavens and Earth into two Parts, the one Light, and the other Dark, which are ſometimes greater or leſſer, according to the Condition of the Place, &c.

It determines the Riſing and Setting of the Sun, Moon, or Stars, in any particular Latitude; for when any of theſe appears juſt at the Eaſtern Part of the *Horizon*, we ſay it Riſes; and when it doth ſo at the Weſtern Part, we ſay it Sets: And from hence alſo the Altitude of the Sun or Stars is accounted, which is their Height above the *Horizon*.

The *Rational*, *Real*, or *True Horizon*, is a Circle which encompaſſes the Earth exactly in the Middle, and whoſe Poles are the *Zenith* and *Nadir*; that is, the two Points, one exactly over our Heads, and the other under Feet.

Horizon on the *Globe* or *Sphere*, is a broad wooden Circle encompaſſing it round, and repreſenting the *Rational Horizon*, having two Notches in the North and South Parts of it for the Brazen Meridian to ſtand in.

On this broad wooden *Horizon* ſeveral Circles are drawn, the innermoſt of which is the Number of Degrees of the 12 Signs of the Zodiack, *viz.* 30 Degrees to each Sign.

Next to this you have the Names of thoſe Signs; then the Days of the Month, according to the *Julian* Account, or Old Stile, with the Calendar; and then a Calendar according to the Foreign Account, called New Stile: And without theſe is a Circle divided into 32 equal Parts, which make 32 Rhumbs, or Points of the Mariner's Compaſs, with the firſt Letters of their Names annexed.

The Uſes of this Circle on the Globe arẽ,

1. To determine the Riſing and Setting of the Sun, Moon, or Stars; and to ſhew the Time of it by the Hour-Circle and the Index.

2. To limit the Increaſe and Decreaſe of Day and Night: For when the Sun riſes due Eaſt, and ſets Weſt, the Days and Nights are equal: When he riſes and ſets to the North of the Eaſt and Weſt, the Days are longer than the Nights: But the Nights are longer than the Days, when the Sun riſes and ſets to the Southward of the Eaſt and Weſt Points of the *Horizon*.

3. To ſhew the Amplitude and Point of the Compaſs the Sun riſes and ſets upon.

HORIZONTAL, or *Baſe-Line of a Hill*, how to find: See *Surveying*.

HORIZONTAL *Dials*, are thoſe whoſe *Planes* lie parallel to the Horizon of any Place.

For the drawing of theſe *Dials*, you muſt have always given the *Latitude of the Place*, or Height of the Pole above the Horizon, (*which is equal to the Height of the Style*) by the Help of which you may find the *Hours Diſtance from the Meridian* by the following Proportion:

As the Radius: Is to the Sine of the *Styles Height*:: So is the Tangent of the Hour (or *Angle at the Pole*):
To the Tangent of the *Hours Diſtance from* 12, (or the *Hour-Arch*.)

Example.

Suppoſe an *Horizontal Dial* was to be drawn for the Latitude of 51 Degrees 32 Minutes.

Firſt, Find the Diſtance of the Hours 1 and 11 from the Meridian, according to the preceding *Canon*:

Thus,

To the S. of the *Styles Height*---51° 32'---9.893745
Add the Tangent of the Hour--15 00---9.428052

Sum---Rad.=T. of the *H. Arc.* 11° 50---19.321797

Which is the Diſtance of 1 and 11 from the *Meridian Line*.

In like manner find the reſt of the *Hours Diſtances*, and place them in a Table:

Thus,

Latitude 32 Degrees 51 Minutes North.

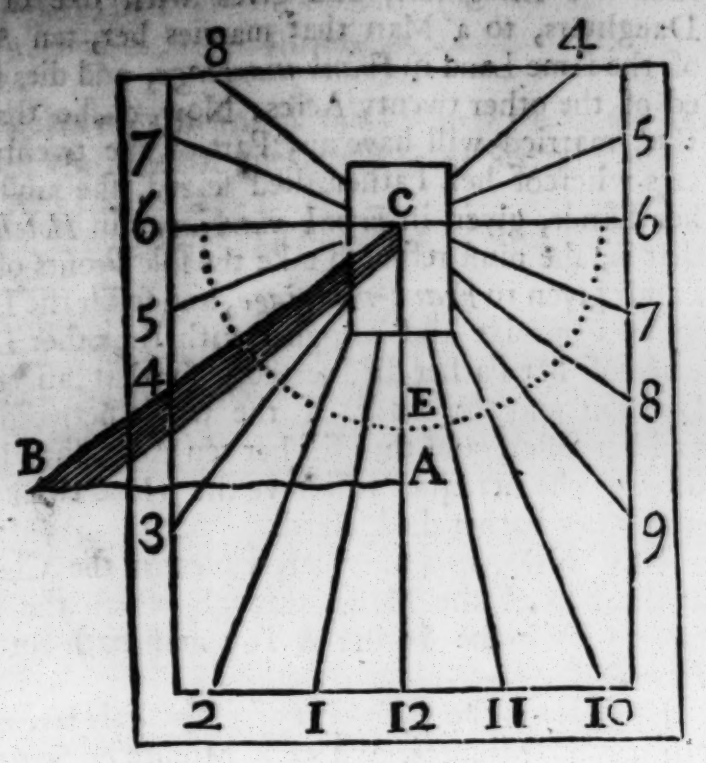
Hours.		Angle at Pole.		Hour Arches.	
		G.	M.	G.	M.
12		00	00	00	00
11	1	15	00	11	50
10	2	30	00	24	20
9	3	45	00	38	03
8	4	60	00	53	35
7	5	75	00	71	06
6		90	00	90	00

For the Style, make the Angle *BCA*= to the Latitude of the Place.

So ſhall *B C A* be the Style or Cock, which muſt ſtand perpendicularly on *C*: 12, and Point due North.

If you would Calculate for every half Quarter, you muſt ſay,

As *R*: *S* Latitude:: *T*, 1 Degree 52 Minutes:
To the Tangent of the firſt half Quarter's Diſtance from the Meridian::
So *T*, 3 Degrees 45 Minutes: To *T*, of the firſt Quarter of an Hour's Diſtance::
So *T*, 5 Degrees 37 Minutes: To a Quarter and half Quarter's Diſtance::
So *T*, 7 Degrees 30 Minutes; To the half Hour's Diſtance, &c.



To deſcribe the Dial, Reſpect muſt be had to the Bigneſs of the Plane, and the Place for the Center *C* determined; and then through *C* draw *C* 12 for the Meridian (which will alſo be the Subſtilar-Line and Hour-Line of 12) and at Right Angles to it 6 *C* 6 for the Hour-Line of Six. Then on *C*, with a Line of Chords, whoſe Radius is proper for the Largeneſs of the Dial, draw a Circle, and from *E*, both ways, ſet the ſeveral Diſtances of the Hour-Arks, found by Calculation, in the Circumference of that Circle: Then lay a Ruler to *C*, and draw Lines from thence through all thoſe Diviſions, they will be the true Hour-Lines on the Plane of the Dial.

N. B This Practice ſerves to draw an *Erect Vertical Dial*; only in Calculation you muſt uſe the Complement of the Latitude inſtead of the Latitude, and the Hours muſt be numbered differently.

To draw an Horizontal Dial Geometrically.

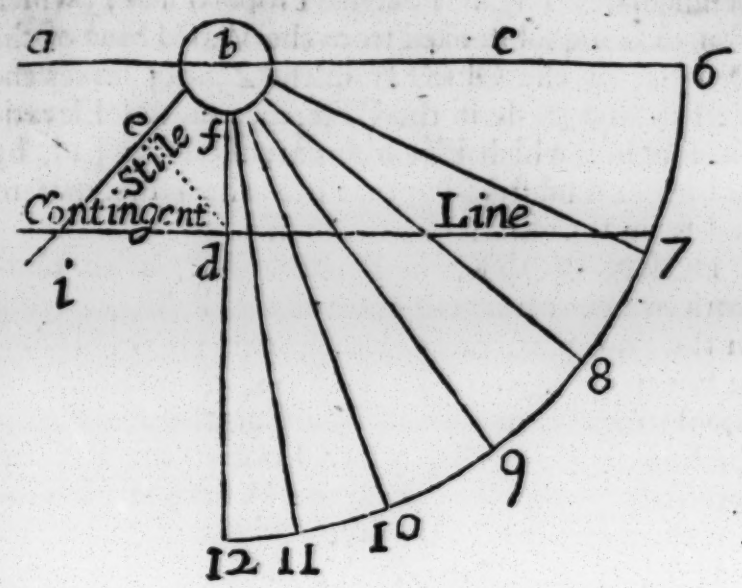
Let two Lines be drawn Square-wiſe, *viz. b d* for the Hour of 12, and *b c* for the Hour of 6; draw the *Style b e* ſo, that the Angle *e b d* may be equal to the Elevation of the Pole; take (where you pleaſe) any Point in the Meridian Line, ſuppoſe *d*, from which, unto the *Style*, let fall a Perpendicular as *d e*, and transfer it into the Meridian in *d f*: Then draw *i d* perpendicular to the Meridian in *d*, for a *Line of Contingence*.

From *f*, as a Center, deſcribe a Circle repreſenting the Equinoctial at any conſiderable Diſtance (the bigger the better) and divide it into 24 Parts for Hours, and 48 Parts for Half-Hours: But it is enough for an *Horizontal Dial*, if one Quadrant betwixt the Hours of 12 and 6 be divided into 6 Parts or 12.

Make Points in the *Contingent*, where it ſhall be cut by a Ruler applied to the Center and every Diviſion in the Equinoctial.

Draw the Hour-Lines from the Center *b*, and every correſpondent Point in the *Contingent*, erecting the *Style* over the *Meridian*, according to the Angle *i b d*.

Horizontal Dial.



HORIZONTAL *Line*, any Line drawn parallel to the Horizon upon a Plane: See *Line*.

HORIZONTAL *Parallax*: See *Parallax*.

HORIZONTAL *Projection*: See *Projection*.

HORIZONTAL *Range*, or *Level Range*, of a Piece of Ordnance, is the Line it deſcribes parallel to the Horizon or Horizontal Line.

Capt. *Halley*, in *Philoſ. Tranſ.* N. 216. gives two very ready Theorems, the one to find the greateſt Horizontal Range at 45 Degrees Elevation, by any Shot made upon any inclined Plane, with any Elevation of the Piece whatſoever; and the other to find Elevations proper to ſtrike a given Object with any Force greater than what ſuffices to reach it with the middle Elevation.

PROP. I.

A Shot being made on an inclined Plane, having the Horizontal Diſtance of the Object it ſtrikes, with the Elevation of the Piece, and the Angle at the Gun between the Object and the Perpendicular; To find the greateſt Horizontal Range of that Piece, laden with the ſame Charge; that is, half the Latus Rectum *of all the* Parabolæ *made with the ſame* Impetus.

RULE.

Take half the Diſtance of the Object from the *Nadir*, and take the Difference of the given Elevation from that half; the Verſed Sine of that Difference ſubſtract from the Verſed Sine of the Diſtance of the Object from the *Zenith*: Then ſhall the Difference of thoſe Verſed Sines: Be to the Sine of the Diſtance of the Object from the *Zenith*:: As the Horizontal Diſtance of the Object ſtruck: To the greateſt Range at 45 Degrees.

PROP. II.

Having the greateſt Horizontal Range of a Gun, the Horizontal Diſtance and Angle of Inclination of an Object to the Perpendicular; To find the two Elevations neceſſary to ſtrike that Object.

RULE.

Halve the Diſtance of the Object from the *Nadir*; this half is always equal to the half Sum of the two Elevations ſought: Then ſay, As the greateſt

Horizontal Range: Is to the Horizontal Diſtance of the Object: : So is the Sine of the Angle of Inclination, or Diſtance of the Object from the Perpendicular: To a Fourth Proportional; which Fourth being ſubſtracted from the Verſed Sine of the Diſtance of the Object from the *Zenith*, leaves the Verſed Sine of half the Difference of the Elevations ſought; which Elevations are therefore had, by adding and ſubſtracting that half the Difference to and from the aforeſaid half Sum.

HORN-WORK, in Fortification, is an Outwork which advanceth toward the Field, carrying in the Fore-part, or its Head, two Demi-Baſtions in Form of *Horns*. Theſe Horns, Epaulments, or Shouldrings, being joined by a Curtain, ſhut up on the Side by two Wings parallel one to another, are terminated at the Gorge of the Work, and ſo preſent themſelves to the Enemy.

HOROLOGIOGRAPHY, the Art of making *Dials*, *Clocks*, or other Inſtruments, to ſhew the Time of the Day.

HOROMETRY, the Art of meaſuring or dividing the Hours, and keeping Account of Time.

HOROPTER, in Opticks, is a Right Line drawn through the Point of Concourſe, parallel to that which joins the Center of the Eye.

HOROSCOPE, a Word in great Requeſt with the Canting Aſtrologers; and ſometimes they put either for a Figure of the Twelve Houſes (as they call the Signs of the Zodiack) erected to tell other Men's Fortunes, and to ſhew their own Folly; or elſe for the Degree of the Aſcendants, or the Star aſcending above the Horizon, at the Time the Queſtion is put, any thing enquired for, or a Native born: But moſt properly *Horoſcope* ſignifies the firſt Houſe or Aſcendant, and is that Part of the Zodiack which is riſing at the Time of the Scheme.

HORRIFICA *Febris*, is that Fever in which the Patient is often ſeized with ſhaking Fits and horrible Agonies; 'tis otherwiſe called *Phricodes*; which ſee. *Blanchard.*

HORS *de ſon fee*, is an Exception to avoid an Action brought for Rent, iſſuing out of certain Land by him that pretendeth to be the Lord, or for ſome Cuſtom and Services; for if he can juſtify that the Land is without the Compaſs of his Fee, the Action falls.

HORSE, is a Rope in a Ship, made faſt to one of the Fore-maſt Shrouds, having a Dead Man's Eye at its End, through which the Pendant of the Sprit-ſail Sheets is reeved. Its Uſe is only to keep the Sprit-ſail Sheets clear of the Flukes of the Anchor: Alſo he that heaves the Lead out of the Shrouds, has a Rope which is there faſtened to preſerve him from falling into the Sea, which alſo is called a *Horſe*, and ſo alſo is the *Wap* called, which is that whereby the Shrouds are ſet Taught, alſo thoſe little ſhort *Waps* ſeized to the Middle of the Top-maſt and Top-gallant-maſt Stay, wherein are reeved the Top-ſail and Top-gallant-ſail Bowlings, are alſo called *Horſes*.

HORSE-SHOE, in Fortification, is a Work ſometimes of a round, and ſometimes of an oval Figure, raiſed in the Ditch of a Marſhy Place, or in low Grounds, and bordered with a Parapet. It is made to ſecure a Gate, or to ſerve as Lodgment for Soldiers to prevent Surprizes, or to relieve an over-tedious Defence.

HOTCHPOT, in Law, ſignifies a Commixture, or putting together of Lands of ſeveral Tenures, for the equal Diviſion of them: As if a Man, ſeized of thirty Acres of Land in Fee, hath Iſſue two Daughters, and gives with one of his Daughters, to a Man that marries her, ten Acres of the ſame Land in *Frank-marriage*, and dies ſeized of the other twenty Acres: Now if ſhe that is thus married will have any Part of the twenty Acres whereof her Father died ſeized, ſhe muſt put her Lands, given in *Frank-marriage*, in *Hotchpot*; that is, ſhe muſt refuſe to take the ſole Profits of the Lands given in *Frank-marriage*, and ſuffer the Land to be commixt and mingled with the other Land whereof her Father died ſeized; ſo that an equal Diviſion may be made of the whole between her and her Siſter, and thus for her ten Acres ſhall have fifteen, elſe her Siſter will have the whole twenty of which her Father died ſeized.

HOUNDS, in a Ship, are Holes in the Cheeks at the Top of the Maſts, through which the Ties run to hoiſe the Yards: A Top-maſt hath but one *Hound.*

HOUR, is the 24th Part of a Natural Day, containing 60 Minutes, and each Minute 60 Seconds, *&c.* Theſe are *Aſtronomical Hours*, which always begin at the Meridian, and are reckoned from Noon to Noon.

But ſome *Hours* are begun to be accounted from the Horizon, which, when the Account begins at the Sun's Riſing, are called *Babyloniſh Hours*; who begin with the Sun's Riſing, and reckoned on 24 *Hours* to his Riſing again the next Day.

Others are reckoned after the ſame manner, only begin at the Sun's Setting inſtead of his Riſing; and theſe are called the *Italian Hours*, becauſe the *Italians* account their Time after this Faſhion.

There is yet another Kind of *Hours*, which are called the *Jewiſh Hours*, becauſe of old the *Jews* accounted their Time this way: Theſe are one 12th Part of the Day or Night, reckoned from the Sun Riſing to Sun Setting (be the Days or Nights long or ſhort;) and theſe were called, as we find in Holy Scripture, the Firſt, Second, or Third, *&c. Hour* of the Day or Night.

HOUR-CIRCLES, the ſame with *Meridians*, are Great Circles meeting in the Poles of the World, and croſſing the *Equinoctial* at Right Angles: They are ſuppoſed to be drawn thro' every 15th Degree of the *Equinoctial* and *Equator*, and on both Globes are ſupplied by the *Meridian*, *Hour-Circle*, and *Index.*

The Planes of the *Hour-Circles* are perpendicular to the Plane of the Equinoctial, which they divide into 24 equal Parts.

HOUR-LINES, on a Dial, ariſe from the Interſection of the Plane of the Dial, with the ſeveral Planes of the Hour-Circles in the Sphere, and therefore muſt be all Right Lines.

To find the Hour of the Day Trigonometrically, having the Latitude of the Place, the Sun's Altitude at Six, and preſent Altitude given.

In *Summer.*

Say, As the Co-ſine of the Latitude: Is to the Difference of the Sines of the Altitude at Six, and preſent Altitude: :
So is the Radius: To the Sine of the Hour from Six.

In

In *Winter*.

Say, As the Co-ſine of the Latitude: Is to the Sum of the Sines of the Altitude at Six, and preſent Altitude::
So is the Radius: To the Sine of the Hour from Six.

To find the Hour of the Day, having the Co-Latitude of the Place = 38 Degrees 30 Minutes.
The Sun's Co-Altitude = 60 Degrees, and his Co-Declination = 76 Degrees 53 Minutes;

Proceed and ſet all things thus;

Co-Latitude	38° 30′	whoſe Compl. Arithm. Sine	= 0.205853
Co-Declinat.	76 53	whoſe Compl. Arithm. Sine	= 0.011481
Difference	38 23		
Co-Altitude	60 00		
Sum	98 23		
Difference	21 37		
Half Sum	49 11	Sine	9.878984
Half Differ.	10 48	Sine	9.272726
		Sum of all the 4 Sines	19.379044
		Their half Sum	9.689522

Which laſt Logarithm is the Sine of 29 Degrees 17 Minutes, and this doubled, gives 58 Degrees, 17 Minutes; and then converted into Time, gives 38 Hours 51 Minutes, and ſo much did it want of Noon then; that is, 'twas 8 a-Clock, and 9 Minutes before Noon.

HOUSED-IN, the Seamen ſay of a Ship, which, after the Breadth of her Bearing, is brought in too narrow to her upper Works, that ſhe is *Houſed-in* or *Pinched-in* too much.

HOWLE, when the Foot-hooks of a Ship are ſcarfed into the Ground-Timbers and boulted, and then the Plank laid on them up to the Orlop, the Carpenters ſay, they begin to make the Ship *Howle*.

HOY, is a ſmall Veſſel or Bark, whoſe Yards are not a-croſs, nor the Sails ſquare like thoſe of Ships; but her Sails are like a Miſſen, and ſo ſhe can lie nearer the Wind than a Veſſel with croſs Sails can do: A *Ketch* is a ſmaller Veſſel of this Kind.

HOYSE, is the Sea Word for haling up any thing into the Ship for getting up a Yard, &c. Thus they ſay, *Hoiſe* up the Yard! *Hoiſe* the Water in! &c.

HUE-AND-CRY: *Manwood*, in *Foreſt Law*, c. 19. *Num.* 11. ſaith, That *Hue* ſignifies the Complaint of the Party, and *Cry* is the Purſuit of the Felon upon the High-way upon that Complaint; for if the Party robbed, or any in the Company of one robbed or murdered come to the Conſtable of the next Town, and will him to raiſe the *Hue-and-Cry*, (that is, make the Complaint known, and follow the Purſuit) after the Offender, deſcribing the Party, and ſhewing, as near as he can, which way he went; the Conſtable ought forthwith to call upon the Pariſh for Aid in ſeeking the Felon; and if he be not found there, then to give the next Conſtable Notice, and the next, until he be apprehended, or at leaſt, until he be thus purſued unto the Sea-ſide.

HUROSCOPE: See *Hygroſcope*.

HULL *of a Ship*, is her Main Body, without any Maſts, Yards, Sails, or Rigging.

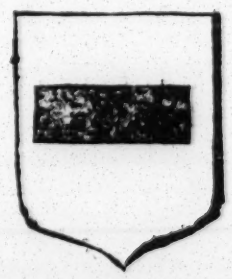
To *Hull*, or lie a *Hull*, is ſpoken of a Ship, when either in a dead Calm (to preſerve her from beating her Sails againſt the Maſts) or in a Storm when ſhe can't carry 'em, all her Sails are taken in to preſerve them, ſo that nothing but her *bare Poles*, her Maſts, Yards, and Rigging are abroad; this is called *Hulling*; her Helm is tied down to the Lee-ſide of the Ship, and then if ſhe be a good Sailer, ſhe will lie eaſily under the Sea, and make her way one Point before the *Beam*.

HULLOCK *of a Sail*, is when in a great Storm ſome ſmall Part of a Sail is cut and left looſe: It's chiefly uſed in the Miſſen-ſail, to keep the Ship's Head to the Sea, then all the reſt of the Sail is made up, except a little at the Miſſen-yard Arm: Alſo when a Ship will not *Weather-Coyl*, to lay her Head the other way, they looſe a *Hullock* of her Fore-ſails; and then changing the Helm to the Weather-ſide, ſhe is then made to fall off, and to lay her Head where her Stern lay before.

HUMECTATION, is the moiſtening of any mixt thing, in order to prepare it for ſome Operation, or that its beſt or fineſt Parts may the better be extracted: Thus *Agarick* &c. are moiſtened while they are pounding, leſt they ſhould exhale too faſt; and *Caſſia* is moiſtened, the better to extract its Pulp.

HUMERUS, the Shoulder-bone, being the firſt Bone of the Arm: 'tis long and round, its Subſtance or Fibres are pretty ſolid and compact; it has a wide and long Cavity in its Middle, in which is contained its Marrow. At its upper-end it has a round Head covered with a Cartilage, which is received into the Cavity of the Neck of the *Scapula*; but becauſe this Head is much larger than the Cavity, therefore it is ſurrounded with a ſtrong Ligament, which riſes from the Edge of the Cavity of the *Scapula*. At its lower End it has two Protuberances; the one External, which receives the Extremity of the *Radius*; the other Internal, which is received into the Semi-circular *Sinus* of the *Ulna*: On the Fore-ſide of this Protuberance there is a ſmall *Sinus*, which receives the fore Proceſs of the *Ulna*; and on the back-ſide there is another large *Sinus*, which receives the *Olecranium*. There is another ſmall Protuberance on the Side of this, from which the Muſcles that lie on the Inſide of the Arm ariſe.

HUMID: *Bloom*, in his Heraldry, gives you a *Feſſe* of this Form, which he calls *Feſſe Humid*.



HUMIDITY, is the Quality which we call Moiſture, or the Power of wetting others, which ſome Liquors and Fluids are endowed with. This differs very much from *Fluidity*, as you may ſee under that Word; and ſeems to be merely a relative thing depending on the Congruity of the Component Particles of the Liquor, to the Pores of ſuch particular Bodies as it is capable of adhering to, penetrating a little into, or wetting.

Thus, for Inſtance, Quickſilver is not a moiſt Liquor, as to our Hands or Cloaths; but may be called ſo in reference to Gold, Tin, or Lead, to whoſe Surfaces it will preſently adhere. Now even Water it ſelf that wets almoſt every thing, and is the great Standard of Moiſtured and *Humidity*, is

not capable, as it appears, of wetting every thing; for it ſtands, and runs eaſily off in Globular Drops on the Leaves of Cabbages and many other Plants, and will not wet the Feathers of Ducks, Swans, and other Water-Fowl, as it will other Things. And that Texture only may cauſe a Fluid to be *Humid*, is plain from hence, That though neither Quickſilver alone, Lead, or Biſmuth will adhere to Glaſs; yet being mixed together, they will form a Maſs that will do ſo; as is plain from ſuch a Compoſition being frequently uſed to Foliate Looking-Glaſſes, Vid. *Mr.* Boyle's *Hiſtory of Fluids and Firmneſs*, Pag. 187.

HUMILIS: See *Deprimens*.

HUMOURS: The Ancients made four *Humours* in the Blood, the Bilous, Pituitous, (Yellow and Black Choler) Melancholick, and the Blood, properly ſo called, and that according to the four Peripapetick Elements: But this Opinion is caſhier'd, ſince the Invention of the Circulation of the Blood; yet they are found when the Blood preternaturally departs from its due Temperature; but they do not conſtitute an integral Part of the Blood, for the Blood is only one *Humour*; if otherwiſe, Tartar in Wine, and Dregs in Beer, were conſtituent Parts of Wine and Beer. In Blood that is let, there appear only three different Species of Bodies; for in the Surface you ſee a Kind of a Fibrous Cruſt of coagulated Blood, which ſpreads it ſelf over the whole Maſs; then you ſee certain red Particles amongſt the Fibres, which grow black about the Bottom by reaſon of their Fewneſs: Laſtly, you ſee the *Serum* wherein it ſwims. But if any one will proceed more accurately, diſtil the Blood, and diſſolve it Chymically, he ſhall find five pure Bodies in it; to wit, Spirit, Sulphur, or Oil, Water, Salt and Earth.

There are three general *Humours* which waſh the whole Body, Blood, Lympha, (a ſort of pure Water) and the Nervous Juice; but there are ſeveral particular *Humours*, as Chyle, Bile, Spittle, Pancreatick Juice, Seed, &c.

There are alſo *Humours* in the three Membranes that cloath the *Fœtus* in the Womb, which are three in thoſe Animals that have Bladders: At the Beginning, when the Egg falls down from the *Ovaria* into the Womb, the *Humours* which are to this Purpoſe in the Bottom of the Womb, firſt ſink into the Membrane called *Chorion*, and then into the *Amnion*; but in Proceſs of Time, when the *Fœtus* is formed, and the Navel-Veſſels are extended to the *Chorion* and the *Amnium*, we imagine that the Nutritious *Humour*, being received by the Opening of the Veins, is carried to the *Fœtus*, and thence, by the Arteries, ſome Part of it is carried into the *Amnion*, as into the Child's Store-houſe; ſo that at the ſaid time the Liquor of the *Membrane Amnion* may be increaſed upon this double Account. *Blanchard*.

At laſt, when the Time of Delivery draws near, that way of Sweating through ſeems to ceaſe, and the others only take Place; unleſs (as *Wharton* writes) the Nutritious *Humour* deſcend from the *Placenta* by the Navel-String, and by the little ſoft Protuberances, thence paſs into the Cavity of the *Amnion*: The Uſe of theſe *Humours* is to nouriſh the *Fœtus* at the Mouth.

The Third *Humour* is the Urine, which flows from the Bladder by the Urinary Paſſage, into the Urinary Membrane.

HUMOURS *of the Eye*, are Three: The *Watery* or *Aqueous*, which is contained between the *Tunica Cornea* and *Uvea*.

2. The *Cryſtalline* or *Icy Humour*, which is contained in the *Tunica Uvea*, and is thicker than the reſt.

3. The *Vitrious* or *Glaſſy Humour*, bigger than any of the reſt, fills the backward Cavity of the Eye.

The *Aqueous Humour* ſerves to moiſten and levigate the two other denſer *Humours*, as alſo the *Tunica Uvea* and *Retina*, and perhaps (ſaith *Diemerbroeck*) to nouriſh them too: When this fails, grows dreggy, or too thick, the Sight preſently grows dull and imperfect. If it be ſo dreggy as that pretty large Particles are formed, and ſwim about in it, the Perſon fancies he ſee Flies and Motes always before his Eyes; and if theſe Particles grow altogether in a Film or Membrane, and ſo come to cover the Pupil, 'tis called a *Suffuſion*, which is the Beginning of a *Cataract*.

The *Vitrious Humour*, ſome ſay, ſerves to dilate the Rays which it receives from the *Cryſtalline*, and to bring them to the *Retina*; or, as others think, it helps to collect the Rays refracted by the *Cryſtalline* into one Point, that the Viſion may be the more diſtinct and vivid.

The *Cryſtalline Humour*, which ſome call *Glacialis*, is the primary Inſtrument of Viſion, in reſpect of its Collecting and Reception of the Rays, which coming hither, dilated by the *Aqueous Humour*, are collected and conveyed to the *Retina*.

HURDLES, or *Clays*, in Fortification, are made of thick and ſmall Twigs of Willows or Oſiers, being 5 or 6 Foot high, and from 3 to 4 Foot broad. They are interwoven very cloſe together, and uſually laden with Earth, that they may ſerve to render Batteries firm, or to conſolidate the Paſſage over muddy Ditches; or to cover Traverſes and Lodgments for the Defence of the Workmen, againſt the Artificial Fires or Stones that may be caſt upon them.

HURTS, a Term in Blazony: See *Balls*.

HUSTINGS, a Court held before the Lord-Mayor and Aldermen of *London*; an Error or Attaint lies there of a Judgment or falſe Verdict in the Sheriff's-Court.

HYALOIDES, is the Vitreous Humour of the Eye, contained betwixt the *Tunica Retina* and the *Uvea*.

HYBERNAL *Occident*: See *Occident*.

HYBERNAL *Orient*: See *Orient*.

HYBONA, is an Incurvation of all the Vertebres.

HYDATIDES, are little Watery Bladders in the Liver, Spleen, or ſome other Viſcus, common to Hydropical Perſons: But Dr. *Tyſon* ſuppoſes them to be a Species of Worms, or imperfect Animals.

HYDATOIDES, is the Watery Humour of the Eye, contained betwixt the *Tunica Cornea* and *Uvea*.

HYDRA, a Southern Conſtellation, conſiſting of 26 Stars, and imagined to repreſent a *Water-Serpent*.

HYDRAGIA: See *Venæ Lymphaticæ*.

HYDRAGOGUES, are Medicines which, by Fermentation and Precipitation, purge out the Watery Humours.

The Ancients thought this was done by ſome peculiar Texture, and that thence its Virtue aroſe to purge away Seroſities or Watery Humours only.

HYDRAULICS, the Art of making all ſorts of Engines to carry or raiſe Water, or which are moved by Water, and ſerve for other Uſes: The Word

Word ſignifies Sound made by Water, becauſe when Organs were firſt found out, they were blown by the Fall of Water inſtead of Bellows.

You have many Ancient Water-Engines deſcribed by *Hiron*, and which are called *Machinæ Hydraulicæ*. *Athenæus* attributes the Invention of the Water-Organ to *Cteſibius* but others ſay *Plato* firſt found out the ſounding *Clepſydra*, which told the Hour of the Night by the Noiſe of Pipes blown by the Air forced by the Fall of Water: Mr. *Ozonam* confounds this Word with *Hydroſtaticks*.

HYDRAULO-PNEUMATICAL *Engines*, are ſuch as raiſe Water by means of the Spring (either Natural or Forced) of the Air.

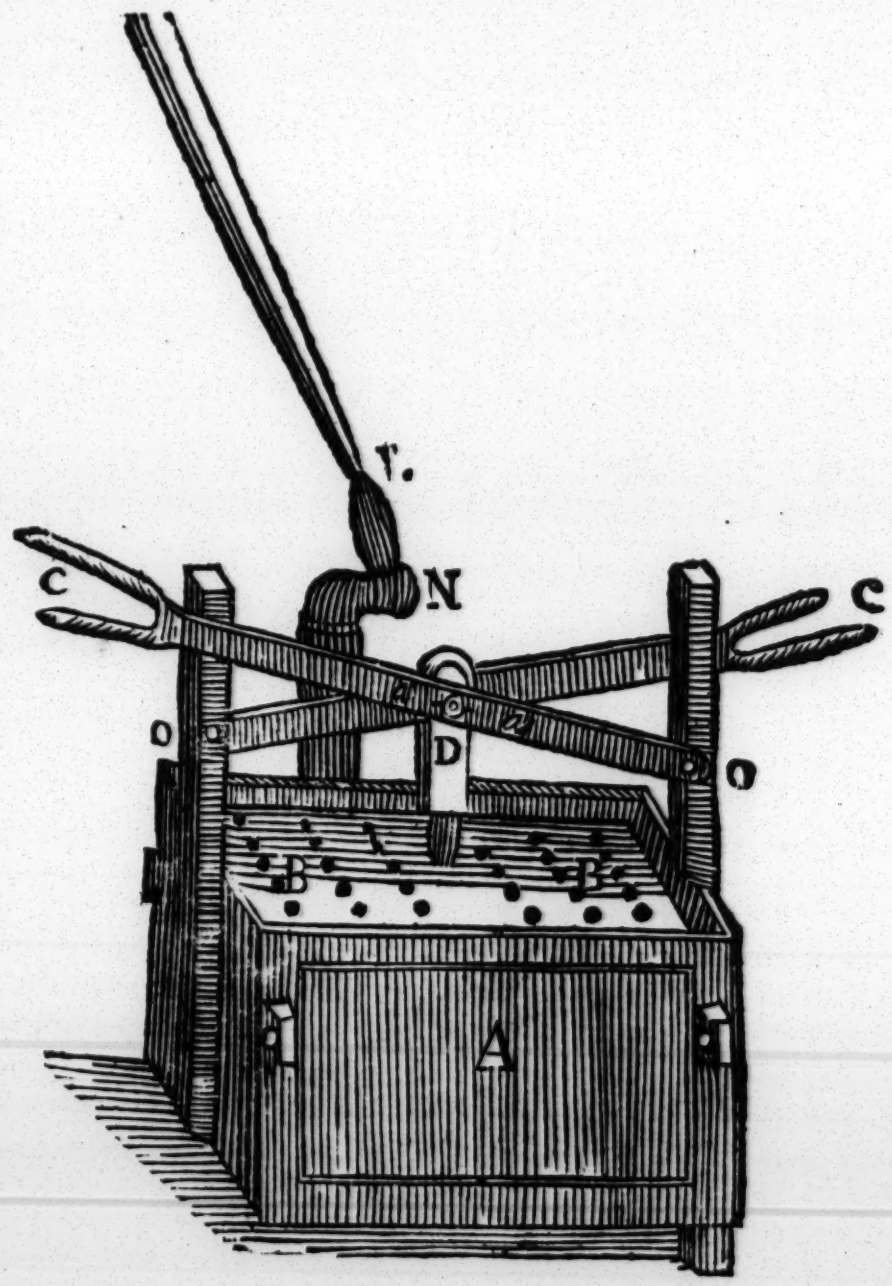
The Honourable Mr. *Boyle* mentions a very pretty Fountain, which he calls *Hydraulo-Pneumatical*, and which was made by the Spring of the Air preſſing up Water in a Pipe, when in the Exhauſted Receiver the Weight of the Atmoſphere was taken off: See *Continuation of Phyſico-Mechanical Experiments*, Exper. 4.

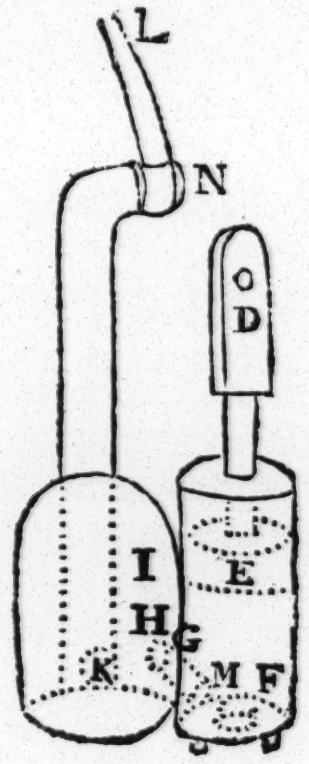
And you may eaſily try the thing, if you fill but any middle ſiz'd Vial about half full of Water; and then, with Sealing-Wax or Cement, faſten in its Neck a long ſlender Glaſs Pipe, (a Piece of Tobacco-pipe or Quill will do) one of whoſe Ends ſhall be below the Surface of the Water in the Glaſs; for then, if the Mouth of the Bottle be accurately ſtopp'd, the Warmth of your Hand only will ſo increaſe the Spring of the included Air, that it will make the Water riſe up, and run out at the Top of the Pipe; and if you blow ſtrongly in at the Top, and force a good Quantity of Air into the Bottle, the Spring of the Air ſo forced in, will, on the Removal of your Mouth, drive the Water up the Pipe with a great Force; and if the Orifice be very ſlender, or the Cavity of the Pipe very ſmall, it will make the Water imitate an Artificial Fountain, which will keep running for near half a Minute.

A Deſcription of the Common Hydraulick Engine *uſed to quench Fire*, &c. *from* Philoſoph. Tranſ. Numb. 128.

The Engine is a Cheſt of Copper, as *A*, tranſportable by means of two wooden Bars, like a Sedan or Chair. This Cheſt is pierced with many Holes above *B B*, and holds within it the Body of a Pump *E F M*, whoſe Sucker *D E* is raiſed and abaſed by two Leavers *C O*: Theſe Leavers have each of them two Arms, and each Arm being fitted to be laid hold on by both Hands of a Man. Each Leaver is pierced in the Middle by a Mortiſe *a a*, in which an Iron Nail, which paſſes through the Handle of the Sucker, turns round when that Sucker is raiſed or lowered.

Near the Body of the Pump there is a Copper-Pot *I H K*, join'd to it by the Tube *G*; and having another Tube *K N L*, which in *N* may be turned every way.





To make this Engine play, Water is poured upon the Cheſt, to enter in at the Holes that are in the Cover thereof: This Water is drawn into this Body of the Pump at the Hole *F*, at the Time when the Sucker is raiſed; and when the ſame is let down, the Valve of the ſame Hole *F* ſhuts, and forces the Water to paſs thro' the Hole: For in the Tube *G* of which the Valve *H* being lifted up, the Water

enters

enters into the Pot, and filling the Bottom, it enters thro' the Hole *K* into the Tube *KNL*, in ſuch a manner, that when the Water is higher than the Tube *KNL*, and the Hole of the Tube *G* is ſhut by the Valve *H*, the Air incloſed in the Pot hath no Iſſue; and it comes to paſs, that when you continue to make the Water enter into the Pot by the Tube *G*, which is much thicker than the Aperture of the End *L*, at which it muſt iſſue, it muſt needs be, that the Surplus of the Water that enters into the Pot, and exceeds that which at the ſame time iſſues through the ſmall End of the Jet, compreſſes the Air to find Place in the Pot, which makes that, whilſt the Sucker is rais'd again, to make new Water by the Force of its Spring, mean time that a new Compreſſion of the Sucker makes new Water to enter, and cauſes alſo a new Compreſſion of Air: And thus the Courſe of the Water which iſſues by the Jet, is always entertained in the ſame State, becauſe that proportionably, as the Impulſe is ſtrong, the Water entring faſter, and conſequently in greater Quantity into the Pot, makes a greater Compreſſion of the Air, which, the more ſtrongly it is compreſs'd and penn'd in, returns alſo with the greater Force into its Native State, by means of its Spring, and therefore throws out the Water with greater Force.

HYDRENTEROCELE, is a Falling of the Inteſtines, together with Water, into the *Scrotum*. *Blanchard.*

HYDROA, are certain little, broad, moiſt, itching Pimples, like Millet-ſeed; ſometimes without itching, which render the Skin ulcerous and rough; tho' to expel the Sweat by the Skin, is hindred ſometimes by its Thickneſs; ſo that the Matter being lodged there, and the ſubtler Parts being either carried back by the Lymphatick Veſſels, or evaporated, the Skin ſwells. This Diſtemper is familiar and common to Boys and young Men, eſpecially of a hot Conſtitution, when they uſe too much Exerciſe in Summer: It infects the Neck, Shoulder-blades, Breaſts, Arms, Thighs, yet more frequently the Secret Parts and the Fundament. *Blanchard.*

HYDROBELE, is a ſwelling of the outermoſt Skin of the *Scrotum*, proceeding from a Watery Humour. *Blanchard.*

HYDROCEPHALUM, is a Swelling of the Head, by reaſon of a watery Humour; whence the Sutures of the Brain are forced aſunder; it proceeds ſometimes from a Burſting of the Lymphatick Veſſels. *Blanchard.*

HYDROGRAPHICAL-CHARTS, are certain Sea Maps, delineated for the Uſe of Pilots and other Mariners; wherein are mark'd all the Rhumbs or Points of the Compaſs and Meridians parallel to one another, with the Shelves, Shallows, Rocks, Capes, &c.

HYDROGRAPHY, is an Art which teacheth how to deſcribe and meaſure the Sea; giving an Account of its Tides, Counter-Tides, Soundings, Bays, Gulphs, Creeks, &c. As alſo the Rocks, Shelves, Sands, Shallows, Promontories, Harbours, Diſtance from one Port to another, and other things remarkable on the Coaſts.

HYDROMANCY, a pretended Divination by Water.

HYDROMEL, Mead, is a Decoction of Water and Honey.

HYDROMPHALUM, is a Protuberance of the Navel, proceeding from Watery Humours in the *Abdomen*. *Blanchard.*

HYDROPHOBIA, is a Diſtemper highly Convulſive, accompanied with Fury, and ſhunning of all things that are Liquids and Splendid; ſometimes with a *Delirium*, a Fever, and other Symptoms, and not without great Danger of Life, proceeding from the Bite of a mad Dog, or a Contagion analagous to it.

In *Philoſoph. Tranſact. N.* 147. there is an Inſtance of one having this Diſeaſe, occaſioned by the Bite of a mad Dog.

HYDROPICA, are Medicines that expel the Watery Humour in a Dropſie.

HYDROPS, a Stagnation of the Watery Humour in the Habit of the Body, or ſome Cavity of it: And it is either General, as an *Anaſarca*, and *Aſcites*; to which ſome add a Tympany, but ill: Or Particular, confined to one Part, as a Dropſie in the Head, Breaſts, Hand, Foot, &c. *Blanchard.*

HYDROPS *ad Matulam*, the ſame with *Diabetes.*

HYDROSTATICKS, is that Part of Staticks which relates to the Gravities and *Æquilibria* of Liquors; and alſo comprehends the Art of Weighing Bodies in Water, or ſome other proper Liquor, thereby to eſtimate their Specifick Gravity, and to deduce thence many other uſeful Theorems.

And *this* (as is obſerved by the Honourable Mr. *Boyle*) is a Part of Philoſophy which ought to be looked upon as the moſt ingenious of any: The Theorems and Problems of this Art, being handſome Productions of Reaſon, and affording Diſcoveries, not only pleaſing, but alſo ſurprizing and wonderful: Nay, very many of the moſt familiar, as well as moſt abſtruſe Phænomena of Nature, can hardly ever be throughly underſtood without Hydroſtatical Principles 'Tis an Art alſo not only delightfully Speculative, but practically Uſeful: It may be of the higheſt Importance to Shipping and Navigation, to thoſe that deal in Salt-works, and to thoſe whoſe Buſineſs 'tis to enquire into the Gravities and Magnitudes of ſome Bodies; the exact Knowledge of which would very much conduce to their Intereſt. But of the great Uſefulneſs of this Art, ſee more under *Specifick Gravity.*

And that Admirable Gentleman, the Honourable Mr. *R. Boyle*, conſidering that all Perſons are not acquainted with, and cannot readily digeſt rigid Mathematical Demonſtrations, that it might be of great Advantage to prove the Truth of ſuch uſeful Propoſitions, as thoſe given us by Hydroſtatical Writers, in a Senſible and Phyſical way: As alſo, That ſome things before paſſing for receiv'd Truths, would then be diſcover'd to be palpable Errors, as well as many Noble and uſeful Diſcoveries this way communicated to the World:

Conſidering this, I ſay, That Noble Author reduced the chiefeſt of the Hydroſtatical Theorems into the following Paradoxes; which you will ſee he made clearly out by Experiment and ſenſible Proof.

Though before he comes to them, he thinks fit to premiſe theſe things as *Poſtulata* or *Lemmata.*

1. That if a Pipe, or Tube, open'd at both Ends, and placed perpendicularly to the Horizon, have its lower Oriſice under Water, there will paſs an Imaginary Plane or Surface parallel, as to Senſe, to the upper Surface of the Water, which ſhall touch that lower Orifice of the Tube.

2. That each Part of this Surface or Plane will be alike preſſed (if at all) by the Weight of the perpendicularly incumbent Water, which cannot but be granted, ſince the Water being ſuppoſed an homogenous Fluid of equal Gravity every where, and equally high above the aforeſaid Plane, there can

no reaſon be aſſign'd why any one Part of it ſhould be more or leſs preſſed than any other.

3. That though in this Caſe the Liquor will keep its former Poſition, yet if any one Part of it comes to have a greater Weight incumbent on it than another, then that Part will be diſplaced and depreſſed; as is the Caſe when a Stone or other Body, ſpecifically heavier than Water, ſinks down in it, and tends to the Bottom.

For in what Part ſoever of the Water the Stone is, that part being more preſſed upon than the reſt, muſt yield and give way to the Motion of the Stone downward, till it come to the Bottom.

And on the other Hand, if any Part of this imaginary Surface be leſs preſſed upon than the reſt, it muſt, by the greater Preſſure of the reſt, be impelled upwards, till it have an height equivalent to balance the Preſſure made on the other Parts of the Water; which latter Part will appear highly reaſonable and grantable by any attentive Conſiderer.

And its Truth in Fact he proves by this Experiment:

If a ſmall Tube, open at both Ends, be held or placed perpendicularly a little beneath the Surface of the Water, in any Veſſel; [Note, *'Tis beſt to uſe one of Glaſs, that the Experiment may be the more viſible*;] then will the Water riſe in the Tube as high and a little higher (for a Reaſon which you will find given hereafter) than the Surface of the Water without: But if you gently pour Oil of Turpentine, or any other Liquor which will not mix with Water, upon that contained in the Veſſel, you will ſee, that as the Oil grows higher and higher on the Surface of the Water, and preſſes conſequently more and more upon it, ſo will the Water riſe within the Orifice of the Tube, and deſcend again proportionably as you take off the Oil; which plainly proves, That the Weight of the Oil preſſing more on the Surface of the Water without the Tube, than the bare Air only can do within it, forces up the Water ſo high in the Tube, till the Cylinder of Water within the Tube, doth as much gravitate on that Part of the Water under the Orifice of the Tube, as the Air, Oil and Water together do on all the others, without it.

PARADOX I.

That the Upper Parts of all Fluids, as Water, &c. do preſs upon the Lower.

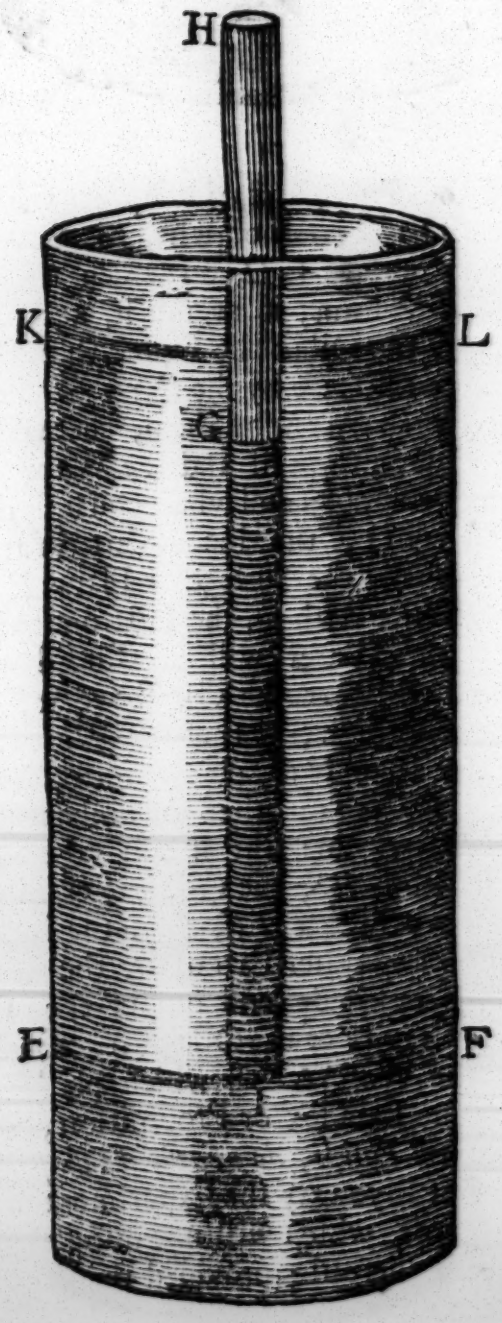
Provide a Glaſs Jarr, near of the Shape in the Figure annexed; (though a long Drinking-glaſs, like that uſed for Mum, may do well enough.) Fill it with Water near full, as up to AB: Then take a ſmall Glaſs Pipe or Tube, open at both Ends, and dipping the lower End into Oil of Turpentine, you may, by ſtopping the Top with your Finger, ſuſpend as much of the Oil as you pleaſe in the Tube: This done, move the Tube into the Glaſs of Water, and thruſt it down till the upper Surface of the Oil in the Tube, be near as low as the upper Surface of the Water: And when you take your Finger from the Top of the Tube, you will ſee the Oil will not run out at the lower Orifice of the Tube. Nay, if you thruſt the Tube lower down into the Water, that Liquor will riſe up into the Tube, and bear the Oil above it; but if you raiſe the Tube up, ſo that the upper Surface of the Oil in it be higher conſiderably than that of the Water, the Oil will

drop out of the Tube, and riſe up to the Top of the Water. The Reaſon of which is this: When the Imaginary Surface *GH*, on which the End *Q* of the Tube *PQ* leans, is as much, and no more, preſſed upon by the Oil in the Pipe, than the other Parts of that Surface are by the Parts of the Water perpendicularly incumbent on them, there is an *Æquilibrium* between the Oil and the Water, and ſo the Oil cannot run out; and when you ſink the Tube down as low as *O*, the incumbent Water doth more gravitate on the Surface or Plane *EF*, than the Oil in the Tube doth on the Part under it; and conſequently the Water will be forced up into the Tube, and will bear the Oil above it; and the Water will riſe ſo high, as that the Water and Oil together in the Tube *NO*, do gravitate as much on the Surface *EF*, as the other incumbent Parts of the external Water do: But if you raiſe the Tube up into the Poſition *RS*, the Oil in it preſſing more on the Imaginary Surface *IK*, than the incumbent Water doth on any other Part of it, the Oil muſt run out, till ſo much deſcend out of the Tube as will bring the Gravity of the Oil to an *Æquilibrium* with that of the Water. All which plainly prove the Truth of the Paradox or Propoſition, *That the upper Parts of all Fluids, do gravitate or preſs upon the Lower.* For if you try the Experiment with any two other Liquors, which will not mingle one with another, it will ſucceed; provided the Bore of the Pipe be not too large.

PARADOX II.

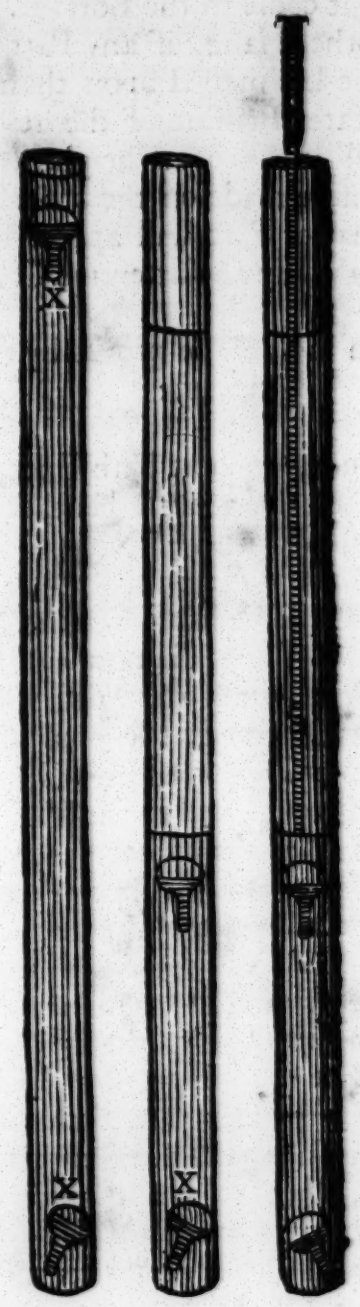
That a lighter Fluid may gravitate or preſs upon a heavier.

Fill the former Jarr with Oil of Turpentine, inſtead of Water, and then place in it a Tube of the ſame Bore as the former, in which you ſhall have ſuſpended a Column of Water, as before you had of Oil: And you will find that though the Water be heavier than Oil of Turpentine, yet if you do not take your Finger from the upper Orifice till ſuch time as you have ſunk the Pipe ſo low as that the upper Surface of the Water in it be a little below the Surface of the Oil in the Glaſs; I ſay, that then on taking off your Finger, you will find the Water in the Pipe will not run out: That if you ſink the Tube lower, or pour more Oil into the Veſſel, the Oil will riſe up in its Lower End; and that if you raiſe it higher, the Water will run or drop out, and fall to the Bottom of the Veſſel. Which plainly ſhews, That a Liquor lighter in Specie, may buoy up and keep ſuſpended one that is heavier; and the Reaſons are in effect the ſame as thoſe given for the Solution of the Phænomena of the Firſt Paradox; the only Difference being, that the Oil and the Water have changed Places, the Oil now being in the Jarr, and the Water in the Tube.



This Second Paradox our Author alſo very ingeniouſly illuſtrates and confirms by the following Experiment.

Into a long Glaſs Pipe, ſealed at one End, and whoſe Bore was about half an Inch in Diameter, he poured a Quantity of Water; and then having a ſmall Glaſs Bubble about the Bigneſs of a Pea, with a very ſmall and ſlender Stem, as you ſee in the Figure annexed; which Bubble was ſo exactly



poiſed, by forcing Water into it, that tho' it would not ſink in a Veſſel of Water, yet a very little more Weight would make it do ſo.

This Bubble being put into the Glaſs Pipe, did ſwim on the Top of the Water contained in it; but when he poured Oil of Turpentine (very gently, to prevent confounding the Two Liquors) on the Water in the Pipe, and that till it had attained a convenient Height above the Surface of the Water, he found that the Bubble, which before ſwam on the Surface of the Water, did now ſink down to the Bottom, and ſtay there as long as the Oil was kept upon the Water; but if either the Tube was very much inclined any way, or if the Oil, by a Siphon or otherwiſe, were drawn off, the Bubble would then emerge to the Top.

The Reaſon of which Phænomenon he truly ſtates to be this, That when the Oil was poured on, that did (though a lighter Fluid by its proper Gravity) preſs on the Water on which it was incumbent, and by that Means did force ſome of it to enter in at the little Stem of the Bubble; which, by that means being rendred in the whole more heavy, did ſink to the Bottom: But when the perpendicular Preſſure of

of the Oil upon the Water was taken off, by inclining the Tube, or removed by drawing off the Oil quite, the Air in the Bubble, which before was compreſt, did now by its Spring force out the newly admitted Water again, and ſo reduce the Bubble to its former Degree of Gravity, ſo that it would be ſuſpended in the Water as before.

He found alſo, that pouring on *more Water* would produce the ſame Phænomenon, if, by a Wire, he firſt thruſt down to, and then kept at the Bottom of the Tube the aforeſaid poiſed Bubble; for though it would readily emerge on the removal of the Rod or Wire, when no more Water was poured into the Tube, yet, that if the Wire kept the Bubble at the Bottom till he had poured in more Water, to about two or three Foot high, into the Pipe, the Bubble would then, on the removal of the Wire, ſtay there, and not riſe at all till the ſame Quantity of Water was taken out which was before added: Which Experiment doth Nobly Illuſtrate and Prove his firſt Propoſition, *That the upper Parts of the ſame Fluid, do preſs or gravitate on the lower.*

PARADOX III.

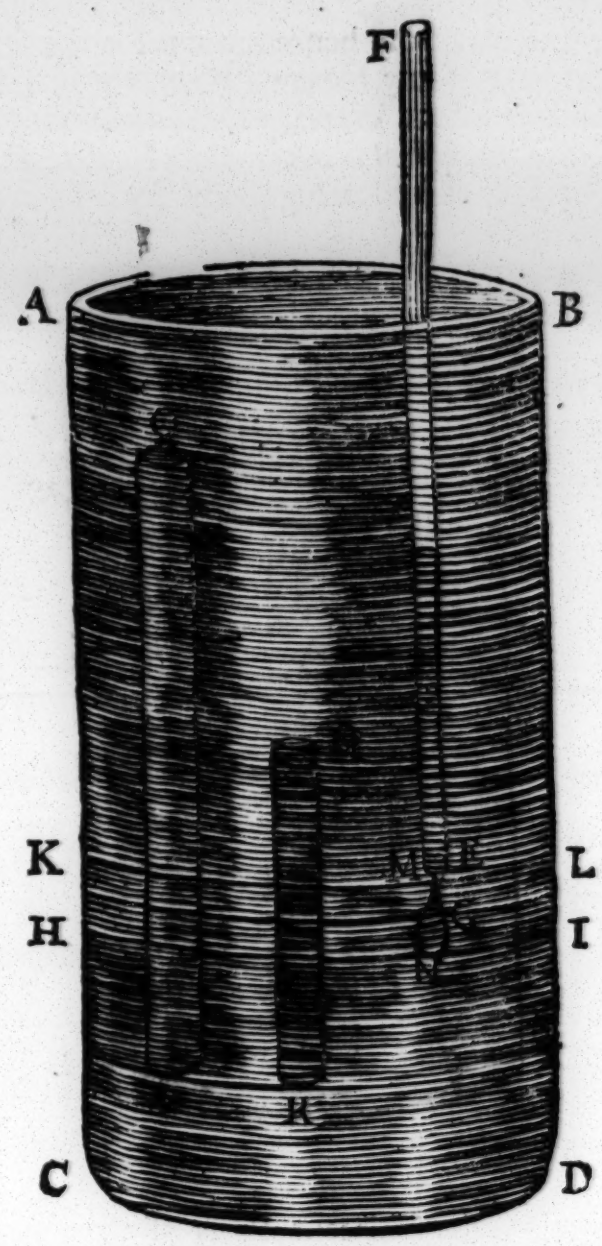
If a Body contiguous to the Water be altogether, or in Parts, lower than the upper Surface of the Water, the lower Part of the Body will be preſſed upward by the Water which toucheth it beneath.

This appears from the *Firſt Experiment*, where the Oil of Turpentine was kept in an open Tube from deſcending, or running out of it, by the Preſſure upwards of the Water on its lower Parts.

And by the *Second Paradox* it appears, that Oil, a lighter Fluid, could preſs upwards, or keep Water, a Fluid in Specie heavier than it, ſuſpended in an open Pipe.

But in order to eſtimate how much the Preſſure of the Water againſt the lower Parts of any Body doth amount to, let us ſuppoſe a Parcel of Oil, heavier than Water, as ſuppoſe that of Cinnamon, Cloves, Guaicum, &c. were taken up into a Tube, and then that Tube were, as in the former manner, immerſed into a Veſſel of Water, and there placed ſo ſhallow, that the Oil, on removing of the Finger from the Top of the Tube, would drop out. The Drop *G*, being heavier in Specie than Water, would (by *Lemma* 3.) ſink to the Bottom, but not ſo quickly as it would in the Air; and ſince, if it were of a Matter equi-ponderant to Water, 'tis plain it could not ſink at all, any more than emerge; it doth now ſink by no greater a Degree of Gravity, than that by which it ſurmounts a Quantity of Water equal to it in Bulk: And therefore *it will loſe in the Water juſt as much of the Weight it would have in the Air, as ſo much Water as is equal to it in Bulk, if weighed in the Air alſo, would amount to*: which is a Phyſical Demonſtration of the *Grand Theorem of Hydroſtaticks*, firſt put in a clear Light by our Noble Author Mr. *Boyle*.

The Preſſure of Water alſo againſt the lower Parts of any immerſed Body, is confirmed by attending to the *Reaſon* why any Body lighter in Specie than Water, doth emerge out of it; which is this, That there is a greater Preſſure or Weight on every other Part of the imaginary Surface of the Water (as ſuppoſe *I K* in *Fig.* 1.) than there is on that, on which the emerging or riſing Body leans; and conſequently to produce an *Æquilibrium* in the Fluid, the Parts immediately under the riſing Body being preſſed by the reſt every way, muſt continually force it upwards, till it attain the upper Surface of the Water: For the emerging Body is



continually preſſed upon by two Columns of Water, one bearing againſt its upper, and the other againſt the lower Parts; the Length of both which Columns being to be accounted from the Top of the Water, that which preſſes on the lower Part, will be the longer by the Thickneſs of the aſcending Body, and conſequently over-balance it by the Weight of as much Water as will fill the Space that Body takes up: Wherefore the greater Diſparity there is between the Specifick Gravities of Water and the emerging Body, and the larger the Particles are that emerge, the ſwifter will they aſcend.

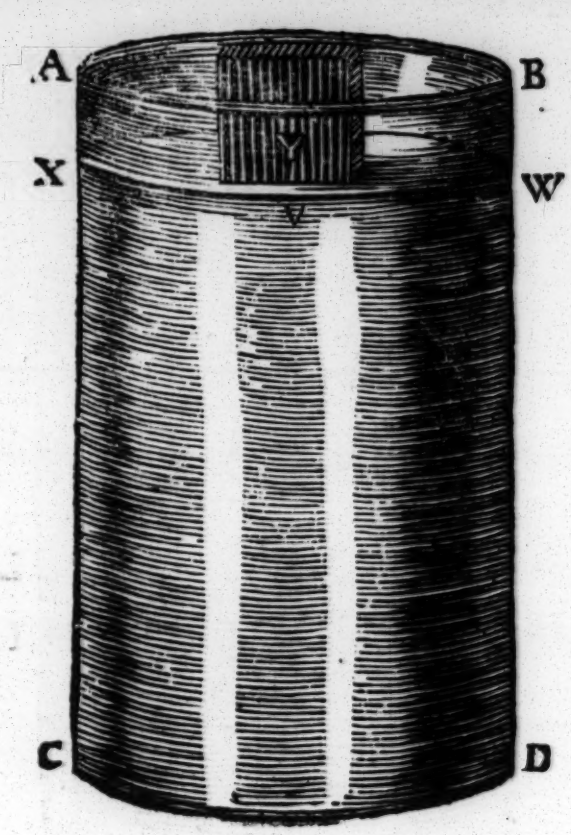
And this will help us to account for theſe things.

1. For the Reaſon of that Experiment, That if two Pieces of a Stick of the ſame Bigneſs, but of unequal Length, as *O P*, and *Q R*, are permitted to riſe from the Bottom of a Veſſel of Water at the ſame time, the longeſt will come firſt to the Top, which muſt be becauſe the Columns of Water which preſs againſt the lower Ends of both, being equal, but that ſhorter which preſſes on the upper End of the longer Piece, it muſt be leſs preſſed downwards than the other, and ſo by the general Preſſure upwards will riſe faſteſt.

2. From hence we may eaſily conceive one Reaſon, (for I aſſert not that 'tis the only one) why very minute Corpuſcles, either higher or heavier in Specie than the Liquor they are mingled with, may be kept there a good while without emerging to the Top, or precipitating to the Bottom: For their

Thickneſs being indefinitely made ſmall, the Difference between the two Columns before mentioned, will be ſo too, and conſequently either of them can very little over-ballance the other.

3. We may from hence account for the Quantity of that Part of any Floating Body which is beneath the Surface of the Water, *which is always in Bulk equal to as much Water as the whole Floating Body doth weigh:* For this Floating Body doth by its lower



Part preſs on the ſubjacent Parts of the imaginary Surface of the Water *XW*, juſt as much as the Columns of Water to the Altitude *AX* or *BW* do on all other Parts; that is, juſt as much as the Water would do if it were in the Space which the Part immerſed takes up, or as much as a Quantity of Water equal in Bulk to the immerſed Part would do.

And from hence 'tis clear, That the Weight of that mighty Ship, the *Royal Sovereign*, is the ſame with that of ſo much Water as is in Bulk equal to the immerſed Part of her, or to that Part of her Hull which is underneath the Surface of the Sea. Which Aſſertion Mr. *Boyle* found accurately enough to hold true by the following Experiment:

A broad ſhallow Veſſel of Glaſs being near filled with Water, he placed floating in it a Glaſs Tumbler or ſhort Drinking Glaſs; and to make it a little reſemble a Ship, he fitted a Wooden Deck, with a Maſt, &c. to it; and then he ſunk it by ballaſting it with Sand, and made it draw as much Water (as the Seamen ſay) as he thought fit: Then did he, by accurate Marks, diſtinguiſh how high the Water in the containing Glaſs did riſe on the Sides of the Veſſel: This done, he took the Tumbler out, wiped it dry, and weighed it, and then found a Quantity of Water exactly equal to that Weight: which Water, when put into the broad Glaſs, roſe up to thoſe Marks exactly which he had before obſerved the Tumbler had raiſed the Water to.

PARADOX IV.

That to account for the raiſing of Water in Pumps, &c. there needs only the competent Weight of an External Fluid.

Take up in a ſlender Glaſs Tube about an Inch in height of any deeply tinged Liquor (ſuch as an Infuſion of Brazil-wood and Cochineel, &c. in Water, for elſe the Phænomena will not be conſpicuous) and then ſtopping the upper End with your Finger, place it in a Glaſs Veſſel filled with the ſame tinged Liquor, and that ſo low, that the upper Surface of the Liquor in the Tube be at leaſt an Inch below that of the Liquor of the Veſſel: Then pour on Oil of Turpentine for about 3 or 4 Inches height above the Water in the Veſſel, and you will ſee, on the removal of your Finger from the Top of the Tube, that the tinged Water will be raiſed or impelled upward near as high as the Surface of the Oil.

Now here no *abhorrence of a Vacuum* can be pretended, as the Cauſe of the Aſcent of the Water, for the Tube is full of Air, and the External Air hath a free Ingreſs into it: But the plain Reaſon is this, That there being a greater Preſſure made by the Oil and Water together on the imaginary Plane that paſſes by the lower Orifice of the Tube without the Tube, than within it, (for within there is a Preſſure only of an Inch of Water, and of a Column of Air) the Parts of the Water at the Bottom of the Pipe muſt be thruſt upwards into it, till it riſe ſo high as to gain an *Æquilibrium* with the reſt.

And this will eaſily account for the Aſcent of the Water in the Pumps:

Where the external Air preſſing every where on the Surface of the Water in the Well, but not on that within the Pump, becauſe 'tis taken off by the Sucker; which is therefore with ſoft Leather, &c. made ſtanch on purpoſe.

On the raiſing therefore of the Sucker, the Water muſt follow it (if the Pump be good) becauſe the Weight of the whole Atmoſphere preſſes on the Surface of the Water in the Well, (but not at all within the Body of the Pump) and ſo raiſes or forces it up into the Cavity of the Pump. And that this Preſſure of the Air is the Cauſe of the Waters riſe, is more than probable, becauſe no Pump can ever raiſe Water above 33 or 34 Foot; which is found to be exactly agreeable to the different Gravities of Air and Water, allowing for the great Height of the Atmoſphere: *Of which more elſewhere.*

PARADOX V.

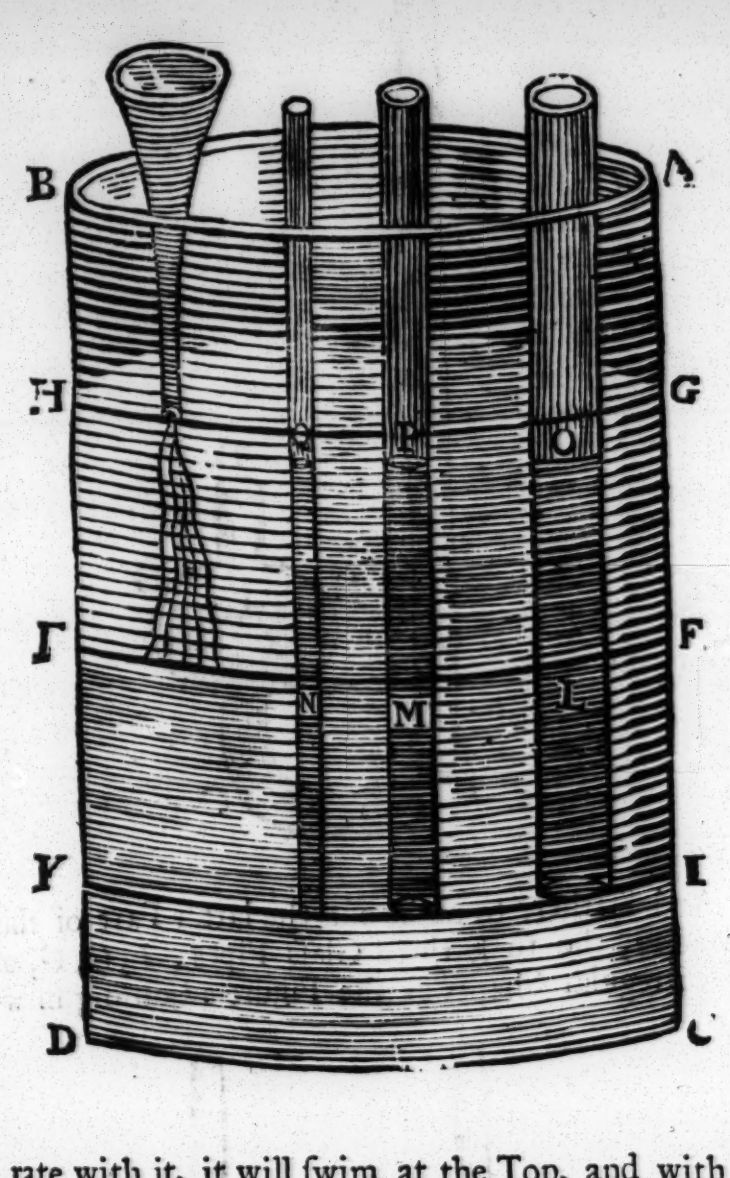
That the Preſſure of an External Fluid, is able to keep an Heterogeneous Liquor ſuſpended at the ſame Height in ſeveral Pipes, though they be of different Diameters.

Take a pretty wide-mouth'd Glaſs, (as in *Fig.* 5. following) of a convenient Depth, and put into it a ſufficient Quantity of Water well tinged with Brazil, &c. then fit to it a Cover of Cork, through which bore, with a red-hot taper Iron, ſeveral round Holes, to admit Tubes of different Bigneſſes or Sizes. Let theſe Tubes ſtand nearly upright in the Veſſel, and reach all with their lower Orifices below the Surface of the Water: Then at an Hole purpoſe-

purpoſely left for it, pour in gently, by a Glaſs Funnel, a good Quantity of Oil of Turpentine, and you will plainly ſee the tinged Water riſe equally, (*i. e.* to equal Heights) in all the Tubes, tho' of very different Bores and Sizes.

The Reaſon of which will thus appear.

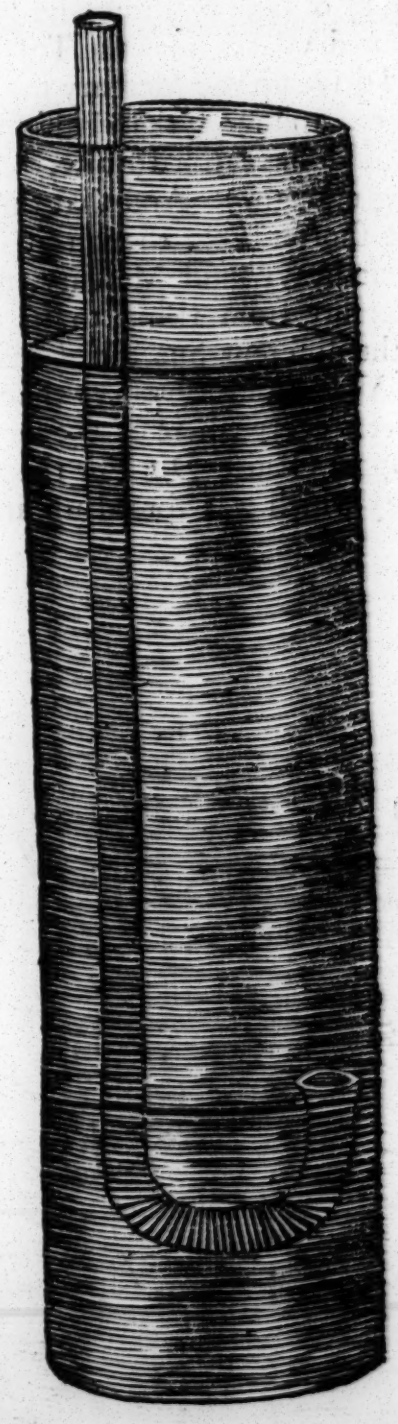
Let *E F* repreſent the Surface of the Water in the Veſſel; when the Oil comes to be poured upon it, not being of a Nature fit to mingle or incorporate with it, it will ſwim at the Top, and with an equal Gravity preſs upon all Parts of the Surface of the Water, and conſequently will raiſe or preſs up the Water in the Tubes, till it come near to the ſame Height in them, as the Oil is at in the Glaſs, to bring the Liquors to a Balance. But there is no Reaſon why the Water ſhould be raiſed to a greater Height in any one Tube than in another; becauſe the Oil preſſes uniformly and equally on all Parts of the Surface of the Water; and conſequently can force up the Water no higher in the ſmalleſt Tube than in the greateſt; for ſhould it do ſo, the Water in the ſmall Tube muſt be of a larger Length than the correſponding Column of Oil (whoſe Diameter is equal to the Orifice of that Tube, and which keeps it up by equi-ponderating with it) doth require: But then it muſt be heavier than it, and ſo would ſink down, and drive the ſubjacent Water away to make room for its Deſcent: Wherefore no Cylinder of Water in any Tube, can be higher than an equal Cylinder of Oil that bears or buoys it up; and this being the Caſe with them all, they muſt be all of the ſame Height; that is, the Water will riſe as high in one Tube as in another, be their Bores never ſo different; and the Reaſon is, becauſe each one is born up by a correſponding Column or Cylinder of Oil, whoſe Diameter is the ſame with that of the Orifice of the Tube.



PARADOX VI.

If a Body be placed under Water, with its uppermoſt Surface parallel to the Horizon, the direct Preſſure *which it ſuſtains, is no more than that of a Column of Water, having the Horizontal Superficies of the Body for its Baſe, and the Perpendicular Depth of the Water for its Height. And if the Water that leans on the Body be contained in Pipes open at both Ends, the Preſſure of the Water is to be eſtimated by the Weight of a Pillar of Water, whoſe Baſe is equal to the lower Orifice of the Pipe, and its Height equal to a Perpendicular reaching from thence to the Top of the Water; though the Pipe be much inclined any way, or though it be never ſo irregularly ſhaped; and much broader in ſome other Places than at the Bottom.*

Take a ſlender Glaſs Pipe of an even Bore, turned up at one End like this in the Figure; dip this Tube (open at both Ends) into Oil of Turpentine,

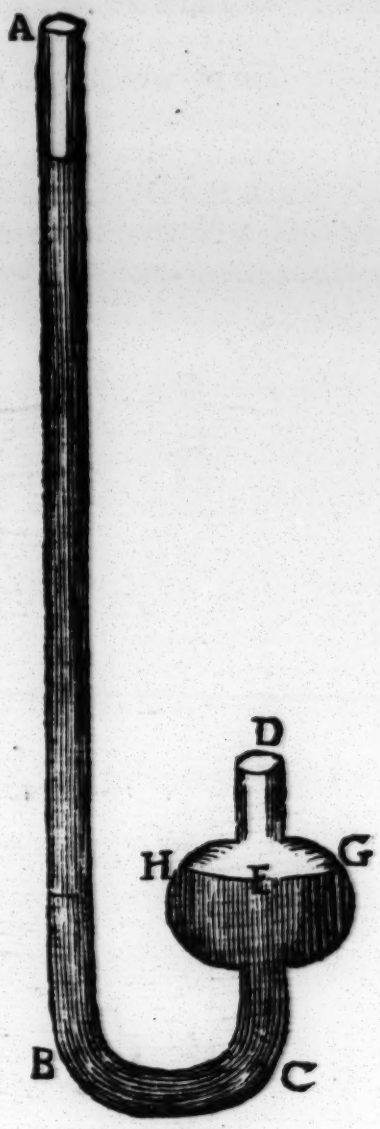


till the Liquor be riſen up to two or three Inches in the longer Leg, whoſe upper Orifice then ſtop with your Finger; and then remove the Tube into a Glaſs of Water, and hold it ſo that the Surface of the Oil in the longer Leg of the Pipe be but a very little higher than that of the Water: And then, if you take away your Finger that ſtopt the Pipe, you will ſee the Oil will keep its ſtation, and not at all, or at leaſt but very little, riſe or fall; but if you ſink the Tube lower, the Oil will riſe;

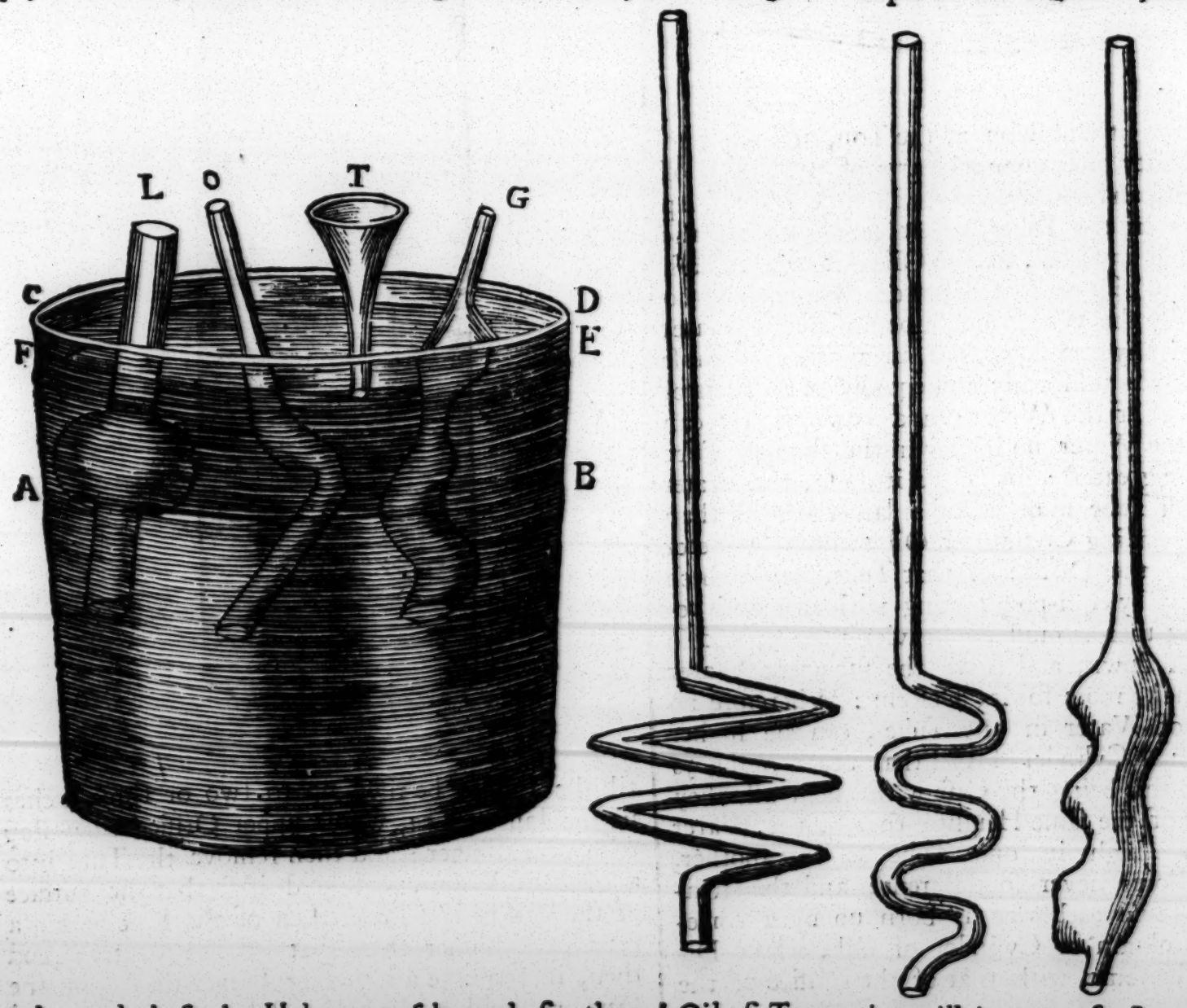
if you raiſe the Tube higher; the Oil will run out at the lower End: From whence it appears, That of all the Water in the Glaſs, no more preſſed on the Orifice of the Pipe, than a Cylinder equal to it in Diameter, and in Length equal to the Diſtance between the Orifice of the Pipe and the Top of the Water (as you may alſo eaſily find if you make a Siphon, whoſe ſhorter Leg ſhall be long enough to contain ſuch a Cylinder of Water as will counterpoiſe the Oil in the longer.) For when, by raiſing up the Pipe, you ſhorten that Cylinder, the Oil will run out: As when by ſinking it lower, and ſo lengthening the Cylinder of Water, the Oil will be forced up higher into the longer Leg of the Tube.

You will find alſo by Experiment, That this Paradox will hold, whatever be the Figure of the ſhorter Leg of the Tube, whether opening broad like a Tunnel by Degrees, or whether it have a Spherical, or otherwiſe figured Cavity of conſiderable Dimenſions in the Middle of it.

For our Noble Author found, by providing a Syphon of the Figure annexed, and pouring in Mercury till it reached up to the Bottom of the Globular Part of the ſhorter Leg, and to an equal Height in the longer Leg of the Syphon; he found, I ſay, that if he poured Water in at the Top of the longer Leg, it would drive up the Mercury into the Ball of the ſhorter Leg, and more than half fill its Cavity; (which it would have filled quite, had the other Leg been long enough.) And that this Ball in the Middle of the ſhorter Leg, though it held a great Weight of that heavy fluid Mercury, did no more hinder the Mercury from riſing to its due Height, according to the different Specifick Gravity of thoſe two Liquors, Water and Mercury, than if the ſhorter Leg had been every where of the ſame Dimenſions with its upper Orifice *D*: For the great Quantity of Mercury which was forced up into the Ball, was there, in a good Meaſure, ſupported by the Bottom and Sides of it, and no more gravitated on *C*, than what lay perpendicularly over it between *B* and *C*.



And farther, to make out the latter Part of this Paradox, he took three Glaſs Pipes, *L*, *O*, G, of ſuch irregular Shapes as the Figure adjoining ſhew-



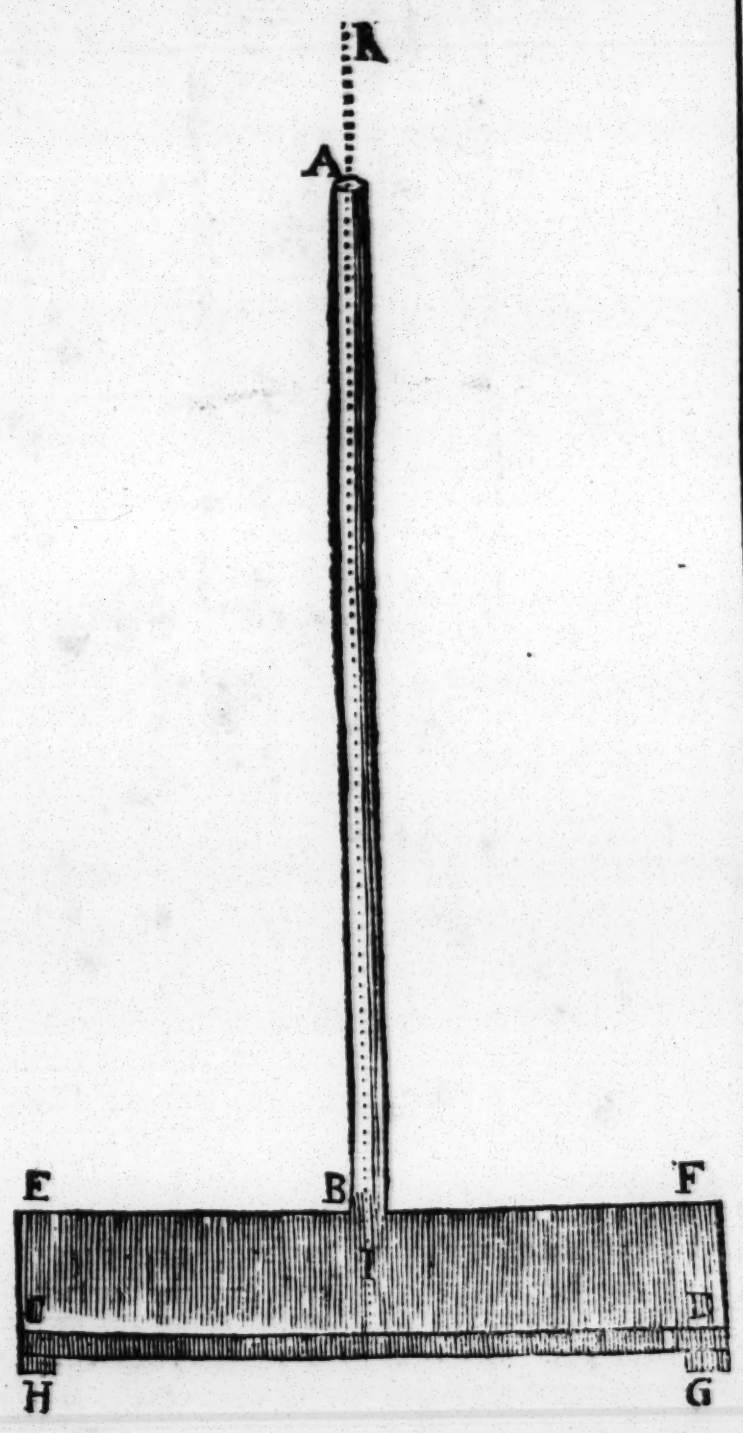
eth; and theſe, by Holes purpoſely made for them in a Covert of Cork, he placed obliquely within a Glaſs Veſſel filled with Water up to *AB*. Then by the help of the Tunnel *T*, he gently poured in Oil of Turpentine, till its upper Surface reached to *FE*; which Oil he found did, by its Preſſure on the Surface of the Water, raiſe it up to an equal Height in all the three Pipes.

SCHOLIUM.

If a Cylindrical, or otherwiſe Figured Veſſel, have, by a Hole made in its Cover or Lid, a Pipe of any length faſtened there, and the Veſſel by that Pipe be filled with Water, as alſo the Pipe it ſelf; the Baſis of that Veſſel doth ſuſtain a Preſſure equal to that of a Column of Water, whoſe Baſe is the ſame with the Bottom of the Veſſel, and its Height that of the Veſſel, Pipe and all.

This Paradox *Stevinus* adds by way of Appendix to the laſt: but the ways he propoſes to Experiment its Truth, are not ſuch as will anſwer trial; and therefore Mr. *Boyle* deviſed the following Experiment, which (though not ſo accurate as ſome other) doth yet very well deſerve to be conſidered.

He ordered a Tin or Laton Veſſel to be made of the adjoining Shape, which had a looſe Bottom,



C D, made of a flat Piece of Wood, covered with a ſoft Piece of Bladder, and greaſed on the lower Side near the Edges, that ſo leaning on the Rim of Wood *G H*, contiguous every where to the Inſide of the Laton, it might eaſily be lifted off from it, and yet lie ſo cloſe upon it at other times, that the Water ſhould not get between them. To the Middle of the looſe Bottom was faſtened a long String, that came up through the Body of the Pipe *A B*.

The Inſtrument thus fitted, there was Water poured in at *A*, which preſſed againſt the falſe Bottom *C D*, and kept it ſo tight down, that no Water ran out. When the Veſſel and Pipe were both filled with Water, the upper End of the String *K I* was faſtened to the Beam of a good Pair of Scales, and then as much Weight was put into the oppoſite Scale, as did lift up the falſe Bottom, *C D*, from the Rim *G H*, and ſo let out the Water; and this Weight he found to be very conſiderably more than what would have ſerved to lift up as much Water as that Veſſel did contain, had it been in an open one of the common Shape: But he neither tells us the Meaſure of the Veſſel, the Height of the Tube, nor the Weight which was required to raiſe the Bottom; which if he had done, 'twere very eaſy to have calculated the Quantity and Weight of a Column of Water, which ſhould have had the Bottom for its Baſe, and the united Length of Tube and Veſſel for its Altitude.

This Paradox, in the *Memoirs Mathematique & de Phyſique*, *A. D.* 1692. *P.* 12. is thus ſtated by Mr. *Varignon*.

If there be two Tubes or Veſſels, having the ſame Heights and Baſes, both filled with Water, but one of them made ſo tapering upwards, that it ſhall contain but 20 Ounces of Water, whereas the other holds 200; the Bottoms of theſe two Tubes ſhall ſuſtain an equal Preſſure of Water, *viz.* each of them that of the Weight of 200 Ounces, the Quantity of the Liquid contained in the greater Tube.

This is undoubted Fact, and agreed upon by all to be true, as long as the contained Liquor continues Fluid: but if it ſhould freeze, then it will by no means hold, the leſſer Quantity of Ice (to be ſure) being much lighter than the greater.

This Reaſon therefore of this ſurprizing Phænomenon ſeems to depend much on the Nature of Fluidity; and accordingly Mr. *Varignon* eſpouſes the Opinion of thoſe who aſſert, That the 20 Ounces of Water in the tapering, or otherwiſe unequally form'd Tube, as long as the Water continues liquid, do preſs and effectively charge *the Bottom* of the Veſſel, as much as 200 Ounces would do in a uniform Cylindrical Tube of the ſame Baſe and Altitude.

Others ſay the ſtraitned Sides of the unequal Tube, by hindering the riſing of the Water, do help to ſuſtain the Weight; and that the *Bottom alone* is not charged with the whole Preſſure, but a good Part of it taken off by the Sides.

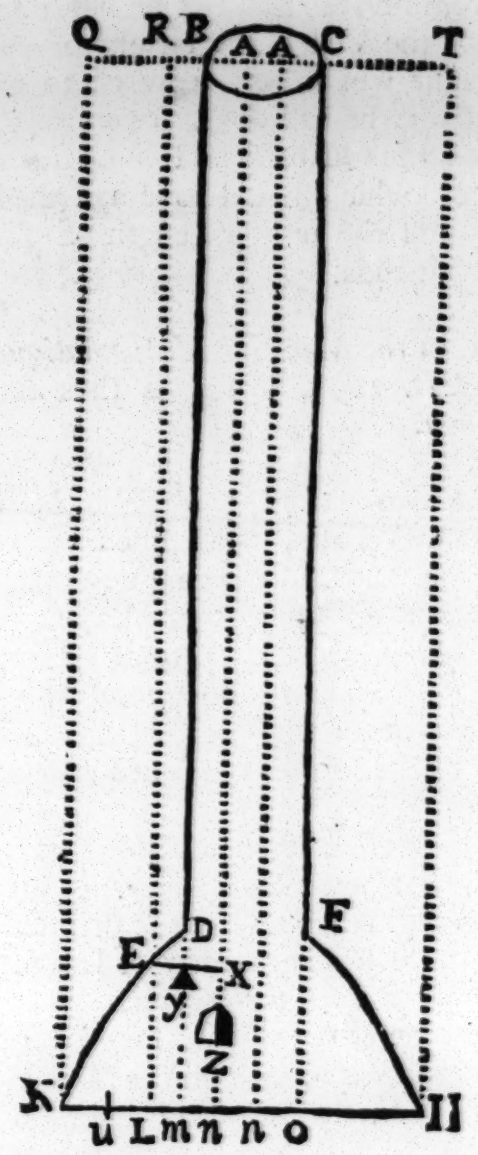
Mr. *Varignon* thinks the Matter eaſily ſolvable in the former way, thus:

The Tube *B A C F H K E D B* (*See the following Figure*) having its bottom Part *D K H F* much larger than its upper Shank *B C F D*; I ſay, hath its Bottom *K H* charged with as great a Weight or Preſſure of Water, as if it were a Cylindrical Veſſel, as *Q T H K*, of the ſame Baſe and Altitude with the unequally ſhaped Tube.

Draw the Lines, as you ſee in the Figure, ſo ſhall *Q V* repreſent a Column of Water in the ſuppoſed truly Cylindrical Veſſel, having the Diameter of its Baſe double to that of *R L*, *B M*, or *A O*.

Then will the Column of Water *B N*, bearing upon the Arm *M N* of the *Libra L N*, whoſe *Hypomochlion* is imagined to be at *M*, be a Counterbalance to the Column of Water *E M*, which is kept down from aſcending any higher by the Side of the Veſſel *E L*, juſt as the Weight at *Z*, at the End *X*, of the *Libra F X*, whoſe *Hypomochlion* is at *Y*, is balanced by the Side of the Veſſel *E D*, which hinders the Arm *E Y* from aſcending. Now *E Y* being = *Y X*, the Weight ſuſtained by the *Hypomochlion*

pomochlion at *Y*, is double to that at *Z*; wherefore the ſubjacent Point *M*, or that part of the Bottom of the Veſſel *L N*, muſt be charged with double the Weight of the Column of Water *B N*; or which is all one, will be preſſed with the Weight of the Column of Water *R N*, which may be ſuppoſed to reach quite up to the Top.



Let us then take *A N L K E D*, as equivalent to ſuch a Column; then will that Water be a Balance on the *Hypomochlion L*, to the Water leaning on the other Arm of the *Libra K L*, and kept down by the Side of the Veſſel *K E*; and conſequently, the part of the Bottom *K N*, will ſuſtain a Preſſure equal to that of the Column of Water *Q N*; for this, by the above-mention'd way of arguing, is the ſame as that of the Water contained in the Space *A N K D B*.

And thus, on the other Side, it may be proved, That the remaining part of the Bottom *N H*, is preſſed upon by the Water *A N H F C*, equivalent to the Weight of the Column of Water *T N*, reaching up to the Top.

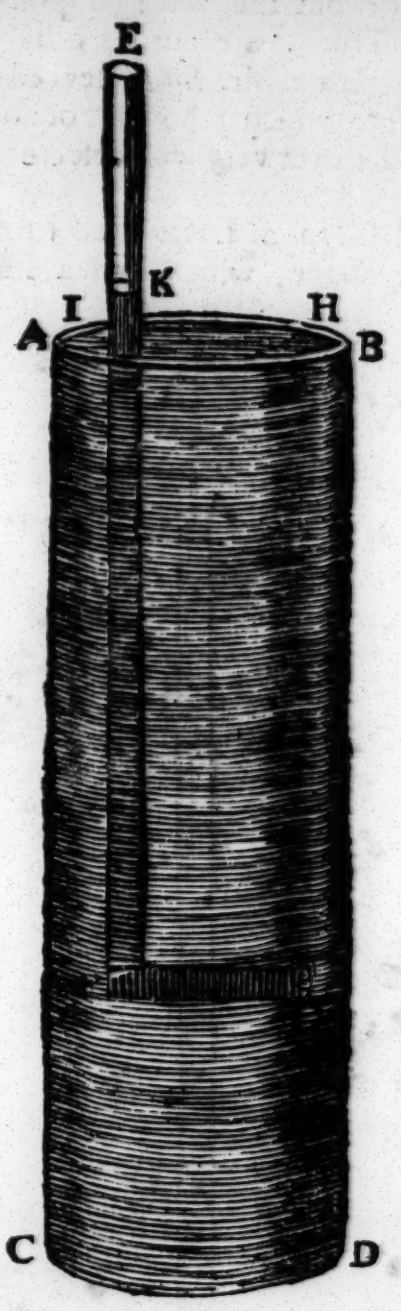
From whence it follows plainly, That the Water in the Tube *B D K H F C*, preſſes or gravitates on the Bottom equally with the Weight of the Cylindrical Column *Q T H K*, having an equal Baſe with it.

All which Method of Arguing, will be clear enough to one that conſiders 'tis the Property of all Fluids, from the known Laws of *Hydroſtaticks*, to have their infinitely ſmall Columns, of which they conſiſt, to be every where a Balance to one another.

PARADOX VII.

That a Body immerſed in a Fluid, ſuſtains a lateral Preſſure from the Fluid; which alſo increaſeth as the Body is placed deeper beneath the Surface of the Fluid.

Take a ſlender Glaſs Tube, and let it be bent ſo near the Bottom, that the lower Part *F G* may very nearly make a Right Angle with the other Part



E F. Dip this Pipe or Syphon in Oil of Turpentine, and take up about 3 or 4 Inches of it in the Pipe, which you may keep there by applying your Finger to the upper Orifice.

This done, move the Syphon into a Glaſs of Water, and place it ſo there, that the longer Leg may ſtand perpendicularly to its Surface, and that the other lower Leg may be ſo far below the Surface of the Water, as that the upper Surface of the Oil in the longer Leg, be but a little higher than that of the Water in the Glaſs: For then if you remove your Finger from the Top, the Oil in the Tube will very little, if at all, change its Station; which ſhews plainly, that there is a lateral Preſſure againſt the Oil at the lower Orifice *G*, which hinders its running out, though preſſed by the Cylinder of Oil contained in the perpendicular Leg. And as if you raiſe the Pipe up higher (keeping it ſtill in its perpendicular Poſture) the Oil will drop out; ſo if you ſink it lower, the Water will get in at *G*, and force the Oil all out of that Leg *G F*, and raiſe the Oil proportionably in the perpendicular one *E F*: Nay, if you thruſt it low enough, the Water will riſe up into the longer Leg, and bear the Oil above it; which laſt Circumſtance proves, That Water hath

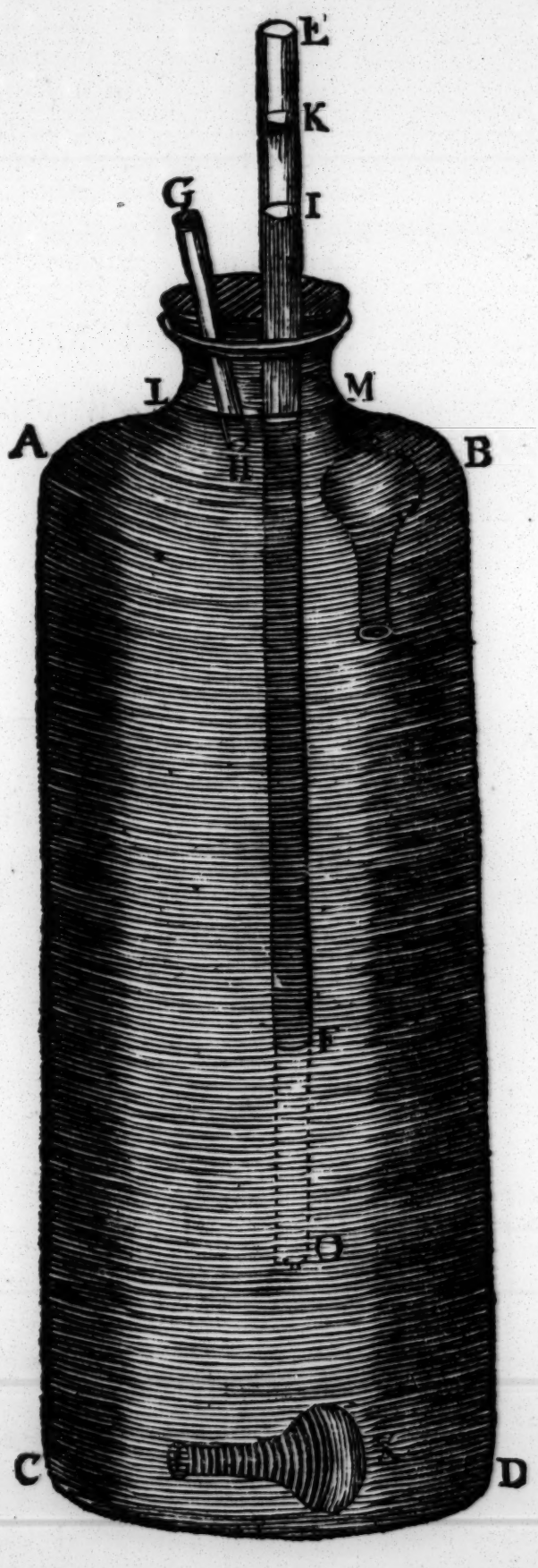
a lateral

a lateral Preſſure againſt it ſelf, as great as the perpendicular one from above, ſince that only can force the Water up into the perpendicular Leg.

If alſo keeping the Tube at the ſame Depth, you turn the Horizontal Leg here and there, or place its Orifice G in any Part of the imaginary Plane *F G*, the Oil will keep its former Station in the Tube, and neither riſe nor ſink; which ſhews, That this lateral Preſſure is equable and uniform in all Places or Parts of a Veſſel of Water, at the ſame Diſtance from its Surface.

Our Noble Author confirms the Truth of this Paradox by the following Experiment:

A ſmall Glaſs Bubble *X*, of the Figure in the Scheme annexed, with a very ſlender Neck, and ſo well poiſed, as that it could juſt float in the Water,



and no more, being provided, was put into a wide-mouth'd Glaſs Veſſel, near filled with Water, and there left to float at the Surface of that Liquor. Then a Cover or Stopple of Cork was well fitted to the Mouth of the Glaſs, and was thruſt hard into it; after which there was an Hole burnt (with a hot Iron) thro' the middle of the Cork, into which was put a long ſlender Glaſs Pipe, reaching a good way into the Glaſs, and ſtanding perpendicularly to the Surface of the Cork.

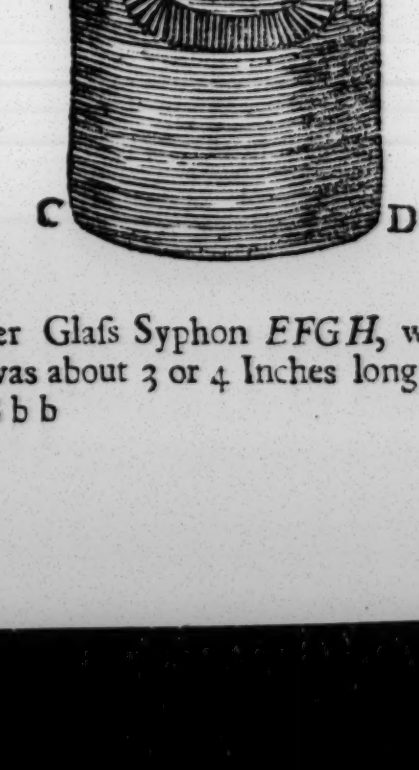
Alſo in another Part of the Stopple was another ſmall Hole burnt, and into that was fitted another ſmall Glaſs Tube, which lay ſloping, but yet reached a pretty way down below the Cork.

The upper Orifice of this ſloping Tube was well ſtopt with Cement: With the ſame Matter alſo were all the Junctures between the Cork and the Glaſs, and between the Tubes and the Cork, carefully ſtopt.

This all done, the Veſſel was inclined ſeveral ways, that the Bubble *X* might get as far as it could from the Pipe; and then more Water being poured in at the upper Orifice of the open Pipe *EF*, till it reached to a good Height, as ſuppoſe to *K* in the ſaid Tube, the Bubble *X* would preſently ſink to the Bottom of the Veſſel, and there continue as long as the Water was continued at the ſame Height in the Tube *EF* (the reaſon of which you have already in *Experiment* 2. *Paradox* 2.) Now this proves, That the Preſſure of the Water contained in the Tube *E F*, doth not only affect the Parts of the Water immediately ſubjacent to it, but alſo thoſe that are remote from it; nay, and above it, ſince it could force the Water into the Bubble *X*, and ſo make it ſink, tho' it lay not near the Orifice *F* of the open Tube.

PARADOX VIII.

That Water may be made to depreſs a Body lighter than it ſelf, as well as to buoy it up.

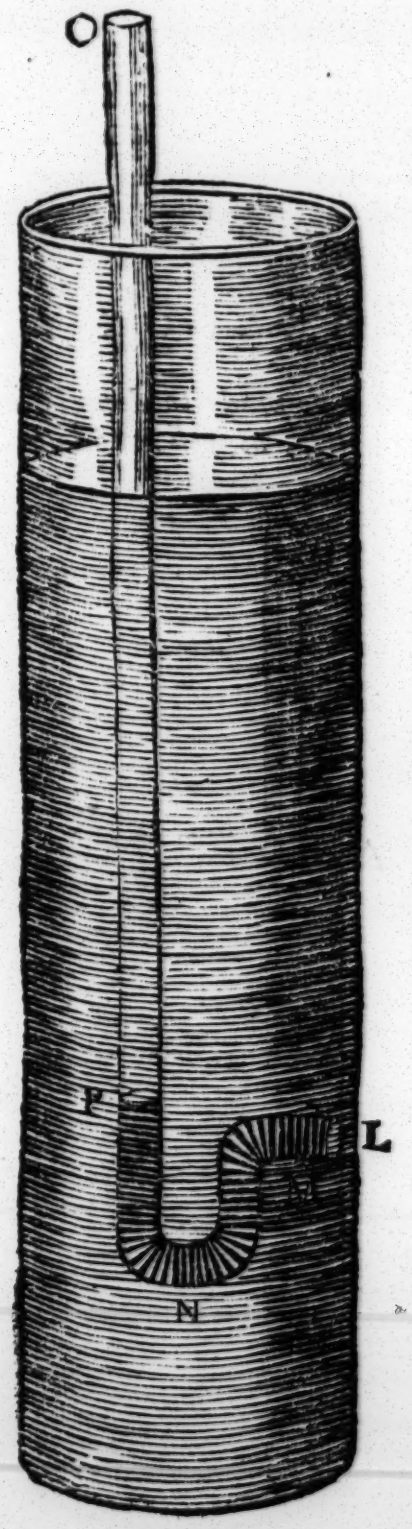


A ſlender Glaſs Syphon *EFGH*, whoſe ſhorter Leg *GH* was about 3 or 4 Inches long, and turn'd

up as near as could be parallel to the longer *EF*, was dipt in Oil of Turpentine, till the Oil filled the ſhorter Leg, and roſe to an equal Height in the longer.

Then the Orifice *E* being ſtopt with the Finger, the Pipe was moved into a Glaſs Veſſel of fair Water, and ſunk down there till the Surface of that Liquor was about an half Inch above the Surface of the Oil in the Syphon: And then the Finger being removed from the Top, the Oil in the ſhorter Leg was immediately driven downwards about an Inch; and as the Tube was ſunk lower, much more, till at laſt the Oil was driven out of that Leg quite, and the Water following it ſupported the Oil in the longer Leg, raiſing it alſo in the ſame Proportion. The reaſon of which is obvious from what hath been ſaid in the former Paradoxes.

Our Author found alſo, that when he uſed a Syphon of the Figure annexed, the Water would



firſt preſs the Oil Horizontally from *L* to *M*, then downwards from *M* to *N*, and at laſt (by ſinking the Tube ſtill lower) upwards from *N* to *P*: From whence it appears, that Water preſſes againſt any Body placed in it all manner of Ways, and that proportionably to the Depth of the Body in it.

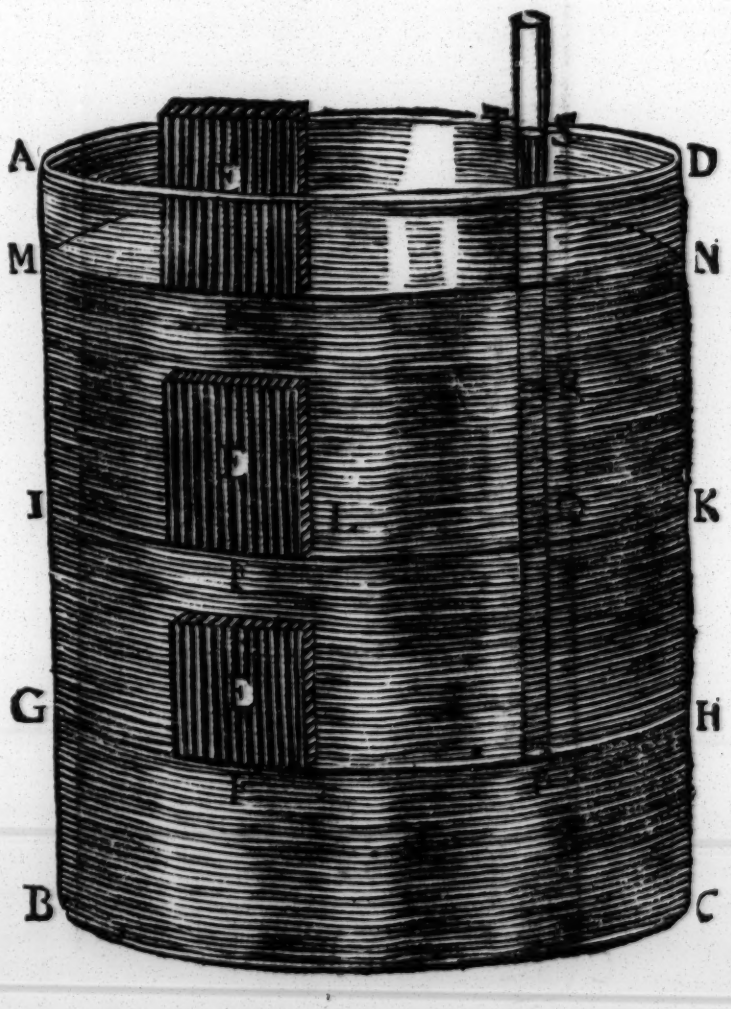
PARADOX IX.

That whatever hath been ſaid of Poſitive Levity, a Parcel of Oil, lighter than Water, may be kept in that Liquor without aſcending in it.

This may very eaſily be experimented, by taking only a ſmall Glaſs Tube, and immerſing it an Inch or two under Water: Stop the upper Orifice with the Pulp of your Finger, and then a Column of Water of an Inch or two in length will remain ſuſpended in the Tube: Keep it ſo, and next dip the ſame Tube into a Veſſel of Oil of Turpentine, and removing your Finger, as much Oil of Turpentine as you pleaſe will riſe into the Tube; which, by putting on your Finger to the upper Orifice, may be there eaſily ſuſpended, as the Water was before. Keep it ſo, and then immerſe the Tube in a Glaſs of Water 3 or 4 Inches beneath its Surface, and you will find on the removal of your Finger, that the Water will riſe up into the Tube, and keep the parcel of Oil ſuſpended between two little Columns of Water. The Reaſon of which is ſufficiently accountable from many things already delivered.

PARADOX X.

That the Cauſe of the Aſcenſion of Water in Syphons, and its flowing thro' them, may be explicated without having recourſe to Nature's Abhorrence of a Vacuum.

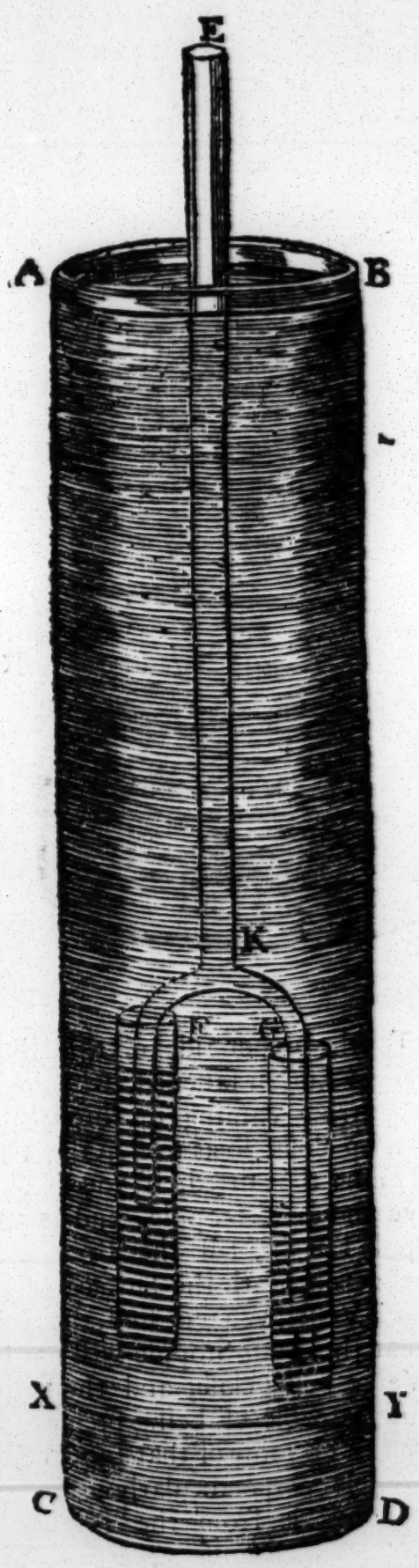


Provide a pretty large Cylindrical Glaſs Tube Veſſel of about 18 Inches, or two Foot long, as *ABCD*; provide alſo a Syphon of two Legs, *KF* and *KG*, with a hollow Pipe, as *KE*, opening into, or communicating with them; to each of theſe two Legs of the Syphon (one of which muſt be longer than the other) tie with a String a Tube of Glaſs *I* and *H*, ſealed at the Bottom. Pour then in Water at *E*, and let it run out at *I* and *H*, till it hath filled the Tubes hanging at the Ends of the

the Legs of the Syphon ſo far, that the End of each Leg be a little beneath the Surface of the Water.

This done, and the Pipe and Syphon faſtened in its true erect Poſition, if you fill the Veſſel *ABCD* with Oil of Turpentine, till it reach higher than the Syphon *K*, ſtopping in the mean time, if you pleaſe, the upper Orifice of the Pipe *E K* with your Finger.

After this you will find the Oil to preſs ſo on the Water in the Tubes *I* and *H*, as to force it up into the Legs of the Syphon as high as *K*; and that on the removing of your Finger from the Top *E*, the Water will begin to run out of the upper Tube *I* into the lower one *H*, as in or thro' a common Syphon or Crane.



Now 'tis plain, in this ingeniouſly contrived Experiment, that the Water runs through the Legs of the Syphon, tho' the Air coming down by *E K*, hath a free Communication with them both, ſo that here no *fuga Vacui* can be pretended as the Cauſe of the Waters running; but that 'tis plainly occaſioned by the Preſſure of the (lighter Fluid) Oil of Turpentine, on the Surface of the Water in the Tube *I*, till it force it up into the empty Leg of the inſerted Syphon as high as *K*, and then it deſcends down into the lower Veſſel or Tube *H*, thro' the other longer Leg of the Syphon. Indeed the Oil will gravitate on the Surface of the Water in both the Tubes *I* and *H*; and there being a longer Column of Oil over *H*, than there is over *I*, by about an Inch in length, the Preſſure will be greater on the Surface of the Water in *H*, by the Weight of an Inch of Oil of Turpentine. But then it muſt be conſidered, that the Column of Water which deſcends in the Leg *G*, though reſiſted in its motion by the Weight of an Inch of Oil, more than the Water which tends downwards in the Leg *F*, is yet alſo longer by an Inch than the other Column of Water in the ſhorter Leg *F*; and an Inch of Water of the ſame Dimenſions being heavier than an Inch of Oil, the Tendency or Motion of the Water muſt be from *F* towards *G*, not from *G* towards *F*; and conſequently the Syphon will work or run that way.

The Application of this Experiment to the Solution of the Motion of Water through Cranes or Syphons is very eaſy:

For when once a Syphon, by Suction or otherwiſe, is filled with the Liquor 'tis to tranſmit; if the Legs of it be not above 34 or 35 Foot in length, and one of them be longer than the other, the Liquor muſt continue to run thro' it as long as there is any to riſe in it, or that the Syphon hold ſtanch: For ſince the Preſſure or Weight of the incumbent Atmoſphere is capable of raiſing Water in Pipes (where it cannot come to preſs) to the Height of 34 or 35 Feet, as our Noble Virtuoſo proves in his *Phyſico-Mechanical Experiments*; and here being manifeſtly no Gravitation of the Air on the Water included in the Syphon, as long as the Syphon is right and ſtanch, the Water muſt continue to keep running, becauſe the Difference of the Preſſure of the Air on the lower Veſſel of Water, and on the upper, being nothing near ſo conſiderable as the Difference between the Weight of the Water in the longer Leg of the Syphon, and that in the ſhorter, the Tendency or Motion muſt be out of the ſhorter into the larger.

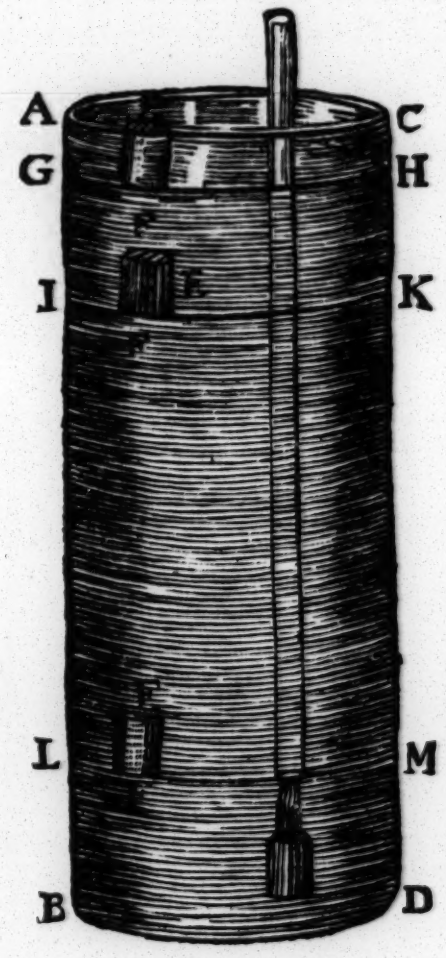
But then, if never ſo little an Hole be made in the Crane or Syphon, or any Leak be there, the Water can no longer run, becauſe the Air now comes to preſs on the Water within the Syphon, as well as on that without it, and conſequently muſt hinder it's Courſe of running.

PARADOX XI.

That a Solid Body, as ponderous as any known, tho' on the Surface of the Water it will ſink by its own Weight; yet if it be placed in a greater Depth than that of 20 Times its own Thickneſs, it will not ſink, if its Deſcent be not aſſiſted by the Weight of the incumbent Water.

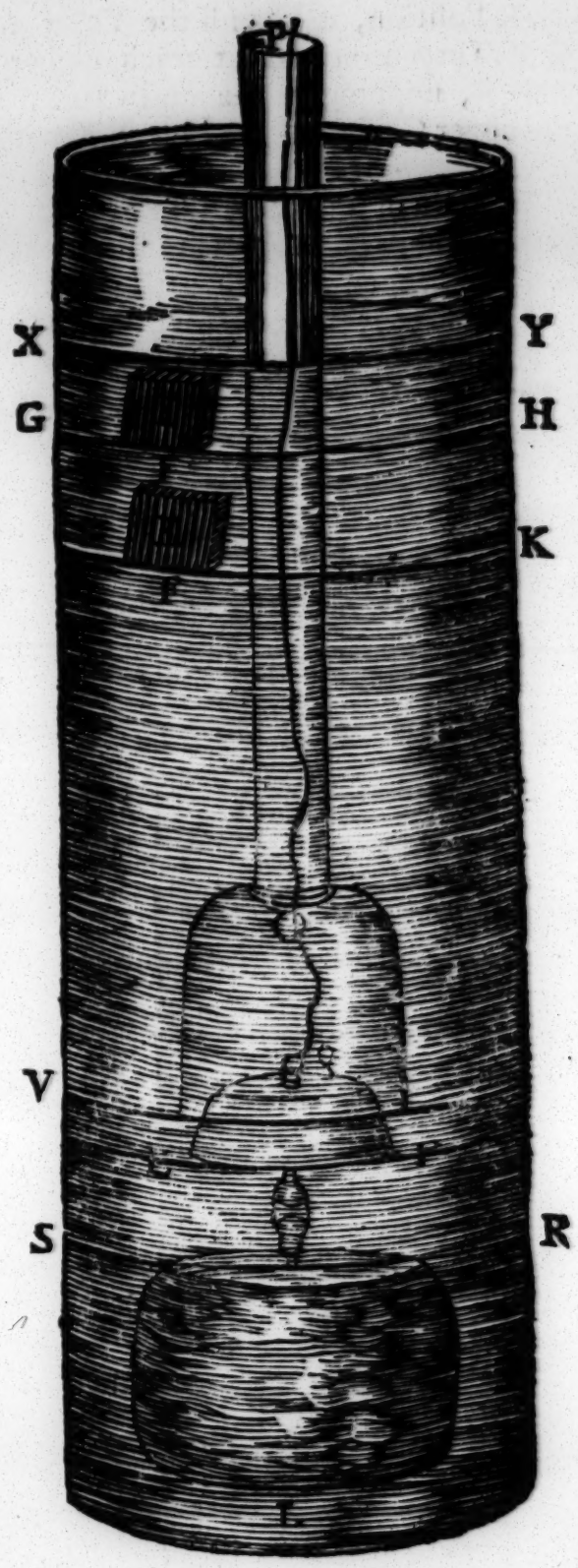
Fill a deep Glaſs Veſſel, of about 2 or 3 Feet in length (a large Tube, ſealed at the End, will do very well) with Water, as in the Figure: If then a little Cylinder or Cube of ſolid Braſs, as *E*, be any where placed, either at the Surface, Middle, or towards the Bottom of the Veſſel, ſtill it muſt ſink to the Bottom, becauſe the compound Column of Water and Braſs together (which Braſs is al-

moſt 9 times as heavy as common Water) will gravitate or preſs more than any Column of Water only of the ſame Length and Diameter; and conſequently the Braſs will diſplace the Water under it, and ſink lower and lower till it come to the Bottom; and this is the Caſe of a Stone, or any other heavy Body, &c. But yet, if you ſuppoſe this Piece of Braſs placed on the imaginary Surface *L M*, above 9 times its depth under Water, and that it were poſſible to keep off the Preſſure of the Water perpendicularly incumbent upon it, it is not reaſonable to ſuppoſe, That the Braſs ſhould ſink at all, but be ſupported and buoyed up there: For the Braſs can in this Caſe charge the Water under it at *F*, with no more than juſt its own proper and abſolute Weight; whereas all the other Parts of the Surface *L M*, are charged or preſſed upon by Columns of Water, which, ſuppoſing them to be of the ſame Diameter with the Piece of Braſs, or ſingly heavier than the Braſs, becauſe they are above 9 times as long as the Braſs is thick; and therefore preſſing or gravitating more on *L M* than the Braſs doth, muſt keep the Braſs ſuſpended; which cannot ſink, becauſe it cannot remove a Weight of Water heavier than it ſelf. And from the ſame Principles 'tis plain from Reaſon, That if the Braſs be placed yet lower, and the Preſſure of the incumbent Water be, as before, taken off, inſtead of ſinking, it muſt needs riſe, and be forcibly lifted upward. This alſo muſt be the Caſe of a Piece of Gold, if it were placed in theſe Circumſtances, in a Veſſel of Water, where the perpendicularly incumbent Preſſure was kept off, and the Gold above 19 Times its own Thickneſs in the Liquor.



To make good which probable Reaſoning by Experiment, our Author proceeded thus:

A large deep Glaſs Veſſel was provided, of the Figure annexed, which was filled with Water near to the Top, as to *XY*: Then at the Bottom of a Glaſs Tube, open at both Ends, there was, by good Cement, faſtened a Braſs Valve, into which was turned and fitted a Piece of ſolid Braſs *EF*, which, tho' it would ſtop the Valve exactly, would yet eaſily fall out, if not ſuſpended or ſupported by



any thing: To the upper Side of this Braſs Piece *EF* let there be a Button faſtened, whereby it may, by means of a String coming up through the Pipe *PO*, be drawn up cloſe, ſo as to ſtop the Valve.

All things being thus fitted, if you ſink the Tube with its Valve and Braſs Stopple, and by the String keep the Stopple faſt in, till the Braſs be about 9 times its Thickneſs beneath the Surface of the Water in the Glaſs Veſſel, you will find, tho' you looſen the String, that the Braſs Stopple will not fall out; becauſe the Valve being cloſe, and the Sides of the Glaſs Tube not capable of being premeated by the Water, there can no more of that Liquor preſs upon the Braſs Stopple perpendicularly; but whatever Preſſure it ſuſtains, is from the Tendency of the Water upwards, which muſt needs ſerve to ſupport it, ſince that is greater than the Weight of the Braſs. But if you raiſe the Tube up towards the Top of the Water, the Braſs Weight over-balancing there the Preſſure of the Water upward, it will ſoon, if not held by the String, ſlip out of the Valve and fall down, and the Water will immediately riſe in the Tube.

And if, inſtead of raiſing the Tube up towards the Surface of the Water *XY*, you ſhould ſink it down much deeper toward the Bottom, you will find that

that this Braſs Stopple, which will fall out readily in the former Station, will now ſupport a conſiderable Weight (as *L*) faſtened to it by a Bottom made on the under Surface of it; but that on the raiſing of the Tube upward, this additional Weight will make the Stopple drop out much ſooner than before: As ſuppoſe, when the Tube is raiſed only to the Height of 3 or 4 Inches, *&c.* which Experiments do abundantly confirm the Truth of this Paradox; and no doubt can be made, but that if a Gold Stopple had been uſed inſtead of a Braſs one, and the Tube let down into the Veſſel, till the Gold had been above 19 times its Thickneſs under Water, even that ponderous Metal would have there remained without ſinking.

N. B. This Experiment may moſt readily and eaſily be tried (as I have often done my ſelf) with Mercury: If you take a ſlender Glaſs Tube or Pipe, of about $\frac{1}{4}$ of an Inch Bore, or rather leſs, and dipping the lower End into a Veſſel of Mercury, you then ſtop the upper End with your Finger, by which means you may keep half an Inch, more or leſs, of that ponderous Fluid ſuſpended in the Pipe; and then if, keeping your Finger thus, you immerſe the Tube into a long Glaſs of Water, till the little Column of Mercury be more than 13 or 14 times its length under Water, you will find on removing your Finger, that the Mercury will be kept ſuſpended in the Tube by the Preſſure of the Water upwards; but that if you raiſe the Tube up but a very little above the former Station, the Mercury will immediately run out: Whereas, if before you had removed your Finger from the Top, you had ſunk the Pipe ſo low, as that the Mercury were 12 or 14 Inches, *&c.* below the Surface of the Water, that then the Mercury would be violently forced up, and make ſeveral Aſcents and Deſcents in the Tube, till by degrees it had gained its proper Station in it, according to the Laws of Specifick Gravity.

Indeed this Experiment will not be of a very long Continuance, becauſe the Water will by degrees get up between the Mercury and the Sides of the Tube; but it will laſt a few Minutes, and longer if the Tube be very ſlender, which is time enough to ſatisfy any one of the Truth of this Paradox.

From hence may the Adheſion of the two poliſhed Marbles together, when the upper is ſuſpended, and a great Weight hung to the latter, be eaſily accounted for: For ſince the Atmoſphere preſſes or gravitates with its whole Weight on the under Surface and Sides of the lower Marble, but cannot do ſo at all on its upper Surface, which is cloſely contiguous to the upper and ſuſpended Marble, it muſt needs keep the Stone buoyed up or pendulous, 'till ſuch time as either the Air inſinuate it ſelf in between the Stones, or that a Weight be affixed to the lower Stone, which exceeds the Weight of a Pillar of Air, whoſe Diameter is that of the Marble, and its Height reaching to the Top of the Atmoſphere: And that this is the reaſon of their Coheſion, is plain, becauſe when they are thus ſuſpended, and do adhere to each other in the Receiver of the Air-Pump, on a very few Pumpings of the Air out of the Receiver, they will immediately disjoin and fall aſunder.

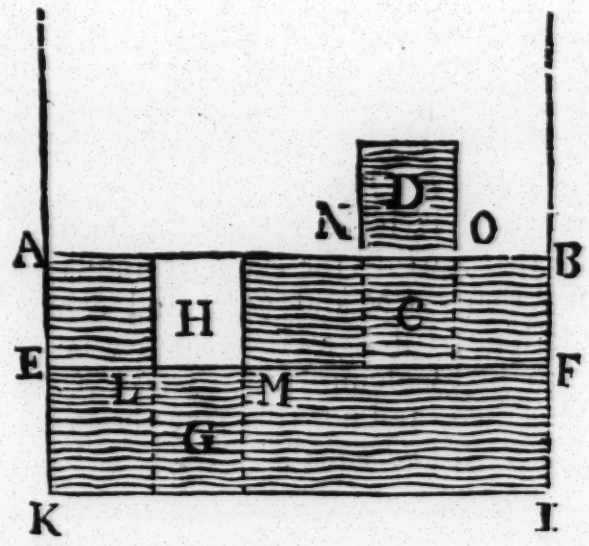
Thus far went this Excellent Gentleman; But that the Mathematical Reader may alſo be pleaſed in his way too, he has the following ſhort Account of *Hydroſtaticks*, drawn up from Dr. *Wallis* and ſome other Authors.

PROP. I.

Let the Veſſel AKIB be fill'd with Water, or any other Fluid, whoſe Surface we ſuppoſe to be even; (which, though in reality it will not be a Plane, but part of the Surface of a Sphere concentrical with the Earth; yet we ſhall all along conſider it as a Plane, or as differing inſenſibly from one;) I ſay, if this Surface be ſuppoſed even at firſt, 'twill ſtill remain ſo.

Which is thus demonſtrated:

Let the even Surface *AB* of the Veſſel *AKIB* (See *Fig.* 1.) be either not preſſed at all, or elſe preſſed equally in every Part, as will be the Caſe, allowing the Preſſure of the Air, which is an Homogeneal Body with reſpect to Gravity, and preſſes equally in all the Parts of ſo ſmall a Surface. Now ſince the Parts of the Fluid below are all acted upon by Gravitation, they cannot aſcend, and ſo elevate any part of the Surface *AB*; nor can the Fluid ſubſide in one part, and ſo be elevated in another, being the Preſſure againſt the Bottom is every where equal, and conſequently hinders one another's Subſidence, ſuppoſing the Fluid divided into any number of equal Columns: Hence it follows, from the contrary Preſſure of theſe equal Columns at the Bottom of the Veſſel, that there can be no Motion; that is, the Surface will remain even without any manner of Diſturbance. *Q. E. D. See Dr.* Wallis's *Mecha. Prop.* 8. *Cap.* 2. *de deſcenſu gravium.*



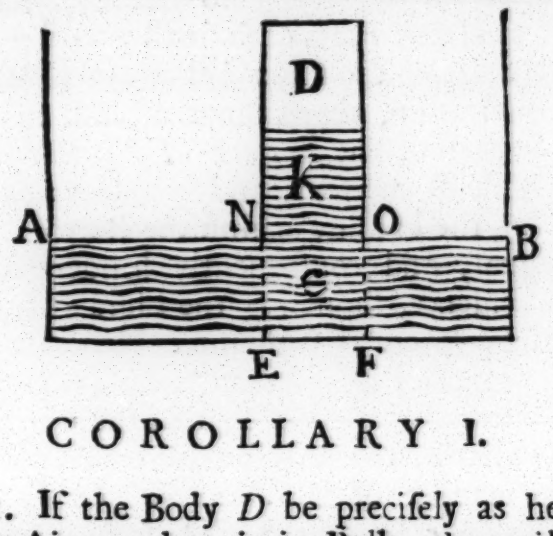
But if the Fluid be put out of this State by ſome external Force, ſo that one part of it, as *D* (*Fig.* 1.) be elevated above the reſt, do but remove the Force, and it will return to its former Horizontal Poſition, partly upon the Account of its Fluidity; the Parts above flowing down into thoſe Places that are below them, and alſo becauſe the ſubjected Part *C* being more preſt than the other Parts of the Surface *AB*, this Preſſure will be continued to the Bottom of the Veſſel; where, by reaſon of the reſiſtance made by the Bottom, it will be communicated to thoſe Parts that are leſs preſt, forcing them to aſcend ſo long till the *Æquilibrium* be again reſtored, *i. e.* till *AB* become even and parallel to the Horizon: So that altho' the Surface be not a Plane, as it was ſuppoſed in the foregoing Propoſition, yet if the force be removed that made its Surface unequal, it will again recover its former State.

There

There may be ſome Accidental Variations which we ſhall not at preſent conſider, as that the Parts of the Fluid may happen to be tenacious, &c.

If the Fluid be preſſed more in one part than another, as in *C*, by reaſon of the incumbent Body *D* (*Fig.* 1.) (which Body is ſuppos'd to be ſpecifically heavier than Air) then will the part of the Fluid *C* ſubſide, forcing the other Parts of *AB* to riſe, in order to make way for it; and this will happen till ſuch time as *C* is no more preſſed than any other Parts of the Surface *AB*.

And what we have ſaid of *AB* is equally true of any parallel Surface with the Fluid; as of *EF*, whoſe Surface is Horizontal, and will remain ſo, the Preſſure being every where equal: But if the immerged Body *A* be ſpecifically heavier than the Fluid, the ſubjected Part G, as ſuſtaining a greater Weight, will be depreſt, forcing the Fluid to riſe in the parts about *EL* and *MF*, which parts have a leſs Preſſure upon them than the part *LM*.

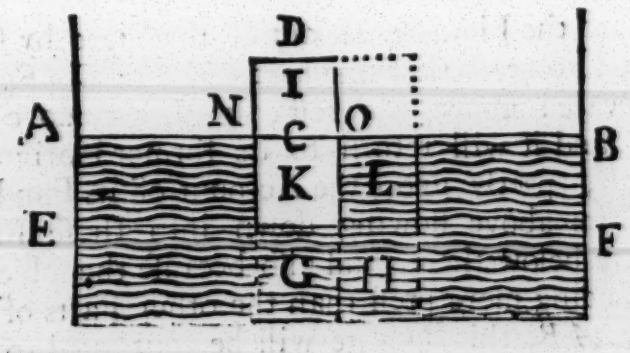


COROLLARY I.

Fig. 1. If the Body *D* be preciſely as heavy as ſo much Air equal to it in Bulk, then will *NO*, that Portion of the Surface which *D* inſiſts upon, have the ſame Preſſure upon it with *AN* and *OB*; and conſequently the Surface will retain its Horizontal Poſition, as having ſtill every where an equal Preſſure upon it.

COROLLARY II.

If the Body *D* (*Fig.* 2.) be ſpecifically lighter than Air, and if it be ſuppoſed not to fly away, then will that part of the Fluid it inſiſts upon, be leſs preſſed than *AN* and *OB*, and conſequently will riſe ſo high, till *K* and *D* together be equal in Weight to that Column of Air whoſe Room they poſſeſs; for then, and not till then, the Preſſure upon *ANOB* will be equal.



COROLLARY III.

If the Body *D* (*Fig.* 3.) be ſpecifically heavier than Air, but lighter than Water, it will then depreſs that part of the Fluid that is under it, and ſubſide ſo far into the Water (ſuppoſe to *G*) until the Gravity of that part of it which is above the Surface of the Water, *viz. I.* bears the ſame Proportion to as much Air as equals it in Bulk: As the Gravity of as much Water as is in Bulk equal to *K*, (*viz. I.*) bears to the Gravity of the immerſed part *G*. To illuſtrate which, put *G* for the Gravity of *I*, *g* for the Gravity of an equal Portion of Air, *M* for the Gravity of *K*, and *m* for the Gravity of *L*; then, before the parallel Surface *EF* can have an equal Preſſure upon it, *GM* muſt be equal to *gm*. (*i. e.*) *G* : *g* :: *m* : *M*.

COROLLARY IV.

If *D* or *H* (*Fig.* 1.) be, Bulk for Bulk, heavier than Water, then will *C* and *G*, the Parts they inſiſt upon, have a greater Preſſure upon them than the other Parts of the two Surfaces *AB* and *EF*; and this will be every where true, ſo that *D* or *H* muſt ſink to the Bottom of the Veſſel *KL*.

COROLLARY V.

If *D* (*Fig.* 1.) be preciſely as heavy as Air, then (by *Cor.* 1.) it will inſiſt upon the Surface without ſubſiding at all; for it will be the ſame thing as if ſo much Air preſt in the room of it: But if it be ſpecifically as heavy as the Fluid it is immerged in, then where ever it be placed within the Fluid, there it will remain; for as to Gravitation, there will be no Difference between the Fluid and it.

PROP. II.

If A be a Body ſpecifically lighter than B (Fig. 4.) *an equal Portion of the Fluid (in which it is immerged) then will it riſe with a Force proportionable to the Exceſs of Gravity of B + above A.*

Demonſtration.

For the Gravity of *A* put *x*; for that of *B*, *x* + *y* (*y* repreſenting the Exceſs of Gravity of *B* above *A*) then take a Body, as *D*, with the Gravity *y*, and let *D* + *A* be immerged in the Veſſel *ABCD*, and it will ſubſide ſo far, till *x* + *y* : *x* :: *y* : is to the Gravity of a Quantity of Air equal to *D*, (which, becauſe 'tis very inconſiderable, may be neglected) or till *B*, a Quantity of Water equal in Bulk to the immerſed part *A*, ſhall be equal in Gravity to the whole *D* + *A*: But a Quantity of Water, equal in Bulk to *A*, ſhall (by the Suppoſition) have its Gravity equal to the Gravity of *D* + *A*; therefore *A* is the part immerſed.

From this *Æquilibrium* it is evident, That the Force with which *A* preſſes upwards, is equal to the Gravity of *D* downwards; but the Gravity of *D* is equal to the Exceſs of Gravity of *B* above *A*; therefore

therefore *A* aſcends with a Force proportionable to the Exceſs of Gravity of *B* above *A*. *Q. E D.*

PROP. III.

If the Body A (Fig. 4.) *be ſuppoſed heavier than B, (an equal Portion of the Fluid in which it is immerged) it gravitates with the Exceſs only of its Gravity above that of B.*

Demonſtration.

Let the Gravity of *B* be $= x$, and that of $A = x + y$; then theſe two Forces being directly contrary, x and x deſtroy one another, ſo that *A* only gravitates with y, the Gravity by which *A* exceeds *B*. *Q. E. D.*

COROLLARY.

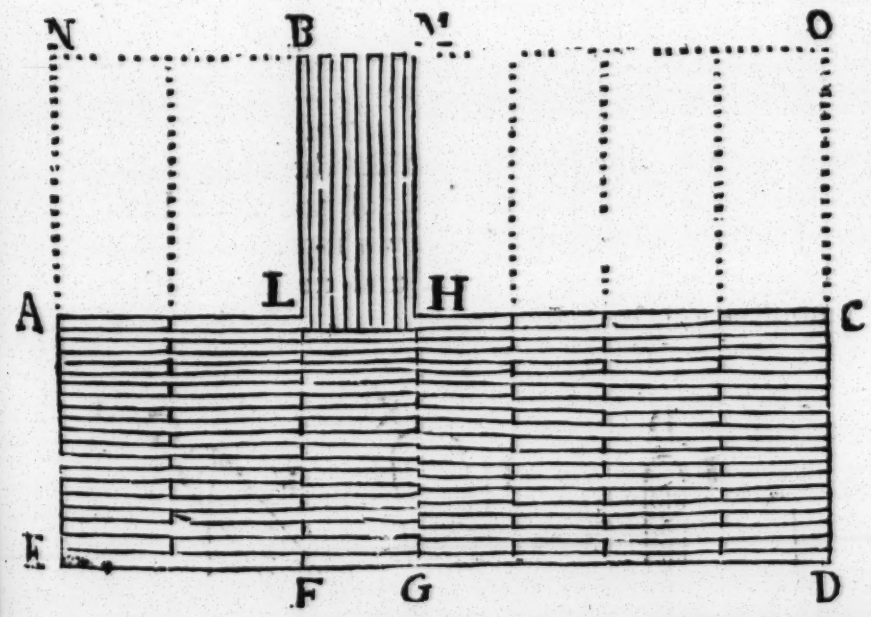
Hence it is manifeſt, That of Bodies immerſed in Water, or any other Fluid, we only perceive the Difference between the Weights of the immerſed Body, and of ſuch a Quantity of Water, or any other Fluid, in which the Body is immerſed, which is equal to the Bulk of that Body.

PROP. IV.

All Fluids preſs upon ſubjected Bodies according to their perpendicular Altitude, and not according to their Latitude.

Which is thus demonſtrated.

Let there be a Veſſel *ALB MHCDE* full of Water (*Fig.* 5.) then becauſe the Column *BF* is heavier (becauſe longer) than *HG*, 'tis certain, that if the Veſſel was open at *H*, *GH* would aſcend



till ſuch time as the Columns *BF* and *GH* were in an *Æquilibrium*; or of an equal Height; but ſeeing the Veſſel at *H* is ſhut, and conſequently hinders *GH* from aſcending, the Preſſure upwards upon *H* is equal to the Difference of the two Columns *BF* and *HG*, *i. e. BL*. And ſince all Preſſure is reciprocal, *i. e.* as much as *H* is preſſed upwards by the Liquor, ſo much it preſſes the Liquor downwards againſt the Bottom (Action and Re-action being always equal one to another:) If to this Preſſure be added the Gravity of *GH*, the Preſſure upon the Bottom G, will be the ſame as if it had the entire Column *BF* inſiſting upon it.

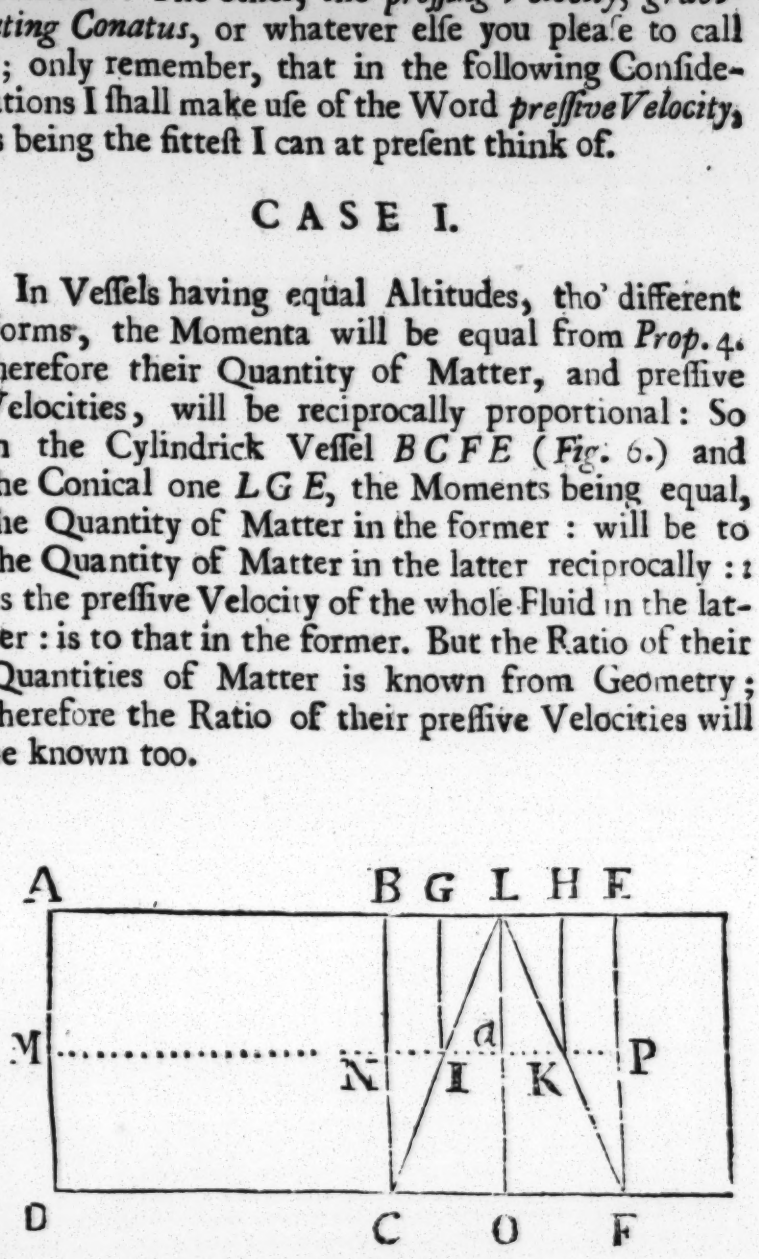
The ſame may be demonſtrated of all the reſt of the equal imaginary Columns; and conſequently 'tis evident, That the Bottom of the Veſſel *ED* ſuſtains as great a Preſſure, as if *NEOD* were full of Water. *Q. E. D.*

SCHOLIUM, by Mr. *Ditton*.

The Momenta of Fluids preſſing upon any Fund, may be look'd upon as Products; the Quantity of Matter being one of the Factors that compoſe theſe Momenta: The other, the *preſſing Velocity*, *gravitating Conatus*, or whatever elſe you pleaſe to call it; only remember, that in the following Conſiderations I ſhall make uſe of the Word *preſſive Velocity*, as being the fitteſt I can at preſent think of.

CASE I.

In Veſſels having equal Altitudes, tho' different Forms, the Momenta will be equal from *Prop.* 4. therefore their Quantity of Matter, and preſſive Velocities, will be reciprocally proportional: So in the Cylindrick Veſſel *BCFE* (*Fig.* 6.) and the Conical one *LGE*, the Moments being equal, the Quantity of Matter in the former: will be to the Quantity of Matter in the latter reciprocally:: as the preſſive Velocity of the whole Fluid in the latter: is to that in the former. But the Ratio of their Quantities of Matter is known from Geometry; therefore the Ratio of their preſſive Velocities will be known too.



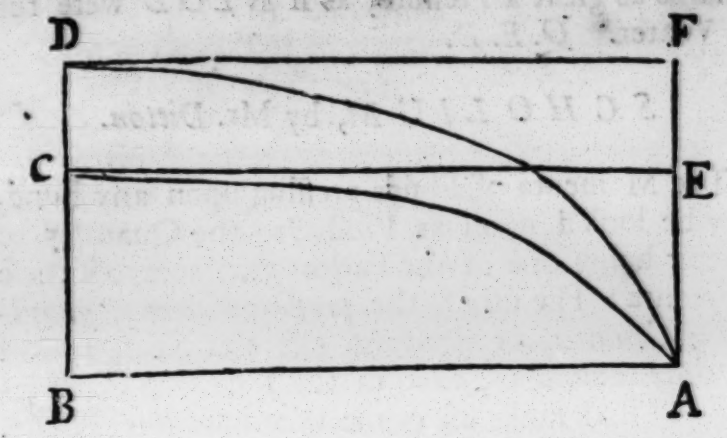
CASE II.

In the Veſſel *LCF*, 'twill be an eaſy thing to find the Momenta of the Fluid preſſing upon the ſeveral imaginary parallel Funds, as *CF*, *IK*, &c. for the Momentum of *LCF*: is to the Momentum of *LIK*:: as the Momentum of the Cylinder *BCFE*: to the Momentum of the Cylinder *GIKH*. But univerſally, the Momenta of Cylinders are as their Altitudes, by the laſt: Therefore let *LCF* be what Figure it will, the Preſſure upon a Fund, as *IK*: is to the Preſſure upon a Fund, as *CF* in the Veſſel continued ſo far:: as the Abſciſſe *La*: is to the Abſciſſe *LO*; that is, as *Ia*, to *CO*. And if you ſuppoſe it a parabolick Veſſel, as *Iaq*, to *COq*, &c.

N. B. We here conſider the Fund *IK*, as making a diſtinct Veſſel, and not meerly an imaginary one; ſo that *LIK* and *LCF* may be conſidered as two diſtinct Veſſels.

From what is ſaid may be found the Proportion of the preſſive Velocities in the Veſſels *LCF*, *LIK*; for we know the Ratio of their Momenta, and the Ratio of their Magnitudes; therefore that alſo of their preſſive Velocities, the other Factor of their Momenta, will be known too.

But



But the Momenta of Veſſels of different Heights, having the ſame common Fund, will be as thoſe Altitudes.

Suppoſe *AD* and *AC* two parabolick Veſſels, having the ſame common Abſciſſe *AB*; then will their Momenta upon the common Fund *AB*, be as their Ordinates *BC* and *BD*, *i.e.* as the Area's of the two Semi-parabola's *ADB* and *ACB*, or in a Sub-duplicate Ratio of their Parameters, as is evident from Conicks.

Likewiſe in Hyperbolical and Elliptical Veſſels, having the ſame Tranſverſe Diameter and Abſciſſa common to both, the Preſſure upon the common Abſciſſa, as a Fund, will be as the Area's *ACB* and *ACD* of the Semi-Ellipſis and Semi-Hyperbola.

CASE III.

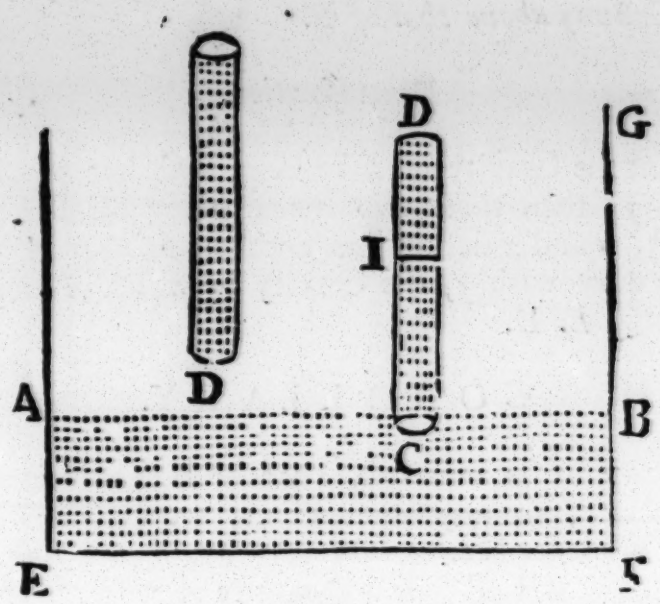
But now we come to conſider the Veſſels *LIK* and *LCF*, (Fig. 6.) as communicating with each other: And here the preſſive Velocities will be very different from what they were in the former Suppoſition: In order to expreſs the Proportions of which, we muſt conſider the Momenta of the ſeveral Portions of the Fluid taken from the Vertex, and imagin'd to be cut off by Plains parallel to the Baſe: And firſt, the Momentum of the Portion *LIK*, upon the Fund *CF*, is equal Momentum of *AMBN*, on the Fund *DC*; therefore the Momentum *LCF*: Is to the Momentum of *LIK*:: As the Momentum of the Cylinder *ABDC*: To the Momentum of the Cylinder *AMBN*; *i.e.* as *LO*, *La*. But having the Momenta's and Quantities of Matter, we can eaſily find the other Factors; that is, the preſſive Velocities of *LCF* and *LIK*, upon the Fund *CF*; which may be expreſſed thus:

The Ratio of the Momenta's is equal to $\frac{LO}{La}$ and the Ratio of the Magnitudes is equal to $\frac{LCF}{LIK}$; therefore the Ratio of the preſſive Velocities will be $\frac{LO \times LIK}{La \times LCF}$.

CASE IV.

To compare together the preſſive Velocities in both theſe diſtinct Caſes, (*viz.* 2, 3.) 'twill be only neceſſary to conſider, That in the Firſt Caſe, where we imagined a different Fund, as *IK*, the Momentum of the Portion *LIK*, is equal to that of the Cylinder *GHIK*; and in the Latter Caſe, where we ſuppoſe all one and the ſame Veſſel, and ſo the Fluid *LIK* preſſing on the Fund *CF*, that then the Momentum of that Portion *LIK*, will be equally the Momentum of the Cylinder *AMBN*; therefore the two Momenta's being as the Cylinders *AMBN*; and *GIKH*, (which have equal Altitudes) will be as *MN* to *IK*, *i.e.* as *NP*: *IK*.

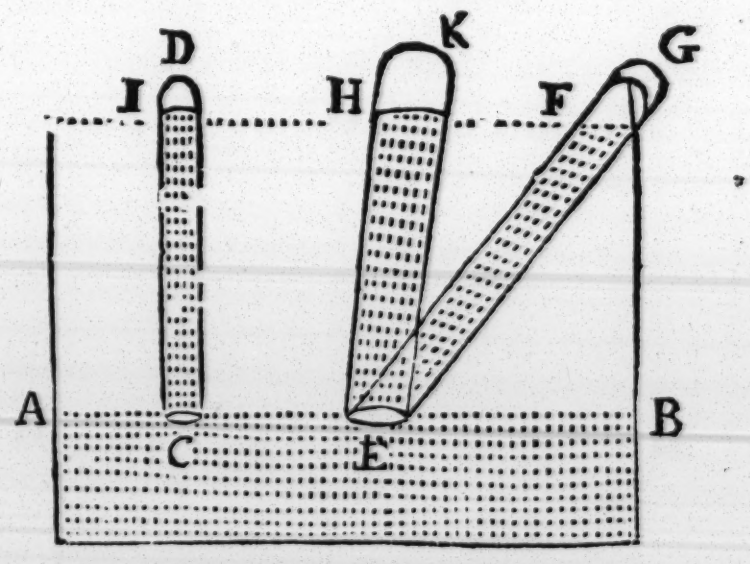
But having the Ratio of the Momenta's, we have alſo that of the preſſive Velocities of one and the ſame Quantity of the Fluid *LIK*, when conceived as preſſing upon the Fund *IK* in one Caſe, and on the Fund *CF* in the other.



CASE V.

Let *BE* (*Fig.* 8.) be a Veſſel fill'd with Mercury to the Altitude *AE*; then, as in the way of making the *Torricellian* Experiments, take a pretty long Glaſs Tube, ſhut at the End *D*, but open at *C*, which fill with Mercury; and ſtopping the open End *C*, invert the Tube, and put the ſaid End *C* into the Mercury *BE*: Tis evident from the firſt and general Propoſition, That if the Mercury contained in the Tube, preſs more upon *C*, than the Air upon the other Parts of the Mercury which are expoſed to it; 'tis evident, I ſay, That the Mercury in the Tube will deſcend ſo far, (ſuppoſe to *I*) till the Preſſure be equal on all the Parts of the Surface of the Stagnant Mercury in the Veſſel: But if the Mercury in the Tube preſs leſs upon *C*, than the external Air does on the Mercury without, then the Mercury within the Tube will aſcend ſo high, till the Preſſure of the Mercury within the Tube be equal to that of a Column of Air of the ſame Diameter in any Part of the Veſſel without.

This is clear from *Prop.* 1. and needs no other Demonſtration.



But here it may be enquired, Why, if the erect Tube *CI* (*Fig.* 9.) be put in an Oblique Poſition, as in *GE*, the Quickſilver ſhould notwithſtanding be found at the ſame perpendicular Height as before; ſince *GE* being longer than *CI*, 'tis certain there muſt be more Mercury contained in that, than in this.

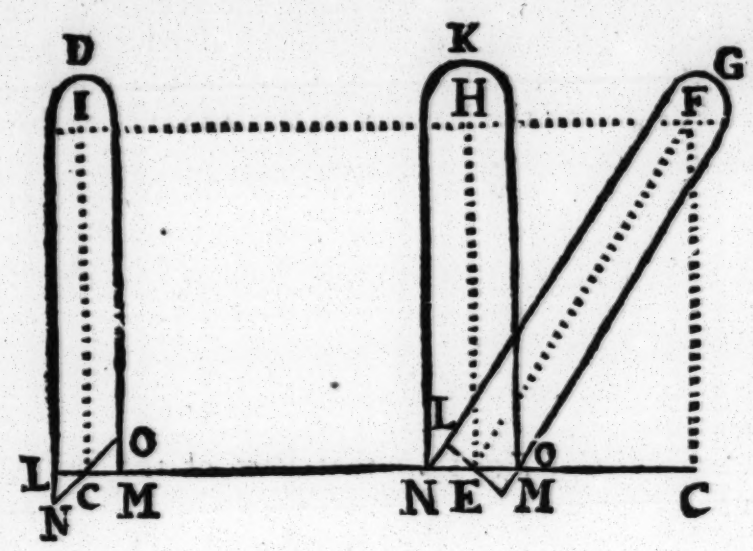
To

To this I Anſwer:

The Figure of the Surface of the Mercury in the Baſe *E* of the Tube *E G*, will become Elliptical, and conſequently enlarged by this Oblique Poſition; for tho' it will be of the ſame Breadth ſtill, yet it will be ſo much longer, as is the Ratio of the Diameter *E*, to the Diameter *C*: *i. e.* as the Tranſverſe Axe of that Ellipſis to its conjugate.

But I ſhall demonſtrate, That the Diameter of the Baſe *C*: Is to the Tranverſe of the Baſe *E* :: As the Length of the Tube *C I*: Is to the Length of the Tube *E F*.

For ſuppoſe *L C M* the Baſe of the erect Cylinder *C D*, which will be a Circle; and *N C O* the Baſe of it cut Obliquely, which will be an Ellipſis.



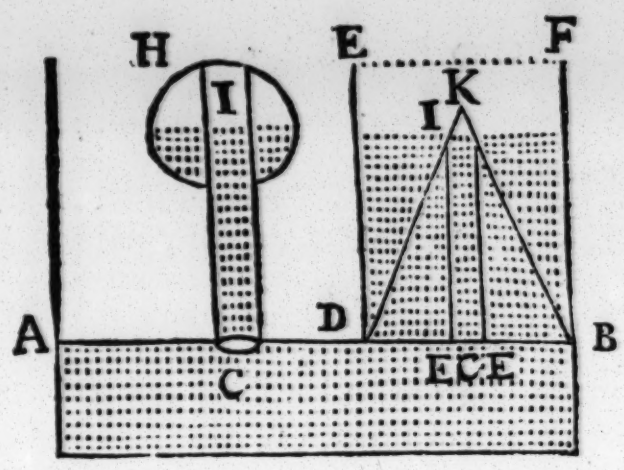
Then let the Cylinder *C D* be reclined into the Poſition *E G*, ſo that *N C O* may become *N E O*, *i. e.* in an Horizontal Poſition; the Cylinder *E F* will be equal to an erect Cylinder upon the ſame Elliptical Baſe *N E O*, and between the ſame Parallels *H F*, *N O*: From *F* therefore let fall *F C* perpendicular to *N E O* produced, and by this Means we ſhall have the Triangles *F E C* and *E N L* ſimilar; for the Angles at *C* and *L* are right, and the Angle *F E C* = *L N E*, ſeeing each of them, together with *L E N*, makes a Right Angle: Therefore *F E*: *F C* (is *C I*) :: *N E*: *E L* :: 2 *N E*: 2 *E L*; Or as the Baſe *E*: Is to the Baſe *C*. *Q. E. D.*

And now the Reaſon plainly appears, why more Mercury is kept ſuſpended in *E G* than in *C I*; (*Fig.* 9.) For the Baſe *E* of the Oblique Tube *E G*: Is as much greater than the Baſe *C* of the erect Tube *C D* :: As is the Length of the Former: Than the Length of the Latter.

But then it may be further enquired, Why, in the two equal Cylinders *E F* and *E H*, (*Fig.* 10.) the Mercury ſhould not riſe higher in the Former than in the Latter, ſince Dr. *Wallis* has demonſtrated, *Cap.* 2. *Prop.* 19. That equal Bodies gravitate in Proportion to their Declivities; and conſequently the Gravity of the Fluid within the Tube *E F*, being weaken'd by the Obliquity of the Tube, 'tis but reaſonable to ſuppoſe, That the Mercury ſhould be raiſed to a greater Height than in the erect Tube *E H*, whoſe Poſition does not at all weaken or hinder the Gravitation of the Fluid.

But here it ought to be conſider'd, That tho' the Gravity of the Fluid in the Tube *E F* be leſſened in proportion to the Obliquity of the Tube, yet at the ſame time the Preſſure upwards is weakened or hindered in the ſame proportion, the Angles *E F C* and *F E H* being equal; ſo that here is a ſort of Compenſation made, and the ſame Force [illegible]ch keeps the Mercury ſuſpended in *E H*, will be no more than ſufficient to buoy up that in *E F* of an equal Altitude with the Former.

Alſo, ſince Tubes and Veſſels, having the ſame or equal Baſes and Altitudes with Cylinders and Priſms, may, notwithſtanding, contain more or leſs Mercury than thoſe Cylinders and Priſms (as is apparent from *Fig.* 11.) it may very reaſonably be



aſk'd, Why the Mercury ſtands at the ſame Height in all? *Viz.* Why in the Tube *C H*, with a round Head, the Mercury ſhould ſtand at the ſame Height that it does in the Cylinder *C I*, upon the ſame or an equal Baſe? And why in the Veſſel *D K B*, it ſhould not riſe higher than it does in *E D B F*?

The Reaſon of theſe two Phænomena I take to be this:

Firſt, In the Tube *C H*, the Mercury contain'd in the Head, without the inſcribed Tube *C I*, is not ſupported by the Baſe *C*, but by the Sides of the Head of the Tube; and conſequently the Preſſure upon *C*, is the ſame in both Tubes *C H*, *C I*; therefore the Altitude of the Mercury in both of them muſt be the ſame.

Secondly, Although the Veſſel *D K B* be much leſs than the Circumſcribing one, yet it will be an eaſy Matter to account for the Mercury's riſing no higher in that than in this; for at thoſe Parts of the Baſe, as *C*, where the Mercury has a free Aſcent, it ariſes to a certain determinate Height, as *C I*, in the Veſſel *D K B*; but the Aſcent of the other Parts *D E* and *E B*, is impeded by the Sides of the Veſſel *D K* and *K B*, as much as if *E D I* preſt upon it; therefore it cannot riſe any higher than the Mercury in the Circumſcribing Veſſel *E D B F*.

PROP. V.

If the Mercury in the Tube C D (See Fig. 9.*) be kept ſuſpended at the Altitude C I, yet if the Aggregate of the Tube and Mercury be left to it ſelf to deſcend freely, it will ſink into the Stagnant Mercury ſo far, till the Gravity D I or D C (the Part above the Surface A B) bears the ſame Proportion to the Gravity of as much Air equal to it in Bulk :: As the Weight of a Quantity of Mercury equal in Bulk to that Part immerſed, bears to the Weight of the immerſed Part of the Tube, together with the Mercury included in C I.*

For the Air upon the Out-ſide *D*, of the Top of the Tube *D C*, is very nearly equal to the Preſſure of the Air upon the other Parts of the Surface of the Mercury *A B*; but this Preſſure upon the Top of the Tube being added to the Preſſure of the included Mercury, together with the Weight of the Tube, will make the Preſſure upon *C* more than double to the Preſſure upon any other Part,

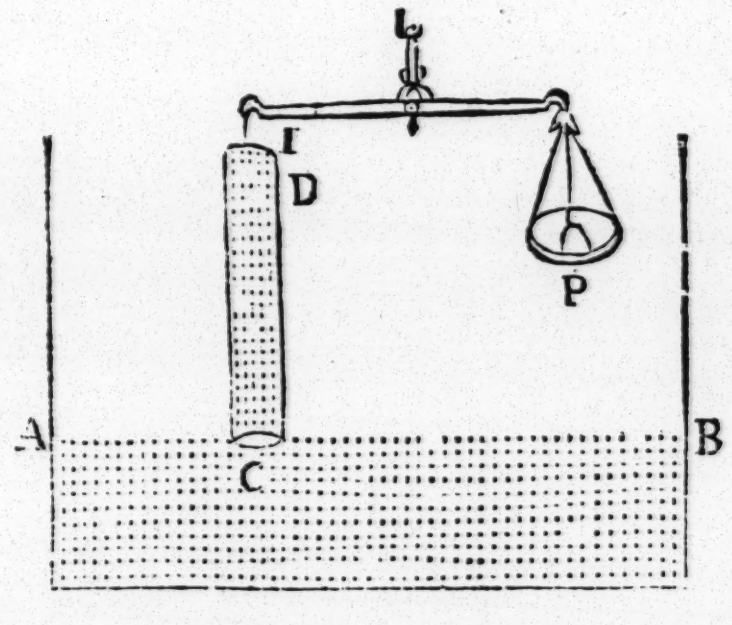
being the Effect of a double Column of Air of the Diameter of the Tube: and the Weight of the Tube and incumbent Air being not ſuſtained otherways, (by *Cor.* 3. *Prop.* 1.) the Tube will ſubſide ſo far, till the Part above the Surface bears the ſame Proportion to as much Air equal to it in Bulk, as a Quantity of Mercury equal in Bulk to the Part immerſed, bears to the immerſed Part. *Q. E. D.*

COROLLARY. I.

If the Tube *DI* be kept ſuſpended with its End *C* juſt under the Surface of the Mercury, the Weight or Tendency of the Tube downwards, is equal to the Gravity of a Column of Air, inſiſting upon the Top of the Tube *DI*, together with the Exceſs of the Gravity of the Tube above an equal Portion of Air; or, which is nearly the ſame Thing, equal to the Weight of the incloſed Mercury *DC*, together with the forementioned Exceſs.

COR. II.

But if *DC*, the Altitude of the inverted Tube, be leſs than *CI*, (where the Mercury, as in a common Barometer, would ſtand, were it not hinder'd) and conſequently, if the Air preſs more upon the other Parts, than the Mercury *DC* does upon *C*; then will ſo much of the Weight of the Tube and Mercury be abated, or ſo much Weight may be ſuppoſed to be taken out of the Scale *P*, (*Fig.* 12.) as is equal to the Exceſs of the Preſſure upon the other Parts above that upon *C*; for the Force upwards in *C* can ſuſtain ſo much Mercury, as is contained in a Tube whoſe Altitude is *CI*: Therefore



if the Altitude *CD* be leſs than *CI*, 'tis plain the Preſſure upwards at *C* will be able to buoy up as much more Weight than *DC*, as *DC* wants of *CI*; that is, ſo much Weight may be taken out of the Scale *P*, to bring it to an *Æquilibrium*.

For the Preſſure of the incumbent Air upon the Parts of the Surface *AB*, ſurrounding *C*, is ſufficient to ſuſtain either a Column of Air of an equal Weight with the former, or a mixt Column made up of 'em both, which does not exceed the Gravity of one of them, but cannot ſuſtain them both together, or any Thing more than what is equal to the Gravity of one.

Suppoſe the Part *C* of the Surface of the Mercury *AB* (*Fig.* 12.) expoſed to the open Air, then there will be ſuſtained a Column of the incumbent Air, equal to what is ſuſtained by every other equal Part of the Surface; but neither Mercury, nor any thing elſe more intenſively or ſpecifically heavier than Air, for that would deſtroy the *Æquilibrium*, by *Prop.* 1.

2. If, as in the *Torricellian* Experiment, which ſuppoſe made, the Preſſure of the incumbent Air be kept from acting upon *C* by *I*, the Top of the Tube *CI*, or any how elſe; the Preſſure at *C* upwards will then ſuſtain a Column of Mercury equal in Gravity to a Column of Air upon the ſame Baſe, but it can ſuſtain nothing elſe; ſo that the Tube, with the incumbent Column of Air upon the Top of it, muſt be ſuſtained ſome other way, either by the Hand, or by an equal Weight in the oppoſite Scale, *&c.*

3. If the Preſſure of the incumbent Air be kept off only in Part; that is, if the Pondus in the Scale *P*, be leſs than the Gravity of the Air reſting upon the Top of the Tube, and the Tube it ſelf; then *C* will ſuſtain a mixt Column, *i.e.* partly of Air, part of Mercury: And the Quantity of Air ſuſtained by *C*, is equal to the Exceſs of the Weight of the incumbent Air and Tube above the Pondus *P*; and the Mercury within the Tube wants juſt ſo much of the Weight of the Mercury in the laſt Caſe, as that Exceſs amounts to.

4. If the Pondus in the Scale *P*, be greater than the Weight of an incumbent Column upon the Top of the Tube, together with the Tube it ſelf, then it will elevate the Tube out of the Mercury.

This Matter will ſtill be more clear by the following Inſtances.

Suppoſe *C*, (*Fig.* 12.) that Part of the Surface *AB* upon which the Tube inſiſts, to be ſo large, as that being expoſed to the open Air, it can ſuſtain a Column of Air of 10 Ounces: Then if the *Torricellian* Experiment be made, and *C* be defended from the Gravitation of the Air upon it, then will, in its room, be ſuſpended a Column of Mercury, or any other Fluid which does not exceed 10 Ounces.

Let us imagine the Weight of the Tube to be two Ounces; then will the Weight of the Tube, together with the incumbent Air, be equal to 12 Ounces nearly, (I ſay nearly, for any one will perceive, from *Prop.* 5. that it wont be exactly ſo;) from which Preſſure *C* muſt be entirely freed, which may be done by the Hand, or by 12 Ounces in the Scale *P*.

Now let us ſuppoſe 4 Ounces taken out of the Scale *P*, then there will remain only 8, which cannot be a Balance for 12: Therefore the Tube *DC* will ſink down into the ſtagnant Mercury, (the Preſſure downwards upon *C* being greater by 4 Ounces, than the Preſſure any where elſe on the Surface of the ſtagnant Mercury) till the included Mercury weigh only 6 Ounces.

But here it may ſeem ſtrange, Why 8 Ounces in the Scale *P*, can buoy up the Tube equal to 2 Ounces, added to the Weight of the incumbent Air equal to 10 Ounces: But the Reaſon of this is evident; for the Preſſure upwards in *C*, is 4 Ounces greater than any where elſe; or, which is the ſame Thing, 4 of thoſe 12 Ounces (the Weight of the Tube and incumbent Air) will not be perceived, by reaſon of the contrary Tendency of the Mercury upwards at *C*; ſo that there will remain only 8 Ounces, equal to the Weight of the Pondus in *P*.

But if, inſtead of 4 Ounces, the whole Pondus had been taken out of the Scale *P*, *C* would then have a greater Preſſure upon it than it is able to bear, and conſequently will give way, and ſuffer the Tube and Mercury to ſink quite down to the Bottom of the Veſſel.

If

If, instead of 4 Ounces, 2 only had been taken out of the Scale *P*, there will remain 10 Ounces, which will take off 10 of the 12 Ounces, (the Weight of the Tube and Air together) and the remaining 2 Ounces will press upon *C*, which, with 8 Ounces of Mercury, will make 10; so that the Mercury in the Tube, in this Case, will weigh 8 Ounces, as before it weighed only 6; *i. e.* the Tube will ascend till the Mercury within it weigh 2 Ounces more than it did before.

If 2 Ounces more be added to *P*, the Tube will rise until the Mercury in it weigh 2 Ounces more than before, *i. e.* 10; but if any more Weight be added to *P*, the Tube will be elevated out of the Mercury.

From the foregoing Principles 'twill be no difficult Matter to account for that Experiment of Water rising higher in very narrow Tubes, than the Surface of the Water in which they are immers'd; for if you take a very slender Tube, open at both Ends, and put one End in a Vessel of Water, the Water within the Tube will be found something above the Level of the Water without, more and more proportionably to the Smallness of the Tube in which the Experiment is made.

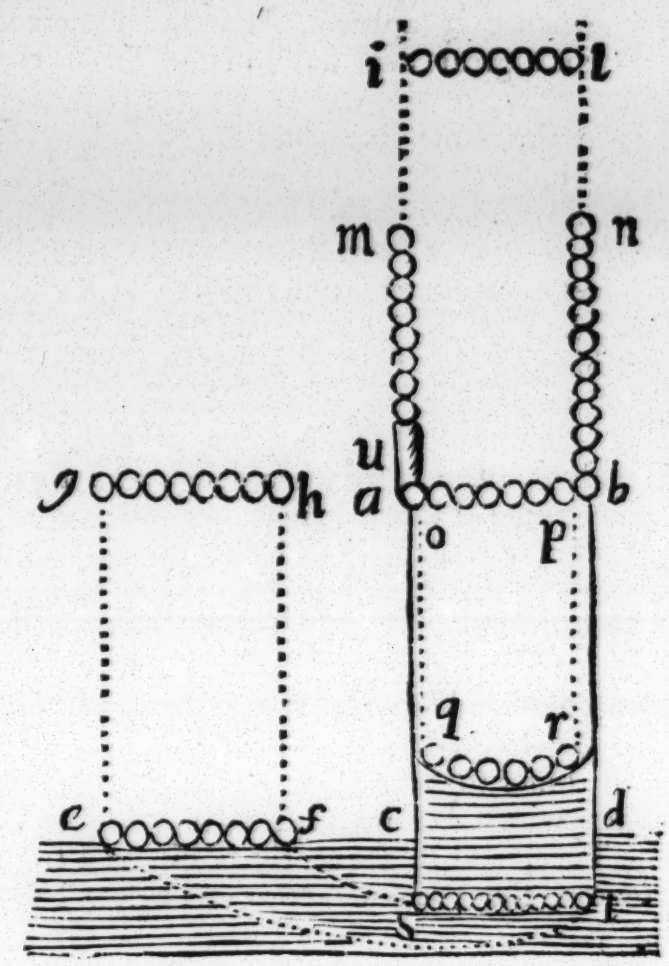
Rohault, in the First Part of his Physicks, *Cap.* 22. *Sect.* 85. tells us, That he thinks this Phænomenon may be thus accounted for: He fancies, That the Particles of Air cannot move so briskly in slender Pipes, as in larger; and consequently, are hinder'd from exercising a Force sufficient to suppress the Water.

Tho' had but this Gentleman made the same Experiment with Mercury, he would have found the quite contrary Effect, and that the Mercury in small Tubes is depress'd below the Mercury without.

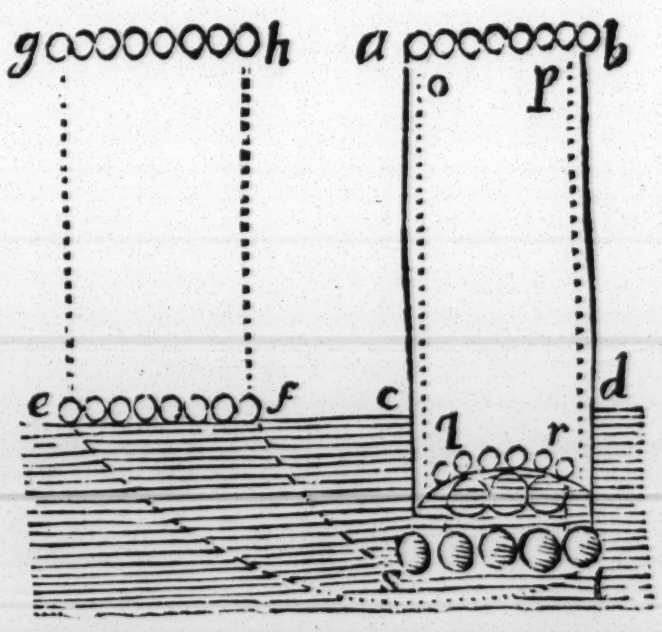
Besides, his Solution will appear precarious to any one that considers the Thing; for I wonder what a free Motion of the Particles of Air hath to do in depressing or elevating Liquors contain'd in Tubes: This is certainly the Effect of Gravity, whose Action is Rectilinear; but this Rectilinear Pressure is no more hinder'd in small Tubes than in larger.

And therefore the Reason why Water in small Tubes rises higher than the Level of the Surface without, according to Hydrostatical Principles, must be either because the Pressure without is increased, or the Pressure within the Tube diminished; but the Pressure without does not seem to be increased by barely putting the Tube into Water, and therefore it follows, the Pressure within is lessen'd: How this can be, is now to be accounted for.

Let there be a small Cylindrical Tube, *a b c d*, immersed in the Surface of the Water *e d*, upon which Surface let the Cylinder of Air *e f g h* likewise insist: Then let us suppose, that upon the Diameter of each Tube can stand a certain determinate Number of Particles of Air, *viz.* 8; or let 8 Particles of Air, placed in a Right-line, be equal to the Latitude of both Tubes: I say, it can seldom, nay, I believe, it can never happen, that the Eight can be intromitted in the Cavity of the Tube; for the upper Edges of the Tube will intercept the First and Eighth, so that only six can fall upon the Water: And the same will hold true of any other Series of Globules, whose two Extream Particles will always fall upon the Brinks of the Tube. Hence it is, that the whole Round of Globules insisting upon the Edges of the Tube, together with *a m* and *b n*, which they perpendicularly insist upon, gravitate only upon the Edges of the Tube, and never come to the Water *q r*, which is only gravitated upon by a Cylinder of Air, whose Diameter consists of six Globules: But 'tis quite another thing in the Aerial Cylinder *e f g h*, taken in any Part of the Surface without, where the Extream Globules are not in-



tercepted by the Sides of the Cylinder *g e* and *c h*, which are purely imaginary, but act freely upon the subjected Liquor: Consequently the Fluid without, is more acted upon than the Fluid within, by how much the Series of Globules insisting upon this, exceeds the Series of Globules insisting upon that; so that the Liquor without must subside a little, forcing that within the Tube to ascend, till such time as the Pressure be every where equal: But this is scarce perceivable in Tubes of larger Diameters; for the Air insisting upon the Brinks of a Tube, bears a greater Ratio to the Air without, whose Pressure is not hinder'd, in small Tubes than in larger, as the subsequent Calculation will make appear.



Let the Diameter of the Aerial Cylinder *e g h f* be 7 Globules, and that of the Cylinder *o p q r* be 6 Globules; then the Area of the Base of the former will be $38\frac{1}{2}$, and that of the latter $28\frac{1}{7}$, whose Difference is $10\frac{3}{14}$; so that *e f* is prest upon above $\frac{1}{4}$ more than the Base of the latter *c d*: But if the Diameter of the Base of the External Cylinder

be 14 Globules, and that of the Internal one a Globule leſs, *viz.* 13, the Area of the former will be 154, and that of the latter $132\frac{11}{14}$, whoſe Difference will be $21\frac{3}{14}$; ſo that the Preſſure of that is now ſcace $\frac{1}{7}$ part greater than the Preſſure of this: From whence it appears, That the Difference of Preſſure is a great deal leſs in large Tubes than in ſmall.

Upon the ſame Principles 'twill follow, That lighter Liquors will riſe higher in ſmall Tubes than heavier: And now we ſhall give an Account, why Mercury in a very ſmall Tube ſhould ſubſide below the Level of the external Mercury.

And here it may not be improper to obſerve, That ſome People, from the Aſcent of Liquors in ſmall Tubes, have vainly hoped for a perpetual Motion; for, ſay they, 'tis but making a Tube extreamly ſmall, and not too long, and then the Aſcent of the Liquor being proportional to the Smallneſs of the Tube, 'twill flow out at the Top, and that continually: But had thoſe People but throughly conſider'd the Matter, they could not have drawn any ſuch Concluſion; for though the Liquor contained in the Tube be forced to the Top of the Tube, by reaſon of a leſs Preſſure; yet when it comes to the Top, it meets there with the Globules which before acted only upon the Edges of the Tube, and conſequently is hinder'd from overflowing, the Preſſure above and below being equal.

But here it may very well be objected, That tho' the Aerial Cylinder *g h e f* preſs upon the ſubjected Liquor, yet this Preſſure is not wholly derived to the Tube, but partly broken: for the Globules of Water *s t*, cannot ſo exactly flow into the Tube, but the extream Globules *s* and *t*, muſt light on the Edges of the Bottom of the Tube, and conſequently their Preſſure be rendred ineffectual, as were *a* and *b* above; and this being true of the whole Round of Globules, they ſee no reaſon why the Water ſhould aſcend at all, being the Preſſure is equally debilitated both above and below.

To obviate which Objection, it may be conſidered, That the Particles of Water are more voluble and flexible; upon which account they eaſily glide into the Tube, without ſuffering any conſiderable Detriment; whilſt thoſe of Air, being more ſtiff and rigid, ſuffer much from the Sides of the Tube: Beſides, the Particles of Water are ſmaller than thoſe of Air, as Mr. *Boyle* has prov'd by ſeveral Experiments, and conſequently, though the extream Globules *s* and *t* do light upon the Edges of the Tube, yet ſtill the Preſſure upwards will be greater than the Preſſure downwards, and the Water forc'd to aſcend.

Theſe Things being conſidered, 'twill be no difficult Matter to account for the ſubſiding of Mercury in ſmall Tubes below the Level of the Mercury without; for by the Law of Contraries, the Particles of Mercury will be more groſs than thoſe of Air; and conſequently the Preſſure of the Particles of Mercury below, upwards will be leſs than the Preſſure of the Air down, and the Mercury forced to deſcend.

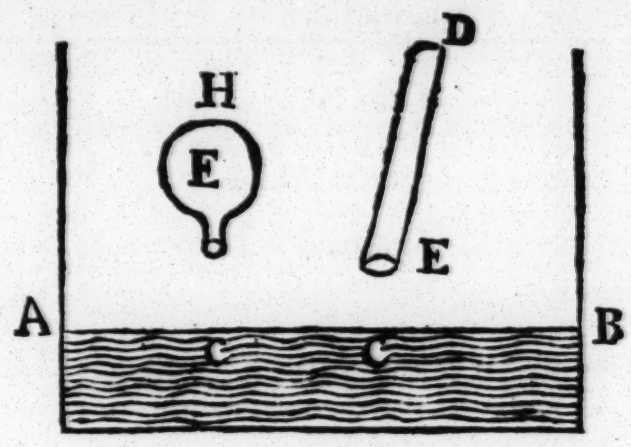
LEMMA.

Hitherto we have only taken notice of the Gravity of the Air, without any regard to that other remarkable Property of *it*; I mean its Elaſticity, which Mr. *Boyle* has prov'd by various Experiments. Now this Elaſticity is a Power that Air compreſſed, either by its own Gravity, or any other way, has of reſtoring it ſelf to its former State; and this Elaſtick Force acts indifferently every way, though in caſe any Part of the compreſſed Air be leſs preſs'd upon than the reſt, 'twill that way endeavour to free it ſelf from the Preſſure upon its other Parts, in order that the Preſſure may be equal every where; and this reſtitutive Force increaſes in proportion to the Compreſſive, and is always equal to it.

If any one deſire a fuller Account of this Matter, he may conſult Dr. *Wallis's Mechanical Philoſophy*, *P.* 1. *C.* 13. *Pr.* 1. and *L.* 14. *Pr.* 11. This being premiſed, I proceed to the following Propoſition.

PROP. VI.

The Elaſtick Force of Air contain'd in any Veſſel, and which is of the ſame Nature with the external Air, i. e. is neither more nor leſs compreſt, does the ſame thing as the whole Weight of the external Air.



Let there be a Tube, as *D*, or a Veſſel, as *H*, of any Form, whoſe Orifice at *E* is open, and conſequently the internal Air communicates with the external; then 'tis plain, that if the external Air be more compreſt than the internal, it will dilate it ſelf, compreſſing the internal till ſuch times as there be an *Æquilibrium*; but on the contrary, if the internal be more compreſt than the external, then will this dilate it ſelf, compreſſing the other till the *Æquilibrium* be again reſtor'd; *i. e.* till the Elaſticity of the included Air be equal to the compreſſive Force without; or, which is the ſame thing, to the whole Weight of the incumbent Air: And if *E* be cloſe, the Elaſticity of the included Air will ſtill be equal to the Weight of the external incumbent Air; for the Elaſticity won't be in the leaſt altered by the Orifice being ſtopp'd; therefore the Propoſition is clear.

PROP. VII.

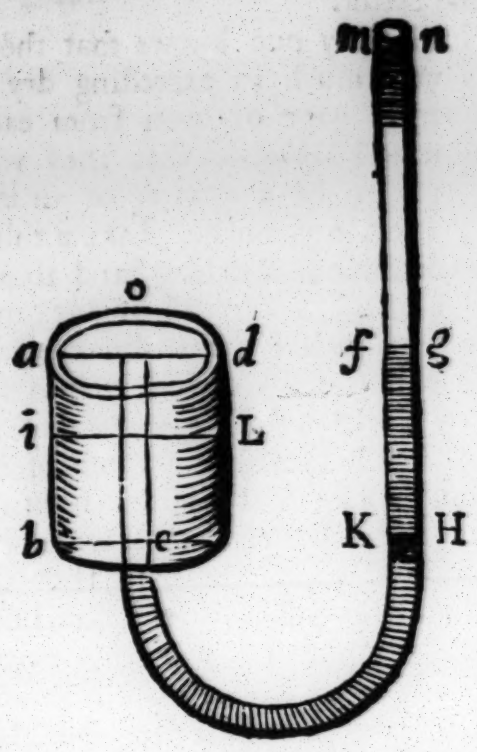
If the Orifice E, of the Tube D, or the Veſſel H, (fill'd with Air of the ſame Nature with the external Air) be put in the Surface AB of a Veſſel of Mercury, that Fluid will neither riſe nor be depreſt.

Demonſtration.

For *C*, that part of the Surface *A B* which the Orifice *E* inſiſts upon, is equally preſt with the other Parts of the Surface *AB*, ſeeing the Elaſticity of the Air in *D* and *H*, is equal by the laſt Propoſition, to the Weight of the external incumbent Air; (Here it muſt be obſerved, that we ſuppoſe the Veſſel to be ſuſtain'd ſome other way) and conſequently, by *Prop.* 1. the Mercury will neither aſcend nor deſcend. *Q. E. D.*

The

The Ingenious Mr. John Keil *thus Mathematically demonſtrates the Reaſon, why* Fluids *keep at the ſame Height in Canals, or Pipes of different Dimenſions.*



Let there be a larger Pipe or Cylinder, as *a b c d*, which is connected with the more ſlender one *m n K H c*, at *c*.

Water being put in at either Orifice, will keep the ſame Level in both Pipes, or will ſtand at the ſame Height in both Legs; ſo that the Surface of the Water, *a d* and *g f*, ſhall be in the ſame Plain.

For if by any Force the Water in the larger part *a d b c* ſhould be impelled down, ſuppoſe to *I L*, it muſt riſe ſo much higher in the leſſer Leg of the Siphon, ſuppoſe to *m n*, that the Cylinder of Water *m n f g* ſhall be equal to the empty part *a d i L*.

But when Cylinders are equal, and are of different Baſes and Heights, their Baſes and Heights muſt be reciprocally proportional; therefore here *f m* : *a i* :: As the Orifice *a d* : To the Orifice *m n* or *f g* : But *f m* : *a i* :: As the Velocity of Aſcent in one Tube : Is to the Velocity of Deſcent in the other; and the Orifice *a d* : Is to the Orifice *f g* :: As the Water in *a c* : Is to the Water in the part of the Pipe *f H*, (for Cylinders of equal Height are as their Baſes:) Wherefore the Velocity of the aſcending Water in the Pipe *f H* : Will be to the Velocity of the deſcending Water in the Pipe *a c* :: As the Water in the Pipe *a c* : Is to the Water in the Pipe *f H*; that is, the Velocities of the aſcending and deſcending Portions of Water are reciprocally proportional, and conſequently their Moments muſt be equal; and being contrary one to another, they will equi-balance each other, and conſequently make the Water ſtand in both Legs at one and the ſame Height.

The Phyſical Reaſon of which Phænomenon is, That no more Water preſſes on the Orifice *c*, than what is contained in the Cylinder *o c*, perpendicularly incumbent on the Orifice (the reſt being ſuſtained by the Bottom of the larger Pipe, which extends beyond the Orifice *c* all round it): Now the Cylinder *o c* being equal every way to *f g*, the Water in each will be of the ſame Height.

From hence alſo, by the by, may the Reaſon appear, Why Water, or any other Fluid, flowing out of a larger Pipe or Canal into a ſlenderer, moves there with a greater Celerity.

Hence alſo in an Animal Body, if the Ramifications of the Arteries (or the Capillary Arteries) have the Sum of all their Orifices, or rather of their Tranſverſe Sections, greater than the Area of the Tranſverſe Section of the Aorta, or great Artery, the Velocity of the Motion of the Blood in them will be leſs than in the Aorta; but if the Sum be leſs, the Motion of the Blood there will be ſwifter than in the Aorta.

HYDROTICKS, or Medicines that provoke Sweating, are thoſe which by fermenting and attenuating the ſmall Parts, penetrate into the cloſeſt Pores of the Blood, divide its Particles, rarify them, and turn them into a kind of Vapour, which, together with whatever they meet, and can carry with them, they drive out into the Surface of the Body, and there being condens'd into an inſenſible Liquor, they appear in the Form of Sweat. *Blanchard.*

HYEMAL-SOLSTICE: See *Solſtice.*

HYGIEA, is Health, which conſiſts in a good Temperature, and right Conformation of Parts.

Health is a Diſpoſition of the Parts of an Human Body, fit for the Performance of the Actions of that Body.

Signs of Health are Three, due Action, ſuitable Qualities, and when things taken in and let out are proportionable. *Blanchard.*

HYGIEINA, is that Part of Phyſick which teaches the way of preſerving Health: Some divide it into three Parts.

Prophylactick, which takes Notice of future imminent Diſeaſes.

Synteritick, which preſerves preſent Health: And,

Analeptick, which recovers the Sick. *Blanchard.*

HYGROCYRSOCELE, is a Branch of any winding Veins, ſwoln with ill Blood, accompanied with other Moiſture. *Blanchard.*

HYGROMETER, the ſame with *Hygroſcope*; which ſee.

HYGROSCOPE, is a Philoſophical Inſtrument, contrived to ſhew the Moiſture or Dryneſs of the Air, according as it abounds with watry or dry Steams; and to meaſure and eſtimate the Quantity of ſuch Moiſture or Dryneſs.

To make a Hygroſcope *with Oil of Vitriol.*

Procure a good nice pair of Scales, not too ſlight, that will turn with about $\frac{1}{10}$ part of a Grain, (or $\frac{1}{8}$ part of a Grain will do pretty well) into one of theſe in a flat Glaſs of about 3 or 4 Inches in Diameter (ſuch a kind of Glaſs as holds the ſtagnant Mercury in the Baroſcope) put 3 or 4 Drams of the Oil of Vitriol; hang up the Balance in a place free from the heat of the Sun's immediate Beams, or a Fire; and put Weights in the other Scale, to reduce it to an *Æquilibrium*, you will be ſurpriſed to find that this Liquor will, if it was good, and well dephlegmated, double, nay, perhaps treble the Weight in a Fortnight, by attracting and imbibing the Moiſture of the Air: But ſo it will certainly do more or leſs, according to the Seaſon of the Year, and the Temper of the Weather. You muſt let this Liquor hang till you find it hath gain'd its utmoſt Increaſe of Weight, which will be in leſs than a Fortnights time, unleſs it be exceeding dry and hot Weather.

And then you may begin to make uſe of it as an *Hygroſcope*: For as the Oil of Vitriol preponderates, the Air increaſes in Moiſture; and as the other

then Scale, where the Weights are, preponderates, its Drought increaſes in the ſame Proportion. The Degrees of Moiſture, or Dryneſs, may be computed either by ſmall Weights put into the lighter Scale, or elſe by having the Handle of the Scale very long, as alſo the Tongue; ſo that it ſhall with its Top mark the Diviſions on an Arch of Braſs, that may be applied for that purpoſe on the Top of the Handle, over the Tongue of the Balance.

The Hygroſcope *of Mr.* William Mollyneux, *Secretary of the Philoſophical Society at* Dublin, *is thus made:*

Faſten a Piece of Whip-cord, of about 4 Foot long, to an Hook or Staple, in ſome convenient Place of the Ceiling of a Room, and at the Bottom hang a Weight of about a Pound: Let thereon, or into the Bottom of the Weight, be faſtened an Index of about a Foot long, and under it, on a Table, or on a Piece of Board, place a Circle, divided into what Number of Degrees you pleaſe, and fit it ſo that the Center of the Index may hang juſt over the Center of the Circle.

After it has hung thus 2 or 3 Days to ſtretch the Cord, you may begin to meaſure by it the Degrees of Moiſture or Drought in the Air: For the Cord will twiſt one way, and contract it ſelf for Wet, and untwiſt it ſelf again on the contrary way for Dry. You will find this plain and ſimple Inſtrument the niceſt *Hygrometer* of any, for it will ſhew you very ſmall Alterations of the Temper of the Air, and is ſubject to fewer Inconveniencies than any other Inſtrument of this kind.

A very good Hygroſcope *may be thus eaſily made.*

Take a ſmall Deal-Box, and to the Bottom, or one of the Sides of it, faſten ſtrongly a pretty large Piece of Lute-ſtring or Cats-gut; and then bringing the other End thro' a Hole purpoſely made for it in the oppoſite Part or Side of the Box, and which muſt be ſo much bigger than the String, that the String may turn eaſily round in it any way: Faſten to the String (without) a light Index, made of a Piece of Cedar or Deal, *&c.* and round about the Hole where the String comes thro', draw a Circle on the Box, and divide it into Degrees; ſo that the String twiſting and untwiſting it ſelf, as it will do againſt wet or dry Weather, may turn the Index along with it, and that will ſhew in the graduated Limb of the Circle, the Meaſure of the Air's Moiſture or Dryneſs.

I have often tried this kind of Hygroſcope, and found it to do very well. But Dr. *Hook*, in his *Micrographia*, ſaith, Nothing will ſhew the Variations of Moiſture and Dryneſs in the Air like the Beard of a Wild Oat; which he there (*P.* 147.) ſhews you how to fit in a proper Box or Frame, and with an Index, *&c.* But I believe the Cats-gut one, tho' not ſo very tender as this, (and yet I have known one go twice round the ſame way) may retain its twiſting and untwiſting Property much longer.

I always found the Wind to have a peculiar effect upon this Inſtrument.

Another Hygroſcope *of two Plain Boards.*

Plain two pieces of Deal, or (which is better) of Poplar Boards, of about two Foot long, and a Foot and a half in breadth, and let them be ſhotten or joynted, ſo that their Edges will meet even together; let thoſe be ſet cloſe together like a Pannel of Wainſcot, with their Tops and Bottoms let into the Groove of a ſtrong Oaken-Ledge, and their four outward Corners pointed into the Groove; but there need be no Ledges on the Sides, that the Boards may play the better.

Then, ſince every one knows that theſe Boards will ſhrink very much in exceeding dry Weather, and conſequently gape or open from each other; ſuppoſe the utmoſt Diſtance that they will ſhrink from each other to be a quarter of an Inch, more or leſs, it matters not much. Take a thin piece of Braſs of two or three Inches long, and about a quarter of an Inch broad, and meaſuring at one end of it a quarter of an Inch (or that diſtance you ſuppoſe your Boards will ſhrink) divide it into five equal Parts, and then with a ſmall File cut thoſe Diviſions into ſo many ſmall Teeth, like thoſe of a Watch-wheel: Then drilling 2 or 3 Holes in this piece of Braſs towards the other end, with ſome ſmall Nails faſten it on one of your Boards, ſo that the firſt of the 5 Teeth may lie juſt over the Juncture of the Boards, and the reſt lie over the other Board. Next on the end of a piece of thick Iron-wire, make a Pinion of 3 Teeth to anſwer the 5 Notches in the Braſs-plate; and by means of a Bracket, let it be ſo faſten'd on the other Board, that its Axle playing in the Bracket, it may fit the Teeth of its Pinion to the Notches in the Braſs-plate; and then whenever the Boards ſhrink aſunder, the Braſs being drawn a little away, muſt needs turn this Axle more or leſs; and when the Boards have ſhrunk a quarter of an Inch from each other, the Axle will have made one entire Revolution. If then you faſten a long and light Index on the Extremity of this Axle, and make a Circle round it, divided into what number of parts you pleaſe, the Motion of the Point of the Index, backwards or forwards, will ſhew you the Degree of Moiſture or Drought in the Air.

You may eaſily have the Axle ſo long, as that its Index-end ſhall come thro' a round Plate of Wood or Metal, which may hide all Contrivances, and make it appear only like a Clock or Watch.

HYGROSCOPE STATICAL, was invented by that Noble Philoſopher Mr. *Boyle*. The beſt way to make it, is to take a Dram weight of fine Spunge, and having well cleaned it and dryed it, let it be put, when the Air is of a moderate Temperature, into one of the Scales of a very nice and tender Ballance, (that will turn, when ſo loaded, with half a quarter of a Grain) and in the other Scale put ſo much weight as will juſt equi-ponderate it. Then will the Spunge by its encreaſe and decreaſe of Weight, daily ſhew the Moiſture or Dryneſs of the neighbouring Air, and meaſure its Quantity by Weight; whence it hath its Name of the Statical *Hygroſcope*.

I have often tried this Inſtrument my ſelf, and have found it to anſwer very nicely, and to increaſe or decreaſe in Weight very conſpicuouſly, according as the Air hath been Moiſt or Dry.

If you think the taking out or putting in of ſuch ſmall Weights, as Grains, or their Subdiviſions, (of which there will be conſtant occaſion) to be troubleſome, you may eaſily ſo fit the Arch of a Semicircle well divided, as that againſt it the Tongue of the Ballance ſhall play, and by the Degree there cut, ſhew you the quantity of the encreaſe or decreaſe in weight of the Airs Moiſture: But the former way is more exact, and will be eaſy enough with a little Practice.

The

The above-mentioned Honourable Gentleman hath a little Tract about the Uſes and Advantages of *Hygroſcopes*; wherein he proves this *Statical one* to have many Advantages above the other Kinds. For,

1. It will laſt good longer than moſt of them.

2. As it is eaſily made at firſt, ſo 'tis as eaſily repaired or mended, if it come to any Injury.

3. The Quantity of the Drought or Moiſture of the Air it meaſures, is eaſily communicable to a Correſpondent by Letter, *&c.* becauſe it is eſtimable in the known Weights of Grains and their Parts; whereas in moſt other Hygroſcopes 'tis not ſo eaſy for another Perſon, beſides the Obſerver, to judge of the Quantity of the Alteration.

The Uſes and Advantages of theſe kind of Inſtruments when well made, and carefully obſerved, he judges may be ſuch as theſe:

1. To diſcover in what part of Day or Night the Air hath its greateſt degree of Moiſture; and how at ſuch times the Baroſcope ſtands affected; whether near the Sea-ſide, the Ebbing and Flowing of the Sea make any ſenſible Alteration as to the Moiſture or Drineſs of the Air; and whether at the Fall and New Moons the Atmoſphere be moſt damp and moiſt; and whether the Menſtrual or Annual Spring-Tides, have any ſenſible Operation on this Inſtrument.

2. To diſcover how much one Year and Seaſon is drier or moiſter than another; whether the multitude or fewneſs of Solar Spots occaſion (as ſome Aſtronomers have obſerved) any Alteration in the Temperature of the Air, as to Wet or Dry: And thoſe that are Aſtrologically given, may obſerve, whether the Aſpects of the Planets, their Eclipſes, Conjunctions, *&c.* have any Influence this way on our Atmoſphere.

3. To diſcover and compare the Changes of the Temperature of the Air made by Winds, ſtrong or weak; or by Froſty, Snowy, or other Weather.

4. To compare the Temperature of differing Houſes, and differing Rooms in the ſame Houſe; which may be of great Uſe to Tender and Sickly Perſons; and to keep a Chamber, if there be occaſion, conſtantly to the ſame, or any aſſigned degree of Drineſs.

HYMEN, is a circular Folding of the inner Membrane of the *Vagina:* and this being broke *(in primo Coitu)* its Fibres contract in three or four places, and ſo form the *Glandulæ Myrtiformes.*

HYOIDES, and by ſome *Os Upſiloides*, from its being in Figure like the Letter ϒ, is a Bone placed at the Baſis of the Tongue upon the Larynx: It hath 10 Muſcles which keep it in its place above by its upper *Cornua*; 'tis faſtened to the *Apophyſes Scyloides* of the Temple-Bone, and below to the Wings of the *Cartilago Theorides* of the *Larynx.*

HYOTHYROIDES, are two Muſcles of the *Larynx*, proceeding from the Inferior Part of the Bone *Hyoides*, laterally and oppoſite to the Origination of the *Ceratogloſſus.*

This pair of Muſcles deſcends directly to the lower part of the *Cartilago Scutiformis:* Its Uſe is to draw the *Larynx* upwards in an Acute Tone of the Voice; the Canal of the *Aſpera Arteria* being alſo ſtreightned by it.

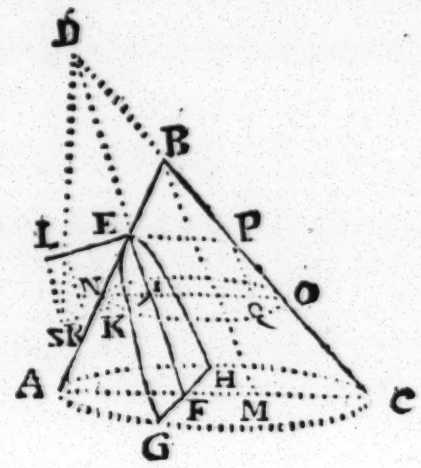
HYPÆTHRON, is an open Gallery or Building, the inſide whereof is uncover'd, and expoſed to the Weather. The Ancients gave this Name to all Temples which had no Roof; as that of *Jupiter Olympius* at *Athens*, having 10 Columns in Front, as alſo two Rows in its exterior Sides, and one in the Interior.

HYPALLAGE, or *Immutation*, a Grammatical Figure, when of different Expreſſions, which give the ſame Idea, we make choice of that which is leaſt uſed; or when there is a mutual Permutation or change of Caſes: As in this Inſtance, *Dare Claſſibus Auſtros*, inſtead of *Dare Claſſes Auſtris.*

HYPERBATON, a Grammatical Figure, where there is too bold and frequent a Tranſpoſition of Words.

HYPERBOLA, in Geometry, is a Section of a Cone made by a Plane, ſo that the Axis of the Section inclines to the oppoſite Leg of the Cone, which in the Parabola is parallel to it, and in the Ellipſis interſects it. The Axis of the Hyperbolical Section will meet alſo with the oppoſite ſide of the Cone, when produced above the Vertex.

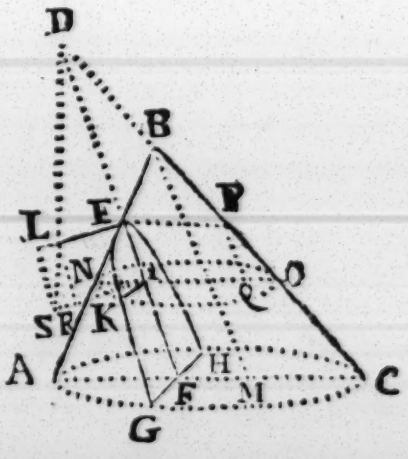
Thus, in the annexed Figure, the Curve *GEHF* is an *Hyperbola.*



Where the Line *E D*, being the Continuation of the Axis till it meet with the oppoſite Cone, or oppoſite ſide of the former Cone *CB* produced, is called by the Name of the *Latus Tranſverſum*; and the middle Point of that Line *E D*, is called the *Center of the Section*, or rather of *the oppoſite Sections.*

PROP. I.

In an Hyperbola GEHF, the Square of the Ordinate IK, is equal both to the Rectangle LI, made under the Parameter *LE, and the* Abſciſſa *EI; and alſo to the Rectangle LS, made under the* Abſciſſa *EI* (or *LR*) *and another Line SR, which is a fourth Proportional to DE the* Latus Tranſverſum, *EL the* Parameter (*or* Latus Rectum) *and EI the* Abſciſſa.



Let the ſide of the Cone *AB*, in which the Section is, be called *a*; and thro' *B* the Vertex of the Cone, draw *BM* parallel to the Axis of the Section, and which call *b*. Let the intercepted part of the

the Diameter of the Baſe AM be called c. Let $EI = eb$. Then by comparing the ſimilar Triangles ABM and EIN, IN, in this way of Notation, will be $= ec$. And if you put $MC = d$, and the Tranſverſe Diameter $DE = ob$; then will $DI = ob + eb$. And by reaſon of the ſimilarity of the Triangles BMC, DEP, and DIO, you will find that EP muſt be expreſſed by od, and IO by $od + ed$, and conſequently, $QO = ed$. *(The General Reaſon of all which way of Notation, and the way of working to obtain it, you will ſee in the Parabola.)*

This done, 'tis plain that KI Square muſt be $=$ to the Rectangle NIO; that is, in this Notation $= oecd + eecd$, as you will find by Multiplication. Wherefore, if $oecd + eecd$, the Square of IK, be divided by the *Abſciſſa* $EI = eb$, the Quotient muſt be ſuch a Line, which together with EI, can make a Rectangle equal to the Square of IK: Wherefore the Rectangle $ES = IK$ Square; which in this Notation will be $\frac{oecd + eecd}{eb}$, or contractedly, $\frac{ocd + ecd}{b}$. This done, proceed (as directed in *Cor.* 1. *Prop.* 1. of the *Parabola*, to find the *Latus Rectum*) by ſaying, As $b : c :: od : \frac{odc}{b}$; in Words, As the Parallel to the Section : is to the part of the Diameter of the Baſe intercepted :: So is the *Latus Primarium* : to a fourth Proportional; 'tis plain, the fourth Term will be one part of the Line IS, or in this Notation $\frac{odc}{b}$ = *Latus Rectum* RI (or LE.) And the other will be found thus: As $b : c :: ed : \frac{ced}{b}$.

Or, according to *Apollonius*'s way of Expreſſion in this Propoſition: As $ob : \frac{ocd}{b} :: eb : \frac{ecd}{b}$; for that will be found to be the fourth Proportional as before: Which is now found out according to the Terms of the Propoſition, between the *Latus Tranſverſum* ob, and the *Latus Rectum* $\frac{ocd}{b}$, and the Abſciſſa eb.

Wherefore $oecd + eecd$, the Square of the Ordinate IK, is manifeſtly equal to the Rectangle under the *Latus Rectum* and the *Abſciſſa*; and alſo to another under the *Abſciſſa*, and the fourth Proportional. *Q. E. D.*

COROLLARY I.

Hence the Reaſon of the Name Hyperbola, which *Apollonius* gave to this Section, is apparent, *viz.* Becauſe the Square of the Ordinate *exceeds* the Rectangle under the *Parameter* and *Abſciſſa*.

COROLLARY II.

If you multiply the *Latus Rectum* $\frac{ocd}{b}$ (which is noted here as in the *Parabola*) both above and below the Line by b, the Parallel to the Section, there will ariſe this Quantity $\frac{bocd}{bb}$.

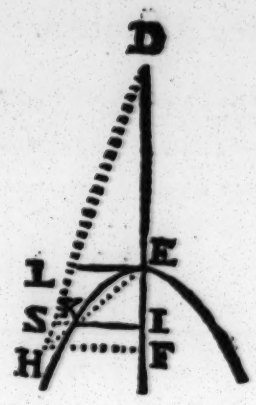
Which being reſolved into Proportionals thus:

As $bb : cd :: bo : \frac{bocd}{bb}$; gives exactly *Apollonius*'s Canon for finding the *Latus Rectum*, (in *Prop.* 12. *Lib.* 1.) *viz.*

As the Square of the Side of the Cone in which the Section is made: Is to the Rectangle between the Segments of the Baſe made by a Parallel to the Section, and drawn thro' the Vertex of the Cone :: So is the *Latus Tranſverſum*: to the *Latus Rectum*.

COROLLARY III.

The *Latus Rectum* may alſo here, as well as in the Parabola, be Geometrically found.



If you find firſt HF, a third Proportional to EI the Abſciſſa, and to KI (or EF) the Ordinate: (See *Praxis* 2. in the *Parabola*.) After which find a fourth Proportional EL to DI, the Sum of the *Latus Tranſverſum* and *Abſciſſa*, to HF, and to DE, the *Latus Tranſverſum*. For ſuppoſing $IS = HF$ (as it might eaſily have been made, by drawing it a little longer) at the end of which place S, and draw DS; as alſo LE parallel to HF: Then ſhall LE be the true *Latus Rectum*: For as $DI : IS$ (or HF;) :: ſo $DE : LE$.

COROLLARY IV.

From which 'tis plain, that having the *Latus Rectum* and *Tranſverſum*, the Ordinates in any *Hyperbola* may be drawn, and conſequently the Curve eaſily deſcribed.

For taking any part of the Axis (as EI) for the Abſciſſa, and making as DE : to EL :: So DI: to a fourth Proportional IS; and then finding a mean Proportional between IS and the Abſciſſa EI (ſuppoſe IK,) that Line IK rightly applied, ſhall be the Ordinate ſought, thro' whoſe Point K, the Hyperbola will paſs.

PROP. II.

In the Hyperbola the Squares of the Ordinates KI and GF, are as the Rectangles DIE and DFE, under the Lines lying between the Ordinates and the Vertices, or Extreams of the Latus Tranſverſum, *and their reſpective* Abſciſſæ. *See* Fig. Prop. 1.

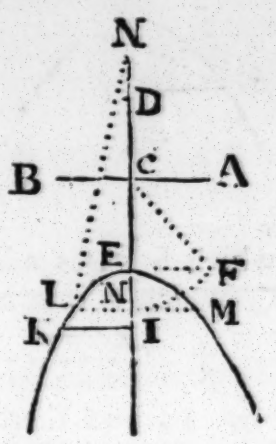
Let the Axis of the Section EF be called ib, as before EI was called eb: Then, by conſidering *Prop.* 1. 'tis plain, that the Square of GF will be $= oicd + iicd$; and the Rectangle DFE, will (by multiplying $DF = ob + ib$, by $FE = ib$) be found to be $oibb + iibb$.

Again, the Square of KI: will be to the Square of GF :: as $oecd + eecd$; (by Prop. 1. equal to it) : is to $oicd + iicd$ (now proved $=$ to the Square GF.) That is, taking away cd, which is common, as $oe + ee$, is to $oi + ii$. But in ſuch very Proportion are the Rectangles DIE and DFE: For $DIE = eobb + eebb$ (becauſe DE

$DE = ob$, and $EI = eb$) and $DFE = oibb + iibb$, as was proved just above. Now there is no doubt but $eobb + eebb : oibb + iibb :: ee + oi : ee + ii$; wherefore these Rectangles are as the Squares of the Ordinates. *Q E D.*

COROLLARY I.

If the *Latus Rectum* LM be applied so, as that N be the Focus, then will $LN = \frac{ocd}{2b}$, and its

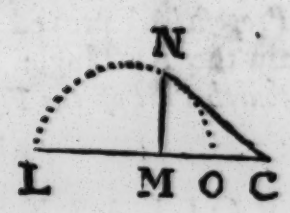


Square $= \frac{ooccdd}{4bb}$: But (by this Proposition) As the Square KI: Square LN :: So is the Rectangle DIE: Rectangle DNE; that is, as $eocd + eecd : \frac{ooccdd}{4bb} :: oebb + eebb :$ To $\frac{oocd}{4}$, which will be found to be the fourth Term by this way of Notation. Also this Rectangle DNE (being made out of the whole Line DE, with the Part added EN, multiplied by that Part added EN) together with the Square of CE, the Half of DE ($= \frac{1}{4}$ of $oobb$, i. e. $\frac{1}{4}$ of ob Square) is equal to $\frac{oocd + oobb}{4} = CN$ Square, the half Line with the Part added: Wherefore CN is the Distance from the *Focus* $= \sqrt{:} \frac{oocd + oobb}{4}$, of which the former Part $\frac{oocd}{4}$, is the fourth Part of the Rectangle under the *Latus Rectum* $\left(\frac{ocd}{b}\right)$ and *Transversum* (ob); or, as *Apollonius* calls it, the fourth Part of the Figure; and the other Part $\frac{oobb}{4}$ is $\frac{1}{4}$ of the Square of the *Latus Transversum*: So that from hence we may have a Canon to determine the Focus of any Hyperbola; thus,

Add the Fourth Part of the Figure (or of the Rectangle under the *Latus Rectum* and *Transversum*) to the Square of half the *Latus Transversum*; and extract the Square Root of the Sum, that Root shall be the Distance of the Focus from the Center $= CN$. And if from CN you take half the *Latus Transversum* CE, the Remainder EN is the Distance of the Focus from the Vertex.

Which Rule is very easie in Practice, for $\frac{oobb}{4}$ is nothing but the Square of CE, and $\frac{oocd}{4}$ is only $\frac{1}{4}$ of DE multiplied into LM.

Wherefore find a mean Proportional between $\frac{1}{4}$ of $DE = MO$, and LM, which let be MN (in this Figure.)



And then make $MC = CE$ of the Hyperbola; for then shall the Hypothenuse NC, be the Distance from the Center C to the Focus N required.

COROLLARY II.

Since the Rectangle DNE + Square CE = Square CN, therefore the Square CN — Square CE = Rectangle DNE: Put therefore, for Brevities sake, $m = CN$, and then will the Rectangle $DNE = mm - \frac{oobb}{4}$ in this Notation, of which more below.

PROP. III.

In the Hyperbola (See Fig. of Prop. 1.) *the* Latus Rectum : *is to the* Latus Transversum :: *as the Square of any Ordinate* IK : *is to the Rectangle* DIE, *contained under the Lines intercepted between it and the Vertexes of the* Latus Transversum *and the* Abscissæ.

For here (as above) $\frac{ocd}{b} =$ *Latus Rectum*, $ob =$ *Latus Transversum*, and $oecd + eecd$, will be $= KI$ Square; and the Rectangle DIE is $= eobb + eebb$; wherefore place those Terms according to the Condition of the Proposition; as

$$\frac{ocd}{b} : ob :: oecd + oecd : eobb + eebb.$$

And trying by multiplication of the Extreams and Means, you will find the same Quantity $eoocbd + eebocd$ arise from both, and therefore the Terms are truly proportional. *Q. E. D.*

COROLLARY I.

In the *Hyperbola* (see *Fig.* 1. of *Cor.* 1. of *Prop.* 2.) if AC Square, or its equal FE Square ($= \frac{oocd}{4}$, which is $\frac{1}{4}$ of DE multiplied into LM) be taken out of CF Square, or its equal CN Square (*i. e.* out of $\frac{oocd + oobb}{4}$, by *Cor.* 1. *Prop.* 2.) there will remain $\frac{oobb}{4}$ whose Square Root is $\frac{ob}{2} = CD =$ half the *Latus Transversum* DE.

Wherefore here, if the Axis be given, the *Foci* are so too: For draw thro' the Vertex E, EF perpendicular to ED, and equal to CA, and with the Distance CE, setting one Foot of the Compasses in C, cross the Axis at N and N; so shall these Points be the *Foci* required.

COROLLARY II.

Since (by *Cor.* 1. *Prop.* 2.) the Rectangle $DNE = \frac{ocd}{4}$; which Quantity $\frac{ocd}{4}$, is also (by *Cor.* 1. of this *Propoſition*) proved equal to AC Square; 'tis plain the Rectangle $DNE = AC$ Square, or to a *fourth Part of the Figure*, as *Apollonius* calls it.

COROLLARY III.

Hence 'tis plain, That the Square of CE, half the *Tranſverſe Diameter*: is to the Square of AC or EF, half the *Second Diameter*, as 'tis called:: as the *Latus Tranſverſum*: to the *Latus Rectum*.

For $\frac{obb}{4} : \frac{ocd}{4} :: obb : ocd :: obb : ocd :: ob : \frac{ocd}{b}$.

COROLLARY IV.

Again, Since CE Square : AC Square :: $ob : \frac{ocd}{b}$ (by *Cor.* 3.) that is, As the Rectangle DIE: IK Square (by this *Propoſition*) :: the Square of half the *Tranſverſe Diameter*: is to the Square of half the *Second Diameter*; (or, by *Cor.* 2. to the Rectangle $ENE = AC$ Square) :: as the Rectangle DIE: to the Square of the Ordinate IK.

COROLLARY V.

Hence the Square of the Ordinate KI (*Prop.* 3.) which hitherto in the Hyperbola hath been denoted by $oecd + eecd$, (ſee *Prop.* 1.) may receive a new and uſeful Notation, thus: ſince $CE = \frac{ob}{2}$ its Square will be $\frac{oobb}{4}$; ſay therefore, As CE Square: to the Rectangle DNE:: Rectangle DIE: to a fourth Term, which will be the Square of the Ordinate IK; and in this Notation it will ſtand thus;

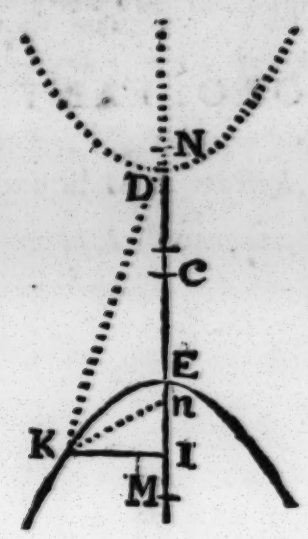
As $\frac{oobb}{4} : mm - \frac{oobb}{4}$ :: ſo is $oebb + eebb$: to $\frac{4emm}{o} + \frac{4eemm}{oo} - oebb - eebb$; ſo that the Square IK is equal to $\frac{4emm}{o} + \frac{4eemm}{oo} - oebb - eebb$. The Uſe of which will follow in the next Propoſition.

PROP. IV.

In the Hyperbola, the Difference between the Right Lines KN and Kn, drawn from the ſame Point in the Curve to both the Foci, is always equal to the Tranſverſe Diameter or Axis DE.

From the Point K in the Curve, let the Ordinate KI be applied; then will EI be the Abſciſſa, and noted eb. Let CN or Cn, the Diſtance from the Focus to the Center, be called m, as in *Cor.* 2. of *Prop.* 2. then will $IN = CI + CN = \frac{1}{2}ob + eb + m$; and $In = CI - Cn = \frac{1}{2}ob + eb - m$.

Square each, and IN Square $= \frac{1}{4}oobb + oebb + eebb + obm + 2ebm + mm$: And In Square $= \frac{1}{4}oobb + oebb + eebb - obm - 2ebm + mm$.



To each of which Squares add the Square of the Ordinate IK, which in this Notation will be found to be $\frac{4emm}{o} + \frac{4eemm}{oo} - oebb - eebb$, (ſee *Cor.* 5. of *Prop.* 3.) and there will ariſe the Square of the Hypothenuſes $KN =$ to $\frac{1}{4}oobb + obm + 2ebm + mm + \frac{4emm}{o} + \frac{4eemm}{oo}$, and of $Kn = \frac{1}{4}oobb - obm - 2ebm + mm + \frac{4emm}{o} + \frac{4eemm}{oo}$.

Out of which Quantities extract the Square Roots, as may eaſily be done, and there will be found,

$$KN = \tfrac{1}{2}ob + m + \frac{2em}{o};$$

And

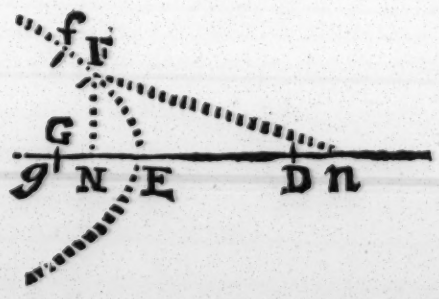
$$Kn = \tfrac{1}{2}ob - m - \frac{2em}{o}:$$

Whoſe Sum is juſt ob. *Q. E. D.*

N.B. Tho' the laſt, $Kn = \frac{1}{2}ob - m - 2em$, be an impoſſible Equation, yet 'tis no matter here, becauſe all the Parts, but $\frac{1}{2}ob$ are loſt in the Addition.

PROBLEM I.

To deſcribe an Hyperbola, having the Tranſverſe Diameter *DE, and the Foci N and n given.*



From N, at any convenient Diſtance, as NF, ſtrike an Arch, and keeping the Compaſſes at that Diſtance with one Foot in E, mark the Point G in the Axis continued; then with the Length GD, and one Foot in n, croſs the former Arch F, ſo ſhall you find a Point which is in the *Hyperbola*: and by this Method repeated, you may find another Point f further on, and ſo many as you pleaſe. The Reaſon of which is evident from this *Propoſition*.

PROP.

PROP. V.

Let the Second Axis *or* Conjugate Diameter *of the Hyperbola B A be brought down and placed at the* Vertex *parallel to the Ordinates, as O P; then if from the Center C, you draw thro' the Points O and P two Right Lines running on infinitely: And after this draw a Parallel to this Diameter within the Hyperbola, as Q R, I ſay,*

It will be plainly demonſtrable,

I. *That the Parts of the produced Ordinates G Q and H R, intercepted between the Curve and the Aſymptotes, will always be equal.*

For the Triangles *C E P* and *C F R*, being ſimilar, as alſo *C E O* and *C F Q*, it muſt be, As *C E*: *E O* (or *E P*) :: *C F*: *F Q* or *F R*: But *O E* and *E P* are equal; wherefore *Q F* and *F R* muſt be equal; from which taking the equal Ordinates, the Remainders *H R* and *D G* muſt be equal. *Q. E. D.*

II. *The Rectangle under Q G and G R (or R H and H Q) will ever be equal to the Square of E O* $\left(\frac{=aacd}{4}\right)$ *or to a fourth Part of the Figure.*

For the Triangles *C E O* and *C F Q* being ſimilar, *C E*: *E O* :: *C F*: *F Q*:: or as the Square *C E*: Square *E O*. That is, (by *Cor.* 3. *Prop.* 3.) as the *Latus Tranſverſum*, to the *Latus Rectum*. That is, by the ſame Propoſition, as the Rectangle *D F E*, is to *F G* Square. And *C E* Square *E O* Square :: *C F* Square : *F Q* Square. But if from *C F* Square, you take away the Rectangle *D F E*, there will remain *C E* Square (by 6. *E.* 2. *Euclid.*) And if from the Square of *F Q* you take the Square of *F G*, there will remain the Rectangle *Q G R*, (by 5. *E.* 2. *Euclid.*) and as will preſently appear, if you try it Algebraically, after the manner of the Demonſtrations in that Book. Wherefore theſe two Remainders muſt be to each other, as their Wholes, *i. e.* as the Square of *C F*, to the Square of *F Q*:: or as *C E* Square : *E O* Square; and then it will ſtand thus:

C E □ : *E O* □ :: *C E* □ : Rectangle *Q G R*.

Or Inverſely: As,

E O □ : *C E* □ :: Rectangle *Q G R*: *C E* □.

That is, the Square of *E O*, and the Rectangle *Q G R*, have the ſame Proportion to the ſame thing, and conſequently are equal one to another.

And this will be the Caſe every where, let the Aſymptotes run never ſo far. And ſince the farther you go from the Vertex of the Angle *C*, the longer muſt the Lines *G R*, *g r*, of neceſſity grow, ſince the Rectangle between *G R* and *Q G* is always the ſame, *viz.* = *O E* Square, the ſhorter muſt *G Q*, *g q*, continually grow; and conſequently decreaſe infinitely, as the others increaſe infinitely; *i. e. The Curve will infinitely approach to the Aſymptote.*

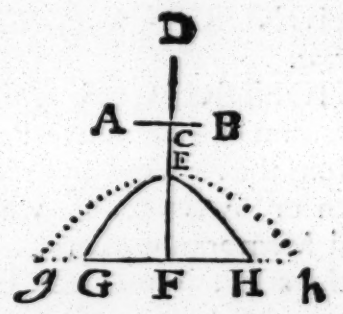
But yet they can never *coincide*, or meet with one another: For if the Points *G* and *Q*, or *g* and *q*, &c. ſhould ever come to be co-incident, it will be, As the Rectangle *D F E*: *F G* Square :: So will *G F* Square: be to *F G* Square (for *G F* Square and *F Q* Square, would then be the ſame thing); that is, Rectangle *D F E* would be = to *C F* Square, which is utterly impoſſible, as is plain from 6. *E.* 2. *Euclid.*

Wherefore theſe Lines are true *Aſymptotes*, as *Apollonius* named them from this Impoſſibility of Co-incidence with the Curve of the *Hyperbola*, when placed in this Poſition, *Vid. Apoll. Prop.* 1. *Lib.* 2.

HYPERBOLE (in Rhetorick) is a Figure which repreſents Things greater, leſſer, better, &c. than in reality they are; and is uſed in Diſcourſe, when our ordinary Terms are too weak or too ſtrong, and carry no Proportion with our Idea; and leſt we ſhould ſpeak too little, we fly out, and ſay too much, or the contrary: As to expreſs the Swiftneſs of a Horſe, one ſhould ſay, He was *ſwifter than the Wind*; if the Slowneſs of a Perſon, That *he moves ſlower than a Snail.*

HYPERBOLICK-SPACE, is the Area or Space contained between the Curve of an *Hyperbola* and the whole *Ordinate.*

Any *Hyperbolick Space G E H G*: is to any other Hyperbolick Figure of the ſame Height *g E h g*, (whoſe *Latus Rectum* and *Tranſverſum*, as in the Circle, are equal, and alſo both equal to *D E*, the *Latus Tranſverſum* of the former Space) :: As the Conjugate Axe *A B*: is to the *Latus Tranſverſum D E.*



For the Square of *g F* (the Ordinate) is = to the Rectangle *D F E*, (by the Hyperbola): Wherefore the Rectangle *D F E* (=Square *F G*): is to the Square *F G*: : as *Latus Tranſverſum*: is to *Latus Rectum* of the Hyperbola *G E H G*; *i. e.* as the Square *D E*: Square *A B*. Wherefore the Roots of theſe Squares will be alſo proportional, and conſequently *F g*: *F G* :: *D E*: *A B*; the former two Terms of which being each an Indiviſible of the two *Hyperbolick Spaces*, it will follow, that the whole Spaces are in the ſame Proportion.

Wherefore *g e h g*: *G E H G*:: *D E*: *A B*.
Or *G E H G*: *g e h g*:: *A B*: *D E*.
Q. E. D.

Hence, if you find the Quadrature of any Hyperbola, whoſe Parameter and *Latus Tranſverſum* are equal, you may ſquare any other Hyperbola.

In *Philoſoph. Tranſact. Numb.* 34. there is a Quadrature of the Hyperbola by an infinite Series of Rational Numbers.

In *Numb.* 53. there is a Method communicated by Sir *Chriſtopher Wren*, for grinding Glaſſes of an Hyperbolick Figure.

HYPERBOLICUM *Acutum*, is a Solid made by the Revolution of the infinite Area of the Space contained between the Curve and the Aſymptote, in the *Apollonian Hyperbola*, turning round that Aſymptote; this produces a *Solid* or *Body* infinitely long, and yet as *Torricellius* plainly demonſtrates,

(who gave it this Name) it is equal to a finite Solid, or Body.

HYPERCATALEPTICK *Verſe*: See *Depoſition*.

HYPERCATHARSIS, is a Purge that works too much.

HYPERCRISIS, is a Critical Excretion above meaſure.

HYPERDISYLLABLE, is a Word of more Syllables than two.

HYPEROON, are the two Holes in the Upper Part of the *Oſſa Palati*, which receive the pituitous Humours from the Mammillary Proceſſes, and after they are ſeparated, diſcharge them at the Mouth. Thro' thoſe a Branch of the Fifth Pair of Nerves paſſes to the Palate, Uvula, and Gums.

HYPEREPHIDROSIS, is too much Sweating.

HYPERSARCOSIS, is an Excreſcence of Fleſh in any part.

HYPERTHYRON, in Architecture, is a large Table, uſually placed over Gates or Doors of the Dorick Order, above the Chambranle, in form of a Frize.

HYPHEN, is an Accent in Grammar, that implies two Words are to be join'd, as *Male-Sanus*.

HYPNOTICKS, are thoſe Things, which by either fixing the Spirits, or by ſtraitning and ſhutting up the Pores, cauſe Sleep. *Blanchard*.

HYPOBIBASMUS: See *Equation*, N. 4.

HYPOBOLE, is a Figure in Rhetorick, whereby we anſwer what we prevented to be objected againſt by an Adverſary.

HYPOCHONDRIACA *Affectio*: See *Hypochondriacus Affectus*.

HYPOCHONDRIACUS *Affectus*, is (ſaith *Blanchard*) a kind of Convulſive Paſſion or Affection, ariſing from the flatulent and pungent Humours in the Spleen or Sweet-bread, which afflicts the Nervous and Membranous Parts.

Or, as others ſay, it proceeds from windy Humours bred in the *Hypochondres*, whence a black Phlegm ariſeth that infects the Animal Spirits, and they the Mind, and is what they call *Hypochondriack Melancholy*.

HYPOCHONDRIUM, or *Subcartilagineum*, is the Upper part or Region of the *Abdomen*, under the Cartilages of the Cheſt or ſhort Ribs: In the Right *Hypochondrium* lies the Liver, and a part of the Stomach; in the Left the Spleen, and a greater part of the Stomach.

HYPOCHYMA, is a depraved Sight, whereby Gnats, Cobwebs, little Clouds, or ſuch like, ſeem to ſwim before the Eyes. The Cauſe of it ſeems to conſiſt in turbid Humours, or ſometimes in the Optick Nerves, whoſe little Pores are obſtructed by the Matter that is thruſt into them. *Blanchard*.

HYPOCHYSIS, the ſame with *Hypochyma*.

HYPOCRATIS *Manica*, *Hippocrates* his Sleeve: See *Manica Hippocratis*.

HYPOGASTRICK-ARTERY, is by ſome ſaid to be a Branch of the internal *Iliaca*, and diſtributes it ſelf among the parts of the *Hypogaſtrium*, to the Bladder, *Rectum* (in Females to the outer and inner ſide of the *Matrix* and *Vagina*) *Veſiculæ Seminales*, *Proſtatæ Penis*, and to the *Os Sacrum*, and all Parts continued in the *Pelvis*: Then it gives two conſiderable Branches, which go out of the lower Belly; the firſt paſſes under the *Pyriformis*, and goes to the *Glutæi*; the ſecond goes to the *Obturatores* and the *Glutæus Major*.

HYPOGASTRIUM, is the lowermoſt Region of the *Abdomen*, reaching from three Inches below the Navel, to the *Abdomen*, *Os Pubis*, and Groins.

HYPOGLOSSIS, or *Ranula*, is an Inflammation or Exulceration under the Tongue: Alſo a Medicine that takes away the Aſperity of the Larynx. *Blanchard*.

HYPOMOCHLION, or *Prop*, in Mechanicks, ſignifies the Roller, which is uſually ſet under the Leaver, or under Stones or Pieces of Timber, to the end that they may be more eaſily lifted up or removed.

HYPOPHTHALMIA, is a Pain in the Eye under the Horney Tunick. *Blanchard*.

HYPOPHORÆ, are deep, gaping, and fiſtulous Ulcers. *Blanchard*.

HYPOPHYLLOSPERMOUS-PLANTS, are ſuch as bear their Seeds on the Backſides of their Leaves, as the *Capillaries*: See that Word.

HYPOPHYSIS, the ſame with *Hypochyma*.

HYPOPYON, is a gathering of Matter under the Horney Tunick of the Eye, which ſometimes covers the whole *Pupil*, hindering the Sight, and ſometimes incompaſſes the Circle of the *Iris*, like the paring of a Nail; whence 'tis called *Onyx* or *Unguis*.

HYPOSARCA, the ſame with *Anaſarca*.

HYPOSARCIDIUM, the ſame as *Anaſarca*.

HYPOSILOIDES: ſee *Hyoides*.

HYPOSPATHYSMUS, is an Inciſion in the Forehead, made by three Cuts or Diviſions, and where the Spatula is thruſt in under the Skin. *Blanchard*.

HYPOSPHAGMA, is a Blood-ſhot from a ſtroke upon the Eye.

HYPOSTASIS *Urinæ*, is that thick Subſtance which generally ſubſides at the Bottom of the Urine.

HYPOSTASTICAL *Principles*; *Paracelſus* and his Followers, called the three Chymical ones, *Salt*, *Sulphur*, and *Mercury*, ſo.

HYPOTENAR, is a Muſcle which helps to draw the Little-finger from the reſt.

HYPOTHENAR, is the Space from the Fore to the Little-finger. *Blanchard*.

HYPOTHENUSE, in a Right-angled Triangle, is that ſide which ſubtends the Right-angle, and conſequently the longeſt. The Square of this Line in a Right-angled and Right-lined Triangle, is always equal to the Sum of the Squares of the other two ſides, *Prop.* 47. *E.* 1. *Euclid*: ſee the Demonſtration under *Triangle*.

HYPOTHESIS, the ſame with *Suppoſition*: When for the Solution of any *Phænomena* in Natural Philoſophy, Aſtronomy, &c. ſome Principles are ſuppoſed as granted, that from thence an intelligible and plauſible Account of the Cauſes, the Effects of the propoſed *Phænomena* may be given, the laying down or ſuppoſing ſuch Principles to be granted, is called an *Hypotheſis*; and the thing ſaid to be accountable eaſily according to that *Hypotheſis*, if it give a clear and eaſie Solution of the *Phænomena*. Wherefore an *Hypotheſis is a Suppoſition of that which is not, for that which may be*; and it matters not whether what is ſuppoſed be true or not, but it muſt be poſſible, and ſhould always be probable.

An *Hypotheſis*, in ſome Senſe, falls in with a Syſtem: But this Word is uſually taken in reſpect to the Univerſe, and in Relation to the Diſpoſitions of the Heavens, and the Motion of the Stars: An elaborately contrived *Hypotheſis* about which, is called a *Syſtem*; as the *Ptolemaick*, *Copernican*, or *Tychonian Syſtem*.

HYPOTRACHELION, in Architecture, is the Top or Neck of a Pillar, or the moſt ſlender Part of it which toucheth the Capital.

It

It is taken by ſome for that part of the *Tuſcan* and *Dorick* Capitals which lies between the *Echinus* and the *Aſtragal*; and is otherwiſe called the *Collar*, *Gorge*, or *Frize of the Chapiter*.

HYPOTYPOSIS, is a lively and exact Deſcription of any Object made in Fancy.

HYPOZOMA, is a Membrane that parts two Cavities, as the *Mediaſtinum* in the Thorax. *Blanchard.*

HYPSILOGLOSSUS: ſee *Baſioglоſſus.*

HYSTERALGIA, is a Pain in the Womb, proceeding from an Inflammation, or otherwiſe. *Blanchard.*

HYSTERICA, are Medicines againſt the Diſeaſes of the Womb.

HYSTERICA-PASSIO, Fits of the Mother, is (according to ſome) a Convulſion of the Nerves of the *Par Vagum* and Intercoſtal in the *Abdomen*, proceeding from a pricking Irritation or Exploſion of the Spirits: This Diſtemper does not always, nor indeed uſually, depend upon the Womb, as is commonly thought: 'Tis ſeen ſometimes in Men, becauſe the Spleen, Pancreas, and other adjacent Bowels, are often the Cauſe of it. *Blanchard.*

Dr. *Purcell*, in his Book of Vapours, attempts to prove, and with Probability, That the Cauſe of Hyſterick Fits is neither the *Six Non-natural Things*, nor the ſolid Parts of the Body, nor the Blood, nor any of the Recrements, nor the Womb, nor Vapours thence ariſing, nor the irregular diſorderly Motion of the Animal Spirits; nor is it in the Chyle, or in the Ferment of the Stomach or Guts, *&c.* But he ſuppoſes the true Cauſe to be Crudities and Indigeſtions in the Aliments, which, by little and little, gather together in the Wrinkles and Folds of the Stomach and Guts; where they (as he ſuppoſes) lie for ſome time without much ſenſible Motion or Fermentation within themſelves, 'till at laſt by the Heat of the circumjacent Parts, their groſſer Salts are divided and put into Motion; which Fermentation is augmented by the various Juices which flow into the Guts from the many Glands which are placed in the Lower Belly; and by this means they are ſo diſſolved and liquified, as to enter in by the *Venæ Lacteæ* into the Blood, where they produce thoſe Accidents which cauſe the Symptoms of this various Diſeaſe.

HYSTEROMOTOCIA, or *Sectio Cæſarea*, is a cutting the Child out of the Womb; which is done thus: You make a *Semi-lunar Section* under the Navel along the *Linea Alba*, the Cavity whereof looks towards the ſaid Line; then according to the leading of the Fibres; the *Fœtus* being extracted after the Section, the Wound in the Womb contracts of it ſelf, ſo that the Blood ſcarce flows more plentifully than in a Natural Birth; but if the Mother be dead, chooſe the moſt convenient Place you can. *Blanchard.*

HYSTEROTOMIA, is an Anatomical Diſſection of the Womb.

JACOB'S-STAFF, a Mathematical Inſtrument for taking Heights and Diſtances; the ſame with *Croſs-ſtaff*; which ſee.

IAMBUS, is a Foot of a Latin Verſe, conſiſting of two Syllables, when the firſt is ſhort, and the other long, as *Tenax.*

JANITOR, the ſame with *Pylorus.*

JAUNDICE: ſee *Icterus.*

ICE: In *The Works of the Learned* for *July*, 1701, there is an Abridgment of a *French* Book, called *Nouvelle Conjecture pour expliquer la Natura de la Glace*; in which the Nameleſs Author modeſtly propoſes the following Conjectures about Freezing and Ice.

Water freezes only becauſe its Parts loſe their Natural Motion, and cleave cloſe to one another; but we muſt obſerve,

1. That the Water, whilſt it freezes, ſeems to dilate it ſelf, and that it becomes more light; whereas it ſhould ſeem that it ought to become more weighty.

2. That frozen Water is not quite ſo tranſparent, and that the Bodies tranſpire not ſo freely thro' it as formerly; tho' one would think the contrary ſhould happen, if it be true, that the Water dilates it ſelf as it freezes. Theſe are the ſeeming Contrarieties which are found in the Effects and Properties of *Ice*, that make the Nature of it obſcure and difficult to be explained.

'Tis the common Opinion of Philoſophers, That *Ice* is made by certain Spirits of Nitre, which in the Winter mix with the Parts of the Water, and being of themſelves improper for Motion, becauſe of their Figure and Inflexibility, infeeble and deſtroy gradually that of the Parts to which they are joined. This Opinion is ſupported by ſome Experiments, which prove, at leaſt, that on certain Occaſions the Spirits of Salt and Nitre contribute to form the *Ice.*

Our Author has no Deſign to controvert thoſe Experiments: He ſays only, That 'tis not certain that the Spirits of Nitre do always enter into the Compoſition of *Ice*; and that tho' they enter'd the ſame conſtantly, that alone would not be ſufficient to explain all the Effects.

For Inſtance; We cannot conceive how the Spirits of Nitre, which enter the Pores of the Water, and fix the Parts of it, can oblige the Water to dilate it ſelf, and make it more light; whereas Naturally they ought to augment the Weight of it. This Difficulty, and ſome others that might be inſiſted upon, ſhew the Neceſſity of a new Syſtem to explain the Nature of *Ice*: Therefore our Author gives this that follows, which he conceives explains all things with more Eaſe, and in a more ſimple manner, than the ordinary Syſtem.

He alledges, That Water freezes in the Winter, becauſe its Parts being more cloſely joined together, they mutually embarraſs one another, and loſe all the Motion they had; and he ſuppoſes the Air to be the ſole, or at leaſt the principal Cauſe, why the Parts of the Water join ſo cloſely together. He explains it thus:

There are an infinite Number of ſmall Parts of groſs Air mixt among the Parts of the Water, as every Man may plainly perceive; for if we put into a Pneumatick Machine an open Veſſel full of Water, in that ſame Proportion as you pump the Air out of the Machine, you will ſee the Water bubble up, and ſend forth a great Quantity of groſs Air.

Thoſe

Thoſe Parts of groſs Air being diſperſed among thoſe of the Water, they have each of them the Vertue of a Spring; which is now ſo well proved in Natural Philoſophy, that no Man will call it in queſtion.

If then it can be ſhewed, That the ſmall Springs of groſs Air, mixed with the Water, have more Force in the Winter, and that then they unbend themſelves a little; it would eaſily be conceiv'd, that on one ſide thoſe Springs unbending themſelves in that manner, and on the other the external Air continuing to preſs the Surface of the Water, the Parts of the Water ſhut up betwixt thoſe ſmall Springs which repulſe them on all ſides, muſt needs being locked up one againſt another, loſe their Moiſture, and form a hard Body, that is to ſay, *Ice*. All the Difficulty lies in this, How to know whether in reality the Springs of the Air, which are diſperſed in the Water, unbend a little in the Winter; which 'tis eaſie to prove they do.

The groſs Air, which we cannot perceive in the Water whilſt it is Liquid, is eaſily ſeen when 'tis Frozen; we ſee then very often a great Quantity of Bubbles of Air very ſenſibly; and when they are too ſmall to be obſerved every one apart, we may ſee them confuſedly and in groſs; for frozen Water is always a little whiter than 'twas before; and they that have ſtudied any thing of the Nature of Colours, know that this Whiteneſs proceeds only from the ſmall Bubbles of Air mix'd with the *Ice*. This is the Reaſon that all Scums are whitiſh, and that the Bubbles of Air mix'd with Glaſs or Chryſtal, appear whiter than the reſt.

Add to this, That the little Bubbles of groſs Air, which are abſolutely inſenſible in the Water, ſo long as 'tis liquid, cannot become ſenſible in frozen Water, but becauſe each of them becomes groſſer than they were: And they cannot become groſſer, but for one of theſe Reaſons: Either becauſe the Water, when it freezes, hath attracted new Air; or becauſe the Air already diſperſed in the Water, takes up a greater Space, and that its Springs are a little more unbended. We cannot conceive how the Water, as it freezes, could attract new Air, ſince the Pores of the *Ice* are certainly leſs than thoſe of the Water, thro' which the groſs Air cannot paſs but with Difficulty. It muſt be then, that the Air already diſperſed among the Parts of the Water, is dilated, and that the Springs are a little unbended.

But why, when 'tis cold, have the Springs of the Air more Strength to unbend themſelves, than at another Seaſon?

It is anſwered in the Firſt place, That to eſtabliſh this Syſtem here laid down, it is enough to prove that the Thing happens really ſo, without any Neceſſity of explaining the Cauſe of it.

Secondly, That this Cauſe is not very difficult to be found. Every one knows that Bodies with Springs have ſo much more Force as they are more ſtiff, and that they are ſo much the more ſtiff, as their Pores are leſs; but it is the Property of Cold to reſtrict the Pores: And during the Heat, the Pores are more open, becauſe the ſubtil Matter which paſſes always thro' them, being then in a more violent Motion, hath the more Force to extend them and keep them open; whereas in the Winter, their Motion being much ſlackened, all the Bodies ſhut themſelves up, and their Pores are ſtraightened. Hence it comes, that in the Winter the Bodies of Animals tranſpire much leſs than in another Seaſon. Since then the Cold locks up the leaſt Parts of the groſs Air, and makes them leſs pliable, and more ſtiff, becauſe it ſtraightens the Pores; we muſt ſay alſo, that it augments the Force of their Springs, the Springs becoming more violent, according as the Body becomes more ſtiff.

Thus, during the Winter, the Springs of Air which are diſperſed in the Water, having conſiderably more Force, they muſt unbend themſelves a little, and as they unbend, they preſs againſt one another the ſmall Parts of Water which they hold ſhut up.

This being ſuppoſed, there is nothing in *Ice* but what may be explained naturally enough.

1. That Water as it freezes, ought to make a hard Body, becauſe then its Parts being preſſed one againſt another, they embarraſs one another mutually, and ſo loſe all the Motion they had.

2. That Water as it freezes, ought to become more light; for tho' its Parts be more preſs'd than they were before, yet the Maſs being compoſed of the Parts of the Water thus preſs'd, and of Air dilated, ought to be more large, and by conſequence more light, than it was when the Water was liquid.

3. Frozen Water takes up a greater Space than when 'tis liquid, becauſe the Springs of Air diſperſed in the Water, by unbending themſelves, do oblige the Water to riſe in the Veſſel which contain'd it. It is true, that the external Air preſſes alſo the Surface of the Water, and makes an Effort to repel it; but this external Air being freer, and its little Springs leſs bended, becauſe they unbended themſelves according as the Cold lock'd up the neighbouring Bodies, it hath leſs Force than that which is ſhut up in the Water, whoſe Springs cannot unbend, but by making the Bulk of the Water larger.

4. If you ſhut up a Veſſel full of Water in the Pneumatick Machine, the Air diſperſed in the Water dilates it ſelf in an extraordinary manner when they pump the Air of the Machine; yet the Water freezes not, becauſe the external Surface of the Water being no more preſs'd, the Air which it contains may, by unbending it ſelf, eſcape freely, as in reality it does.

5. Frozen Water muſt always be leſs tranſparent than the ſame Water when it is liquid, becauſe the Bubbles of Air which are inſenſible in the Water, by reaſon of their Smallneſs, being more ſenſible and large in the *Ice*, muſt alſo make it appear to be more white, and by conſequence leſs tranſparent.

6. The Bodies muſt much leſs tranſpire through the *Ice*, than through the Water, becauſe the Parts of the frozen Water are, in effect, more preſs'd than they were before, and ſo leave a leſs free Paſſage to foreign Bodies.

7. The Water, from which there is abundance of Air drawn by means of the Pneumatick Engine, muſt alſo freeze with leſs Difficulty; of which an able Man told our Author he had made the Experiment.

8. The Spirit of Wine, Brandy, and other Liquors of the ſame ſort, cannot freeze at all, or at leaſt rarely; for their Parts being in a great Motion, as appears by the Evaporation made of them, it follows, that the Air diſperſed into the Parts of thoſe Liquors, is much more ſubtil, and by conſequence hath leſs of a Spring, than that which is diſperſed in the Parts of common Water, ſince the Spring of the Air is principally in its groſs Parts.

9. Oil, Fat, and other viſcous Liquors, muſt congeal more eaſily than Water freezes, becauſe their Parts being improper for Motion, do ſpeedily embarraſs one another; but thoſe Liquors, when they congeal, cannot become ſo hard as *Ice*, nor dilate themſelves in the ſame manner; for tho' they

contain among their Parts a greater Quantity of Air than Water does, yet that Air is more ſubtil, hath leſs Spring, and eaſily makes its way thro' the Pores of thoſe Liquors.

10. Quick-ſilver cannot freeze, becauſe it does not contain a great enough Quantity of groſs Air; its Parts alſo are much poliſh'd, and they can eaſily ſlide one againſt another, without embarraſſing or ſtopping one another.

11. According as the Cold grows more ſharp, the Springs of the Air, diſperſed in the *Ice*, ought to have more Force to repel the Parts of the frozen Water; and the Bulk compoſed of the Air and frozen Water, muſt needs grow larger and larger. This hath been proved in the following manner: They fill'd with Water an hollow Iron Bullet, which had a Hole of three or four Lines Diameter; the Water being frozen in that Bullet, and not being ſtrong enough to break it, the *Ice* iſſued at the Hole, and form'd a ſort of Stalk or Ice-ſickle, which lengthened according as the Cold increaſed, and grew to the Length of a Finger; this Stalk being broke, and the Bullet expoſed to the Air during a very cold Night, it made a new Stalk, but not ſo long as the former, the *Ice*'s pining it ſelf, if we may be allowed ſo to ſpeak, as it paſſed through the Hole of the Bullet; as Gold and other Minerals do, by paſſing through the Wire-drawer's Inſtruments.

12. In the Hypotheſis here laid down, the Spirits of Nitre may alſo contribute to form the *Ice*, in as much as by joining themſelves to the ſmall Parts of the Air diſperſed in the Water, they contribute towards rendring them more ſtiff and inflexible, and to augment the Force of its Springs.

ICHNOGRAPHY, in Perſpective, is the View of any thing cut off by a Plane parallel to the Horizon, juſt at the Baſe or Bottom of it: And in Architecture is taken for the Geometrical Plan or Platform of an Edifice, or the Ground-plot of a Houſe or Building delineated upon Paper, deſcribing the Form of the ſeveral Apartments, Rooms, Windows, Chimneys, *&c.* And this is properly the Work of the Maſter-Architect or Surveyor, being indeed the moſt abſtruſe and difficult of any.

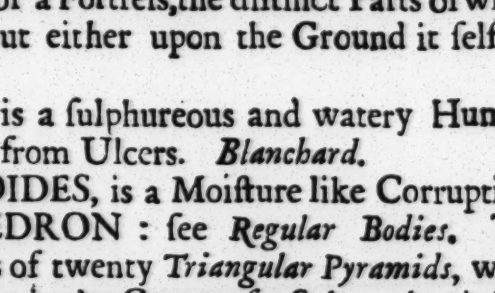
ICHNOGRAPHY, in Fortification, is in like manner the Plane or Repreſentation of the Length and Breadth of a Fortreſs, the diſtinct Parts of which are mark'd out either upon the Ground it ſelf, or upon Paper.

ICHOR, is a ſulphureous and watery Humour which flows from Ulcers. *Blanchard.*

ICHOROIDES, is a Moiſture like Corruption.

ICOSIHEDRON: ſee *Regular Bodies.* This Solid conſiſts of twenty *Triangular Pyramids*, whoſe Vertexes meet in the Center of a Sphere that is imagined to circumſcribe it, and therefore have their Height and Baſes equal: Wherefore the Solidity of one of thoſe Pyramids, multiplied by 20, the Number of Baſes, gives the ſolid Content of the *Icoſihedron.*

The following Figure being drawn on Paſteboard cut half thro', and then folded up neatly together, will repreſent an *Icoſihedron.*



ICTERUS, the Jaundice, is a changing of the Skin into a Yellow Colour, from an Obſtruction of the *Ductus Choledochus*, or the Glandules of the Liver, thro' Weakneſs, Obſtruction, or a *Schirrus* of the Liver; or becauſe the Gall abounds more than can be conveniently excerned, ſo that it ſtays in the Blood. The *Latins* call it, *Regius Morbus*, the Kingly Diſeaſe, becauſe it is eaſily cured in Courts with the Paſtimes and Divertiſements there which chear the Mind. It is alſo called a Suffuſion of the Gall. *Blanchard.*

IDEA, is whatſoever the Mind perceives in it ſelf, or ſtands there for the immediate Object of any Phantaſm, Notion, Species, Thought or Underſtanding.

IDENTITATE NOMINIS, is a Writ that lies for him, who upon a *Capias* or *Exigent*, is taken and committed to Priſon for another Man of the Name.

IDEOTA *inquirenda vel examinanda*, is a Writ to the Eſcheator or Sheriff of any County, where the King hath Notice that there is an *Ideot*, Naturally born ſo weak of Underſtanding, that he cannot govern or manage his Inheritance, to call before him the Party ſuſpected of the *Ideocy*, and examine him; and alſo by the Oath of Twelve Men, to inquire whether he be ſufficiently witted to diſpoſe of his own Lands with Diſcretion, or not, and to certify accordingly into the Chancery: For the King hath the Protection of his Subjects, and by his Prerogative, the Government of their Lands and Subſtance, that are naturally defective in their own Diſcretion.

IDES *of a Month*, among the *Romans*, were the Day after the *Nones* were out. They commonly fell out on the 13th of every Month, except in *March*, *May*, *July*, and *October* (which they called the *Full Months*, as all the others were called *Hollow*) for then they were on the 15th, becauſe in thoſe Months the *Nones* were on the 7th. The Etymology of the Word is variouſly given, and to be ſeen in moſt Dictionaries: See *Danet*'s *Greek* and *Roman Antiquities.*

IDIOCRASY, the proper Diſpoſition or Temperament of a Thing or Body.

IDIOPATHY, is a primary Diſeaſe, which neither depends on, nor proceeds from any other.

IDIOSYNCRASY, is a Temperament peculiar to any particular Animal Body; whereby it hath, either in Sickneſs or in Health, a peculiar Averſion againſt, or Inclination for ſome particular Things; or on which ſome Things will have no ſuch, or a more than uſual Operation, than they will have on other Bodies.

JECAR-CAPSTAN: ſee *Capſtan.*

JECUR, the ſame with *Hepar.*

JECUR *Uterinum*: ſee *Placenta Uteri.*

JEER, or *Jeer-Rope*, is a Piece of a Hawſer faſtened to the Main-yard and Fore-yard (in great Ships only) cloſe to the Ties; then 'tis reeved thro' a Block, which is ſeized cloſe to the Top, and ſo comes down again, and is reeved through another Block at the Bottom of the Maſt cloſe by the Deck; there are uſually two of theſe, one on each ſide the Ties: Its Uſe is to help hoiſe up the Yard, but more eſpecially to ſuccour the Ties, and to keep the Yard from falling, if they ſhould break.

JEJUNUM *Inteſtinum*, is the Second of the Small Guts, ſo called, becauſe it is moſt times found empty: 'Tis in Length about Eight Foot in Men; it begins on the Right Side under the *Colon*, where the *Duodenum* ends, and fills a good Part of the Umbilical Region, eſpecially on the Left Side;

'tis

'tis continued to the *Ileum*, but is eaſily known from it by its Emptineſs, by the great Number of its Veins and Arteries, which make it look a little Reddiſh, and alſo becauſe the Wrinkles in its Coats are more in number, and nearer to one another, than thoſe in the *Ileum*, and the Coats themſelves are much thicker.

JEOFAIL, in Common Law, ſignifies an Overſight in pleading, touching which you have a Statute, 32 *H.* 8. 30. whereby it is enacted, That if the Jury have once paſt upon the Iſſue, tho' afterward there be found a *Jeofail* in the Pleading, yet Judgment ſhall likewiſe be given, according to the Verdict of the Jury.

JESSANT, when in a Coat of Arms a Lion or other Beaſt is born *over* ſome Ordinary, as over a *Chief*, a *Bend*, a *Feſſe*, *&c.* that Lion or Beaſt is blazoned *Jeſſant* or *Jacent*, *i. e.* lying over all.

JET D'EAU, is the French Word for a Pipe of a Fountain, which caſts up the Water any conſiderable Height into the Air.

Mr. *Mariotte*, in his Treatiſe *du Mouvement des Eaux*, *&c.* ſaith, That a *Jet d' Eau* will never riſe ſo high as its Reſervatory, but always falls ſhort of it by a Space, which is in a ſubduplicate Ratio of that Height; and this he proves by ſeveral Experiments.

He ſaith alſo, That if a greater branches out in many ſmaller ones, diſtributed to different Jets, the Square of the Diameter of the main Pipe muſt be proportioned to the Sum of all the Expences of its Branches; and particularly ſaith, That if the Reſervatory be 52 Foot high, and the *Adjutage* half an Inch in Diameter, the Pipe ought to be 3 Inches in Diameter.

JETSON: ſee in *Flotſon*.

IGNIS-FATUUS, is a certain Meteor that appears chiefly in the Summer-Nights, for the moſt part frequenting Church-yards, Meadows and Bogs, as conſiſting of a ſomewhat viſcous Subſtance, or a fat Exhalation; which being kindled in the Air, reflects a kind of thin Flame in the Dark, yet without any ſenſible Heat, often flying about Rivers, Hedges, *&c.* becauſe it meets with a Flux of Air in thoſe Places. This Meteor is well known among the Common People, under the Name of *Will-of-the-Whiſp*, or *Jack-with-a-Lanthorn*.

IGNIS PERSICUS, the ſame that *Gangræna*: it is taken alſo for a Carbuncle.

IGNIS ROTÆ: ſee *Wheel-fire*.

IGNIS SACER, the ſame that *Eryſipelas*: Yet ſome take it for an *Herpes*.

IGNIS SYLVESTRIS, the ſame that *Phlyctena*.

IGNITION, is Calcination made by Fire.

IGNORAMUS, in Law, is a Word uſed by the Grand Inqueſt, impannelled in the Inquiſition of Cauſes Criminal and Publick, and written upon the Bill when they diſlike their Evidence, as defective or too weak to make good the Preſentment: The Effect of which Word ſo written is, That all farther Enquiry upon that Party, for that Fault, is thereby ſtopped, and he delivered without farther Anſwer.

ILE, is the Cavity from the *Thorax* to the Bones of the Thighs: *Pliny* obſerves, That all the Inteſtines in all Animals, except a Man and a Sheep, are called *Ile*. *Blanchard*.

ILEUM, is the Third of the ſmall Guts, ſo called ἀπὸ τῦ εἱλεῖσθαι, *à Circumvolvendo*, becauſe of its many Turnings, *&c.* It begins where the *Jejunum* ends, and ends it ſelf at the Gut called *Cæcum*, at the Beginning of the *Colon*: It is about 21 Hands Breadth in Length: There can be no ſuch thing as twiſting of the Guts, but ſometimes the Coats being doubled inward, the upper Part of an Inteſtine ſinks or falls with the lower, which makes the *Iliack Paſſion*, or *Volvulus*. The *Ileum* oft falls down into the *Scrotum*, and then the Rupture is called *Inteſtinalis*. The Paſſage of the *Ileum* is a little narrower than that of the *Jejunum*, and its Coats are ſomewhat thinner.

ILIA, the *Flanks* are the lateral Parts of the *Abdomen*, betwixt the laſt Rib and the Secret Parts.

ILIACK PASSION, the ſame with *Miſerere*, or the Twiſting of the Guts.

ILIACK VESSELS, are thoſe double-forked Veſſels of the Trunks of the great Artery, and the great Vein of the *Abdomen*, about the Place where the Bladder and the Womb are ſituate. *Blanchard*.

ILIACUS INTERNUS, is a Muſcle of the Thigh, which ariſes fleſhy from above half the Superior Region, and Internal Concave Part of the *Os Ilium*; and in its Deſcent over the Inferior Part of the laſt-named Bone, joins with the *Pſoas Magnus*, and is inſerted with it, partly under the Termination of the *Pectineus*: This, together with the *Pſoas Magnus*, move the Thigh forwards in Progreſſion.

ILINGUS: ſee *Scotomia*.

ILIUM OS, is the firſt and upper Part of the Bone called *Oſſa Innominata*, which are two large Bones ſituated on the ſides of the *Os Sacrum*. This Part of it, *Ilium*, is ſo named, becauſe it contains the Gut *Ilium*, which lies between it and its Fellow. Its Circumference is circular, being a little convex and uneven on its external ſide. 'Tis a large Bone, and is connected to the ſides of the three ſuperior *Vertebræ* of the *Os Sacrum*: The upper Part of it, of its Edge or Circumference, is called *Spina*, the Concave Internal Side *Coſta*, and the External Convex one *Dorſum*: It is joined to the *Os Sacrum* by a true *Suture*: It is larger in Women than Men.

ILLUMINATIVE-MONTH, is that Space of Time that the Moon is viſible to be ſeen betwixt one Conjunction and another.

IMAGE, in Opticks, is the Projection of an Object in the diſtinct Baſe of a Convex-glaſs.

To find the Diameter of an Image, *in the diſtinct Baſe of a Convex-Glaſs, Mr.* Molyneux *gives this Rule.*

As the Diſtance of the Object from the Glaſs:
To the Diſtance of the Image from the Glaſs::
So the Diameter of the Objects Magnitude:
To the Diameter of the Image.

Wherefore, if the Diameter of the Sun ſubtend an Arch of 32 Minutes of a Great Circle in the Heavens, the Diameter of the Sun's Image repreſented in the *diſtinct Baſe* of a *Convex Glaſs*, ſubtends an Arch of 32 Minutes alſo of ſuch a Circle as hath for its Radius the Diſtance of the diſtinct Baſe from the Glaſs.

IMAGINATION, is an Application of the Mind to the Phantaſm or Image of ſome *Corporeal Thing* impreſſed in the Brain.

IMBRICATED, is a Word uſed by Mr. *Tournefort*, and ſome other Botaniſts, to expreſs the Figure of the Leaves of ſome Plants, which are hollowed in like an *Imbrex*, or Gutter-Tile.

IMMENSE,

IMMENSE, is that whoſe Amplitude or Extenſion no Finite Meaſure whatſoever, or how oft ſoever repeated, can equal.

IMMERSION, the Plunging of any thing under Water: 'Tis alſo uſed by Aſtronomers, to ſignifie that any Planet is beginning to come within the Shadow of another, as in Eclipſes, whenever the Shadow of the Eclipſing Body begins to fall on the Body Eclipſed, we ſay, that is the time of *Immerſion*; and when it goes out of the Shadow, is the Time of *Emerſion*.

IMMERSUS: ſee *Subſcapularius*.

IMMUTATION: ſee *Hypallage*.

IMPALED, when the Coats of a Man and his Wife (who is not an Heireſs) are born in the ſame Eſcutcheon; they muſt be Marſhalled *in Pale*, the Husband's on the Right ſide, and the Wives on the Left; and this the Heralds call *Baron* and *Femme*, *two Coats Impaled*.

If a Man hath had two Wives, he may Impale his Coat in the middle between theirs; and if he hath had more than two, they are to be Marſhalled on each ſide of his, in their proper Order. See *Clifton*'s Coat in *Guillim*, p. 399. who had ſeven Wives.

IMPARLANCE, or *Emparlance*, is a Motion made in Court upon the Account of the Demandant by the Tenant, or Declaration of the Plaintiff by the Defendant, whereby he craveth Reſpite, or any other Day to put in his Anſwer.

This Imparlance is either *General* or *Special*.

The *Special* is with this Clauſe, *Salvis omnibus advantagiis tam ad juriſdictionem curiæ quam breve & narrationem.*

The *General* is made at large, without inſerting that or any other like Clauſe.

IMPENETRABILITY, is the Diſtinction of one extended Subſtance from another, by which the Extenſion of one thing is different from that of another; ſo that two things extended, cannot be in the ſame Place, but muſt of Neceſſity exclude each other.

IMPERATIVE-MOOD (in *Grammar*) implies a Command to ſuch a one to do ſuch a thing.

IMPERFECT CONCORDS: ſee *Concords*.

IMPERFECT *Flowers of Plants*, are ſuch as want the *Petala*, or thoſe finely coloured little Leaves which ſtand round and compoſe the Flower: And therefore they are ſometimes called *Apetalous*, and ſometimes *Stamineous*; becauſe they have only the *Stamina* and *Style* of a Flower.

IMPERFECT NUMBERS, are ſuch whoſe Aliquot Parts taken altogether, do either exceed, or fall ſhort of that Whole Number, of which they are Parts: And theſe are of two ſorts, either *Abundant* or *Deficient*; which ſee.

IMPERFECT PLANTS, are by the Botaniſts accounted ſuch as either really want Flower and Seed, or rather ſeem to want them; ſince no Flower or Seed hath yet been diſcovered to belong to much the greateſt part of them.

Theſe Mr. *Ray* diſtinguiſhes according to the Place of their Growth; into,

I. *Aquaticks*, or ſuch as grow in the Water; and that either in the Sea, and then they are called

- *Marine Plants*; and thoſe are either of an hard and ſtony Conſiſtence, as the *Corals*, *Corallines*, *Porus*;
  Or of a more Soft and Herbaceous one.

  Of theſe ſome are like Herbs, and are of two Kinds:

  - The Greater, which are *Cauliferous*, as the *Fucus*,
    The Leſſer, as the *Alga*.

  The others are more of the *Muſcus* or *Fungus* Appearance, as the *Spongia*.

- *Freſh-water Plants*, and thoſe have either no Leaves, but are *Capillaceous*, as the *Conferva*:
  Or their Leaves divided into three Parts; as the *Lens paluſtris*, *Lenticula*.

II. Such *Imperfect Plants*, as inhabit the dry Ground, he divides into,

- Firſt, Such as have a Subſtance, either Woody, or Fleſhy; and theſe have ſcarce any thing common to the Perfect Plants, neither the Green Herbaceous Colour, nor the Texture of Herbs, nor Flower, Seed, nor Leaf, properly ſpeaking, as all the *Fungi*; which are,

  1. Such as grow on Trees, and therefore called *Arboreous*; as the *Fungus Laricis*, called *Agarick*, and the *Fungus Sambuci*, which we call *Jews-Ear*, *Auricula Judæ* in *Latin*.

  2. *Terreſtrial*; and theſe are either *Cauliferous*, with Heads either Lamellated, or Poroſe underneath; or without Stalks, as the *Pezicæ* of *Pliny*, and *Fungus Pulverulentus*, *Crepitus Lupi*, or common Puff-Balls.

  3. *Subterraneous*; as the *Tuberæ Terræ*, or *Truffles*.

- Secondly, Such as have a more ſoft and dry Conſiſtence, and more like that of Herbs: Of which ſome are both *Cauliferous* and Branched, as the *Muſci* or *Moſſes*.

  Others are without Stalks, adhering like a Cruſt to the Surface of the Earth, Stones, Trees, or Wood; as the *Lichen Terreſtris* and *Arboreus*.

IMPERIAL-TABLE, is an Inſtrument made of Braſs, with Box and Needle, and Staff, uſed to meaſure Land: ſee *Vol.* II.

IMPERSONAL VERB, in Grammar, is ſuch an one as is only uſed in the Third Perſon Singular, as *Oportet*, *Licet*, &c.

IMPERVIOUS: Bodies are ſaid to be Impervious to others, when they will neither admit the Rays of Light, &c. nor the Effluvia of other Bodies to paſs thro' them.

IMPETIGO CELSI, the ſame with *Lepra Græcorum*. *Celſus* makes four ſorts of it:

The moſt harmleſs, ſays he, is that which is like a Scab, for it is red and hard, exulcerated and gnawed: But it differs from it, in that it is more exulcerated, and is accompanied with ſpeckled Pimples: And there ſeem to be in it certain Bubbles, from which after a certain time there fall, as it were little Scales, and it returns more certainly.

Another ſort is worſe, almoſt like a ſort of Meazles, or hot Pimples in the Skin, but more rugged, and redder, and of different Figures: In this Diſtemper little Scales too, fall from the Surface of the Skin, and it is called *Rubrica*.

The third ſort is yet worſe; for it is thicker and harder, and ſwells more, and is cleft on the top of the Skin, and gnaws more violently: It is Scaly too, but black, and ſpreads broad and ſlow: It is called *Nigra*.

The fourth ſort is altogether incurable, of a different Colour from the Red; for it is ſomething white, and like a freſh Scar, and has pale Scales; ſome whitiſh, ſome like the little Pulſe called *Lintel*, which being taken away, ſometimes the Blood follows: Otherwiſe the Humour that flows from it is white, the Skin hard and cleft, and ſpreads farther.

All theſe ſorts ariſe eſpecially in the Feet and Hands, and infeſt the Nails likewiſe.

Impetigo ſome reckon the ſame with *Lichen*. *Blanchard*.

IMPETIGO PLINII, *Pliny's Impetigo*, is the ſame with *Lichen Græcorum*. *Blanchard*.

IMPROPER FRACTIONS, are ſuch as have their Numerators equal to, or greater than their Denominators, as $\frac{6}{4}$, $\frac{18}{12}$, &c. which are not Fractions properly ſpeaking, but either Whole or Mixt Numbers; and are only put into the Form of Fractions, in order to be added, ſubtracted, multiplied, or divided, &c.

INACCESSIBLE HEIGHT or *Diſtance*, is that which cannot be Meaſured, by reaſon of ſome Impediment in the Way; as Water, &c.

INADEQUATE IDEA'S, are ſuch, which are but a partial, or incomplete Repreſentation of thoſe Archetypes or Images to which the Mind refers them.

INANITY, is the School-Term for Emptineſs or abſolute Vacuity, and implies the Abſence of all Body and Matter whatſoever; ſo that nothing remains but bare Space.

INCALESCENCE, is a Thing growing hot by ſome Internal Motion, or Fermentation; as when Quick-lime grows hot by pouring Water upon it.

INCALESCENT MERCURY, ſo Mr. *Boyle* calls ſome Mercuries of an uncommon Preparation, which by being mingled with a due Proportion of Gold Leaves, or ſmall Filings, would Amalgamate and grow hot with the Gold, even in the Palm of our Hand.

IN CASU CONSIMILI, is a Writ: ſee *Caſu Proviſo*.

IN CASU PROVISO, is a Writ: ſee *Caſu Proviſo*.

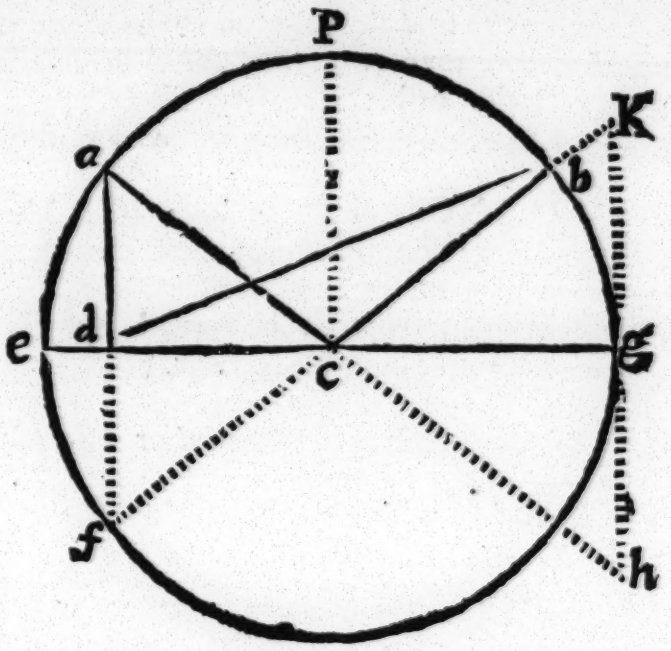
INCEPTIVE *of Magnitude*, is a Word uſed by Dr. *Wallis*, expreſſing ſuch Moments or firſt Principles, as tho' of no Magnitude themſelves, are yet capable of producing ſuch. Thus a point hath no Magnitude it ſelf, but is Inceptive of a Line, which it produces by its Motion: A Line conſidered one way, hath no Magnitude as to Breadth, but is capable by its Motion of producing a Surface which hath Breadth, &c.

INCERATION, is a mixture of Moiſture with ſomething that is dry, by a gentle ſoaking, till the Subſtance be brought to the Conſiſtence of Soft Wax. *Blanchard*.

INCIDENCE. In Opticks, the Angle *a c P*, made by the Ray *a c*, and the Perpendicular *P c*, is called the *Angle of Incidence*; but Dr. *Barrow*, and ſome others, call it the *Angle of Inclination*; and by the *Angle of Incidence*, they underſtand its Complement *e c a*.

Mr. *Molyneux*, in his Dioptricks uſes the Words *Inclination* and *Incidence* promiſcuouſly, and by the *Angle of Incidence* or *Inclination*, always intends the firſt named Angles *a c P*.

The Angle *P c b*, is called, *The Angle of Reflexion*, and is always = to the Angle of *Incidence a c P*: Which is thus proved by *Leibnitzius*.



Every Ray of Light goes the ſhorteſt way that poſſibly it can: But if you ſuppoſe the Ray *a c* to fall on the Plane-Glaſs, or Surface *e g*, and thence to be reflected to *b*, ſo that the Angle *a c e* be = *b e g*, then will the two Lines *a c* and *c b* be the two ſhorteſt Lines that can poſſibly be drawn from the Points *a* and *b*, to the Plane *e g*: For Inſtance, they will be ſhorter than *a d* + *d b*, or any others.

Produce *c b* to *f*, and draw *d f*, becauſe the oppoſite Angles at *c* are =; the Arch *e f* (= *b g*) = *a e* by the Suppoſition; but 'tis plain that *f c* = *a c*, and *c f* = *c b*. Wherefore *f b* (= *a c* + *c b*) will be leſs than *d f* (i. e. *a d*) + *d b*: and ſo it will be every-where elſe. Wherefore ſince the Ray muſt go the neareſt way, the Angle of Incidence will always be = to that of Reflexion: For the two Angles *e c a* and *b c g*, being thus equal, their Complements *a c P* and *P c b* muſt be ſo too.

That the *Angle of Incidence a c P*, is = to that of *Reflexion P c b*, may very briefly be thus proved.

Produce the Ray *a c* directly till it meet with the Perpendicular *g h* in the Point *b*: Then make *g R* = *g h*, and draw *c K*: I ſay *c K* is the Reflected Ray, and that the Angle *P c k* = *r c P*: For *P* being drawn perpendicular to the Plane *e g*, the Angle *e c a* + *a c P* = *K c g* + *P c K*; becauſe both are = *L*: But *e c a* = *g c h*, becauſe Vertical and *c g h* = *g c K* by Conſtruction. Wherefore *e c a* = *b e g*: And conſequently their Complements *a c P* and *P c b* are equal. *Q. E. D.*

In *Dioptricks*, the Sines of the *Angles of Incidence*, and *Refracted Angles*, are to each other reciprocally, as the Reſiſtances of the Mediums, as is demonſtrated

ſtrated by *Leibnitz* in *Acta Erud. Lipſiæ Anno* 1682. *p.* 185. And in Mr. *Molineux's Dioptrica Nova*, Part II. Chap. I.

Sir *Iſaac Newton* diſcover'd, That from Air to Glaſs, the Sine of the Angle of Incidence: is to the Sine of the Refracted Angle :: as 300: to 193, or nearly, as 14 to 9.

And on the contrary, That from Glaſs to Air, the Sine of the Incidence: is to the Sine of the Refracted Angles:: as 193: to 300, or as 9 to 14.

But in his Diſſertations concerning *Light* and *Colours*, he has demonſtrated, that the Rays of Light are not all *Homogeneous*, or of the ſame ſort, but of different Forms and Figures; ſo that ſome are more Refracted than others, tho' they have the ſame or equal Inclinations on the Glaſs: And therefore there can be no conſtant Proportion ſet between the Sines of the *Incident*, and *Refracted Angles*.

But the Proportion that comes neareſt the Truth, for the middle and ſtrong Rays of Light, is nearly as 300 to 193, 14 to 9.

INCIDENCE-POINT, (in Opticks) is that Point in which a Ray of Light is ſuppoſed to fall on a Piece of Glaſs.

INCIDENT-RAY, in *Catoptricks* and *Dioptricks*: ſee *Ray of Incidence*.

INCINERATION, is the Reducing the Bodies of Vegetables and Animals into Aſhes by a violent Fire.

INCISIVUS, is a Muſcle which pulleth the Upper Lip upwards.

INCISORES DENTES, the ſame with *Primores*.

INCISIVI, the ſame with *Primores*.

INCLINATION, is a Word frequently uſed by Mathematicians, and ſignifies the mutual Approach, Tendency or Leaning of two Lines or two Planes towards each other, ſo as to make an Angle.

What the *Angle of Inclination* ſignifies in Opticks, ſee in *Incidence*.

The *Inclination* of two Planes, is the acute Angle made by two Lines, drawn one in each Plane, and perpendicular to their *Common Section*.

INCLINATION *of the Axis of the Earth*, is the Angle which it makes with the Angle of the Ecliptick; or the Angle between the Planes of the Equator and Ecliptick.

INCLINATION *of a Planet*, is an Arch of the Circle of Inclination, comprehended between the Ecliptick and the Place of a Planet in his Orbit.

INCLINATION *of a Plane*, in Dialling, is the Arch of a Vertical Circle, perpendicular to both the *Plane* and the *Horizon*, and intercepted between them.

To find the Inclination of a Plane,

Take a Quadrant, and apply its Side to the Side of a Square, and apply the other Side of your Square to your *Plane*; if the Plummet fall parallel to the Side of the Square, then the lower Side of the Square ſtands level; by which draw an Horizontal Line, whereon erect a Perpendicular, and apply your Square to that Perpendicular, and if the Plummet falls parallel to the Side of the Square, then that is alſo a level Line, and your Plane ſtands Horizontally: If the Plummet falls not parallel to the Side of the Square, then turn your Square until it does, and draw an Horizontal Line, on which erect a Perpendicular, to which apply your Square, and obſerve what Angle your Plummet makes on the Quadrant, with the Side of the Square; that is, the Angle of the *Inclination of the Plane*.

INCLINATION *of a Ray*, in Dioptricks, is the Angle which this Ray makes with the *Axis of Incidence* in the firſt *Medium*, at the Point where it meets the ſecond *Medium*.

INCLINATION *of a Right Line to a Plane*, is the acute Angle which this Right Line makes with another Right Line drawn in the Plane, through the Point where the inclined Line interſects it, and thro' the Point where it is alſo cut by a Perpendicular drawn from any Point of the *inclined Lines*.

INCLINATIONS of the Planes of the Orbits of the Planets, to the Plane of the Ecliptick, are thus: *Saturn's* Orbit makes an Angle of 2 Degrees 30 Minutes; *Jupiter's* 1 Degree, and $\frac{1}{3}$; *Mars's* little leſs than 2 Degrees; *Venus's* is 3 Degr. and $\frac{1}{4}$; *Mercury's* is almoſt 7 Degrees.

INCLINING *Direct South or North Dials*: ſee *Direct South or North Inclining Dials*.

INCLINING *Declining Dials*: ſee *Declining Inclining Dials*.

INCLINING *Planes*, are thoſe which lean or incline to the Horizon.

INCOMMENSURABLE *Numbers*, are ſuch as have no Common Diviſor that will divide them both equally.

INCOMMENSURABLE *Quantities*, are thoſe which have no Aliquot Parts, or any Common Meaſure that may meaſure them; as the *Diagonal* and Side of a Square: for altho' that each of thoſe Lines have infinite Aliquot Parts, as the Half, the Third, &c. yet not any Part of the one, be it never ſo little, can poſſibly meaſure the other, as is demonſtrated in 117. *El.* 10. *Eucl.*

INCOMPLEX *Terms* in Logick: ſee *Complex*.

INCONGRUITY: ſee *Congruity*.

INCORPORATE: To *Incorporate*, in Chymiſtry or Natural Philoſophy, ſignifies accurately to mix the Particles of one Body with another.

INCRASSATING, or thickening things, are thoſe which being endued with thick ropy Parts, and mixed with thin liquid Juices, bring them to a thicker Conſiſtence, by joining and knitting their Parts together. *Blanchard*.

INCUBUS: ſee *Ephialtes*.

INCUMBENT, in Common Law, is a Clerk reſident on his Benefice with Cure; and called *Incumbent* of that Church, becauſe he doth, or ought to bend his whole Study to diſcharge his Cure.

INCURVATION *of the Rays of Light*: ſee *Light* and *Refraction*.

INCUS, the Anvil, is a Bone of the inner Part of the Ear: It is like a Grinder-tooth, and lies under the Bone called *Malleus*. It has two Legs, the ſhorter of which is tied to the Side of that Conduit or Paſſage which goes to the *Proceſſus Mammillaris*; and the longer Leg to the Head of the third Bone, called the *Stapes*.

INDAGATOR, a Searcher or Inquirer into Nature.

INDEFINITE, is what hath no Bounds or Limits determined; or what is conſidered as not having any.

INDENTED, a Term in Heraldry, when the Out-line of a Bordure, Ordinary, &c. is in the Form of the Teeth of a Saw: Thus,

INDENTURE, is a Writing comprising ſome Contract between two, and being *indented* in the Top anſwerable to another, that likewiſe containeth the ſame Contract.

INDETERMINED *Problem in Geometry*: ſee *Local*.

INDEX, is the ſame with what is ſometimes called the *Characteriſtick* or Exponent of a Logarithm; and ſheweth always of how many Places the Abſolute Number belonging to the Logarithm doth conſiſt, and of what Nature it is; *i. e.* whether an Integer, or a Fraction: Thus; In this Logarithm 2.562293, the Number ſtanding on the Left-hand of the Point, is called the *Index*; and becauſe it is 2, ſhews you that the abſolute Number anſwering to it, conſiſts of 3 Places; for 'tis always one more than the Index, becauſe the Index of 1 is 0; of 10 is 1; of 100 is 2, *&c.*

As in this Example;

0 1 2 3 4 5 6 7 8 9

1 2 3 4 5 6 7 8 9

Where the upper Numbers are Indices to the lower. And therefore in thoſe ſmall Tables of *Briggs*'s Logarithms, where the Index is omitted, it muſt always be ſupplied before you can work by them. If the abſolute Number be a Fraction, then the Index of the Logarithm hath a negative Sign, and is marked thus, $\overline{2}.562293$; which ſhews the correſponding Number to be a Decimal Fraction of 3 Places, *viz.* 1.365.

Mr. *Townly* hath a peculiar way of noting theſe Indices, when they expreſs Fractions, and 'tis now much in Uſe, *viz.* by taking inſtead of the true Index, its Arithmetical Compliment to 10; and therefore he would write the Logarithm now mention'd thus, $\overline{8}.562293$. How they are added and ſubtracted, ſee in *Addition* and *Subtraction*.

INDICATION, a Word uſed by Phyſicians and Surgeons, and ſignifies a Diſcovery of what is to be done, and what Courſe is to be taken for the Recovery of the Patient's Health; as if on Examination Bleeding be found neceſſary, they ſay, Bleeding is indicated.

INDICATIONS are uſually accounted Threefold:

1. *Preſervatory*, which ſhew what is to be done for the Continuation and Preſervation of Health.

2. *Curative*, which ſhew how the Diſeaſe is to be removed, that the Patient at preſent labours under. And,

3. *Vital*, which reſpect the Patient's Life, Strength and way of Living.

INDICATIVE-MOOD, in Grammar, demonſtrates ſimply what we affirm.

INDICATOR; ſee *Extenſor Indicis*.

INDICAVIT, is a Writ or Prohibition, that lieth for a Patron of a Church, whoſe Clerk is Defendant in Court-Chriſtian, in an Action of Tythes commenced by another Clerk, and extending to the fourth part of the Church, or of the Tythes belonging to it; for in this Caſe the Suit belongeth to the King's Court; wherefore the Patron of the Defendant being like to be prejudiced in his Church and Advowſon, if the Plaintiff obtain in the Court-Chriſtian, hath this Means to remove it to the King's Court.

INDICTION: ſee *Cycle of Indiction*.

INDICTMENT: ſee *Enditement*.

INDIGNATORIUS, an Epithet attributed to the fourth ſtreight Muſcle of the Eye, becauſe that Motion or Caſt of the Eye is peculiar to Men in the Paſſion of Anger. For this Muſcle being one of the *Abducent*, ſerves to draw the Eye outward from the inner Corner to the outer.

INDIVIDUUM, in *Logick*, is that which ſignifies but one only thing: Of which they make a fourfold Diviſion.

1. *Individuum Vagum*, is that which tho' it ſignifies but one Thing, yet may be any of that kind; as when we ſay, *A Man*, *A certain Perſon*, or *One* ſaid ſo or ſo; tho' but one Perſon is meant, yet that one Perſon, for ought appears to the contrary, may be any Body.

2. *Individuum Determinatum*, is when the Thing is nam'd or determin'd; as *Alexander*, the River *Nile*, or Mount *Athos*: This alſo is called *Signatum*.

3. *Individuum Demonſtrativum*, is when ſome Demonſtrative Pronoun is uſed in the Expreſſion; as *This Man*, *That Woman*.

4. *Individuum ex Hypotheſi*, or by Suppoſition; when an univerſal Name or Term is reſtrained by the Suppoſition to a particular Thing; as when we ſay, the *Son* of ſuch an one, and it be known that he had but one Son.

INDIVISIBLES, in Geometry, are ſuch Elements or Principles as any Body or Figure may ultimately be reſolved into. And theſe *Elements* or *Indiviſibles*, are in each peculiar Figure ſuppoſed to be infinitely ſmall.

With regard to which Notion, a Line may be ſaid to conſiſt of Points; a Surface of Parallel-Lines, and a Solid of Parallel and Similar Surfaces: And then, becauſe each of theſe Elements is ſuppoſed Indiviſible, if in any Figure, a Line be drawn thro' the Elements perpendicularly, the Number of Points in that Line, will be the ſame as the Number of the Elements.

Whence we may ſee, that a Parallelogram, Priſm or Cylinder, is reſolvable into Elements, or Indiviſibles, all equal to each other, parallel, and like to the Baſe. A Triangle into Lines parallel to the Baſe, but decreaſing in Arithmetical Proportion, and ſo are the Circles which conſtitute the *Parabolick Conoid*, and thoſe which conſtitute the Plane of a Circle, or the Surface of an Iſoceles Cone.

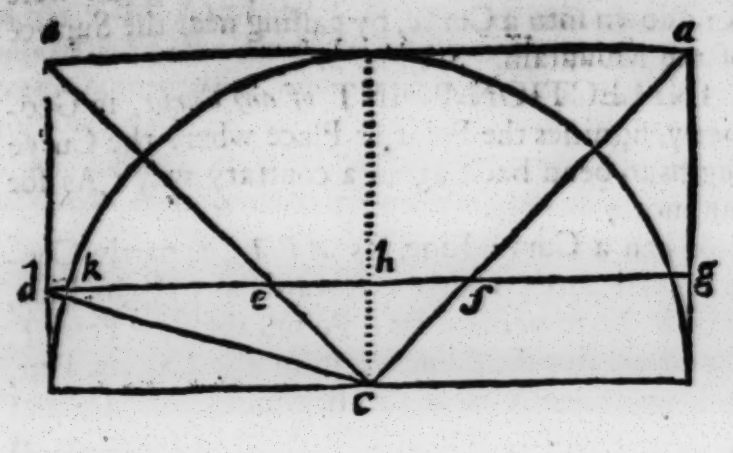
A Cylinder may be reſolved into Cylindrical Curve Surfaces, having all the ſame Height, and continually decreaſing inwards, as the Circles of the Baſe do, on which they inſiſt.

This *Method of Indiviſibles*, is only the Ancient *Method of Exhauſtions* a little diſguiſed and contracted: It was firſt introduced by *Cavallerius* in his *Geometria Indiviſibilium*, *Anno Dom.* 1635. purſued after by *Torricellius* in his Works, printed 1644. and again by *Cavallerius* himſelf in another Treatiſe, publiſhed 1647. And is now allowed to be of excellent Uſe in the ſhortening of Mathematical Demonſtrations: Of which take the following Inſtance in that famous Propoſition of *Archimedes*;

That *A Sphere is two thirds of a Cylinder circumſcribing it.*

For ſuppoſe (as in the Figure) a Cylinder, Hemiſphere, and an Inverted Cone, to have the ſame Baſe and Altitude, and to be cut by Infinite Planes all parallel to the Baſe, of which dg is one: 'Tis plain, the Square of dh will every where be equal to the Square of KC (the Radius of the Sphere) the Square $bc = eb$ Square; and conſequently, ſince Circles are to one another, as the Squares of the Radii,

Radii, all the Circles of the Hemiſphere will be equal to all thoſe of the Cylinder, deducting thence



all thoſe of the Cone: Wherefore the Cylinder, deducting the Cone, is equal to the Hemiſphere; but 'tis known, the Cone is one third of the Cylinder, and conſequently the Sphere muſt be two thirds of it. *Q. E. D.*

INDUCTION, is commonly taken for the giving Poſſeſſion to an Incumbent of his Church, by leading him into it, and delivering him the Keys, by the Commiſſary or Biſhop's Deputy, and by his ringing one of the Bells.

INDURANTIA: ſee *Sclerotica.*

INDUSIUM: ſee *Amnios.*

INEDIA, is abſtaining from Meat, when one eats leſs than formerly.

INEFFABLE-NUMBERS, the ſame with *Surd-Numbers.*

INEQUALITY of Natural Days. Tho' the Sun is ſuppoſed vulgarly to meaſure our Time equally, yet he is very far from doing ſo: And as 'tis impoſſible for a good Clock, or Movement, to keep Time with the Sun; ſo one that is truly ſuch, will meaſure Time much more truly, and go exacter than any Sun-Dial.

The uſual Reaſon, and one good one it is, of the Inequality of Natural Days, you have under the Word *Equation of Time*: But the Truth is, there is alſo another; and that is, That the Motion of the Earth it ſelf round its Axis, is not exactly Equable or Regular, but is ſometimes ſwifter, and ſometimes ſlower.

INERGETICAL Bodies or Particles, are ſuch as are ſluggiſh and unactive.

INESCUTCHEON, in Heraldry, ſignifies all the Eſcutcheons, containing $\frac{1}{7}$ of the Field, and is born within it as an Ordinary, thus:

He beareth *Ermin*, an *Ineſcutcheon Gules.*

This is alſo ſometimes called, An *Eſcutcheon of Pretence*; which is born when a Man marries an Heireſs: For then he bears her Coat of Arms on an *Ineſcutcheon*, or *Eſcutcheon of Pretence*, in the Middle of his own Coat.

INFERNAL-STONE, or *Perpetual Cauſtick*, is a Chymical Operation, whereby Silver is rendred *Cauſtick* by the Salts of Spirit of Nitre.

'Tis thus made;

Diſſolve in a Vial any Quantity of Silver in thrice its Weight of Spirit of Nitre; and then in a Sand-heat evaporate $\frac{2}{3}$ of the Moiſture: The Remainder put into a good large *German* Crucible, which place over a gentle Fire; let the Matter alone, and heaving 'till at laſt it ſinks quietly to the Bottom: Then increaſing the Fire a little, 'twill turn into an Oil; and as ſoon as you perceive it to be ſo, it muſt immediately be poured into an Iron-mold, purpoſely made for it, that is a little oil'd and greas'd, where it will preſently coagulate and harden. After 'tis taken out, it muſt be kept in a Vial well ſtopt; 'tis a great *Cauſtick*, and will laſt for ever, if it be kept from the Air. Some make them of Copper, but thoſe are not ſo good as theſe.

INFIMUS VENTER: ſee *Abdomen.*

INFINITE, is that which has no Bounds, Terms, nor Limits.

INFINITE QUANTITY. *Of the ſeveral Species of* Infinite Quantity, *and of the Proportions they bear one to the other, the learned Mathematician Capt.* Halley, *in* Philoſoph. Tranſactions, N. 193. *gives the following Account:*

That all Magnitudes infinitely great, or ſuch as exceed any aſſignable Quantity, are equal among themſelves, though it be vulgarly received for a Maxim, is not yet ſo common as it is erroneous; and the Reaſon of the Miſtake ſeems to be, That the Mind of Man coming to contemplate the Extenſions of what exceeds the Bounds of its Capacity, and of which the very Idea does include a Negation of Limits; it comes to paſs, that we acquieſce generally, and it ſuffices to ſay, ſuch a Quantity is *Infinite.*

But if we come more nearly to examine this Notion, we ſhall find, that there are really beſides *Infinite Length*, and *Infinite Area*, no leſs than three ſeveral ſorts of *Infinite Solidity*: All of which are *Quantitates ſui generis*, having no more Relation or Proportion the one to the other, than a Line to a Plane, or a Plane to a Solid, or a Finite to an Infinite; but that among themſelves each of theſe Species of *Infinites*, are in given Proportions, is that which is to be made plain.

But firſt, *Infinite Length*, or a Line infinitely long, is to be conſidered, either as beginning at a Point, and ſo infinitely extended one way, or elſe both ways from the ſame Point; in which caſe the one, which is a beginning *Infinity*, is the one half of the whole, which is the Sum of the beginning and ceaſing *Infinity*, or of *Infinity a parte ante*, and *a parte poſt*, which is analogous to Eternity in Time or Duration, in which there is always as much to follow as is paſt from any Point or Moment of Time: Nor doth the Addition or Subduction of finite Length or Space of Time alter the Caſe, either in Infinity or Eternity, ſince both the one and the other cannot be any Part of the Whole.

As to *Infinite Surface* or *Area*, any Right Line infinitely extended both ways on an infinite Plane, does divide that infinite Plane into equal Parts, the one to the Right, and the other to the Left of the ſaid Line: But if from any Point in ſuch a Plane, two Right Lines be infinitely extended, ſo as to make an Angle, the infinite Area, intercepted between thoſe infinite Right Lines: is to the whole infinite Plane:: as the Arch of a Circle, on the Point of Concourſe of thoſe Lines as a Centre, intercepted between the ſaid Lines: is to the Circumference of the Circle; or as the Degrees of the Angle, to the 360 Degrees of the Circle.

For Example,

Two Right Lines meeting at a Right Angle, do include, on an infinite Plane, a quarter Part of the whole infinite Area of ſuch a Plane.

But

But if ſo be two parallel infinite Lines be ſuppoſed drawn on ſuch an infinite Plane, the Area intercepted between them will be likewiſe infinite; but at the ſame time will be infinitely leſs than that Space which is intercepted between two infinite Lines that are inclined, tho' with never ſo ſmall an Angle; for that in the one Caſe, the given finite Diſtance of the Parallel Lines, diminiſhes the Infinity in one Degree of Dimenſion; whereas in a Sector, there is Infinity in both Dimenſions; and conſequently the Quantities are the one infinitely greater than the other, and there is no Proportion between them.

From the ſame Conſideration ariſe the three ſeveral Species of infinite Space or Solidity, as has been ſaid; for a Parallelopipid or a Cylinder infinitely long, is greater than any finite Magnitude, how great ſoever; and all ſuch Solids ſuppoſed to be formed on given Baſes, are as thoſe Baſes, in proportion to one another: But of theſe, three Dimenſions are wanting, as in the Space intercepted between two parallel Planes infinitely extended, and at a finite Diſtance; or with infinite Length and Breadth with a finite Thickneſs; all ſuch Solids ſhall be as the given finite Diſtances one to another; but theſe Quantities, tho' infinitely greater than the other, are yet infinitely leſs than any of thoſe wherein all the three Dimenſions are infinite. Such are the Spaces intercepted between two inclined Planes infinitely extended; the Space intercepted by the Surface of a Cone, or the ſide of a Pyramid likewiſe infinitely continued, *&c.* of all which, notwithſtanding the Proportions one to another, and to the vaſt Abyſs of infinite Space, (wherein is the Locus of all things that are or can be; or to the Solid of infinite Length, Breadth and Thickneſs taken all manner of ways) are eaſily aſſignable. For the Space between two Planes: is to the whole: : as the Angle of thoſe Planes: to the 360 Degrees of the Circle.

As for Cones and Pyramids, they are as the Spherical Surface intercepted by them, is to the Surface of the Sphere; and therefore Cones are as the Verſed Sines of half their Angles to the Diameter of the Circle. Theſe three ſorts of *Infinite Quantity*, are analogous to a Line, Surface, and Solid, and after the ſame manner cannot be compared, or have no proportion the one to the other.

Beſides theſe, there are alſo ſeveral other Species of *Infinite Quantity*, ariſing from the Contemplation of Curves, and their Aſymptotes, which he leaves to the Speculation of the learned Mathematicians.

INFINITE SERIES: ſee *Series*.

INFINITIVE-MOOD, in Grammar, is when a Verb is uſed ſo as to determine neither any particular Perſon, or Number.

INFLAMMATIO: ſee *Phlegmone*.

INFLATION, is the Diſtention of a Part from flatulent Matter.

INFLECTION (in Opticks) is a Multiplicate Refraction of the Rays of Light, cauſed by the unequal Denſity of any Medium, whereby the Motion or Progreſs of the Ray is hindred from going on in a Right Line, and is Inflected or Deflected by a Curve, ſaith the ingenious Dr. *Hook*, who firſt took notice of this Property in his *Micrography*, p. 217. And this he ſaith, differs both from Reflection and Refraction, which are both made at the Superficies of the Body, but this in the middle of it within.

Sir *Iſaac Newton*, as you will find under the Word *Light*, diſcovered alſo by plain Experiment this Inflection of the Rays of Light; and Mr. *de la Hire* ſaith he found, That the Beams of the Stars being obſerved in a deep Valley, to paſs near the Brow of an Hill, are always more refracted than if there were no ſuch Hill, or the Obſervations were made on the Top thereof; as if the Rays of Light were bent down into a Curve, by paſſing near the Surface of the Mountain. *See Vol.* 2.

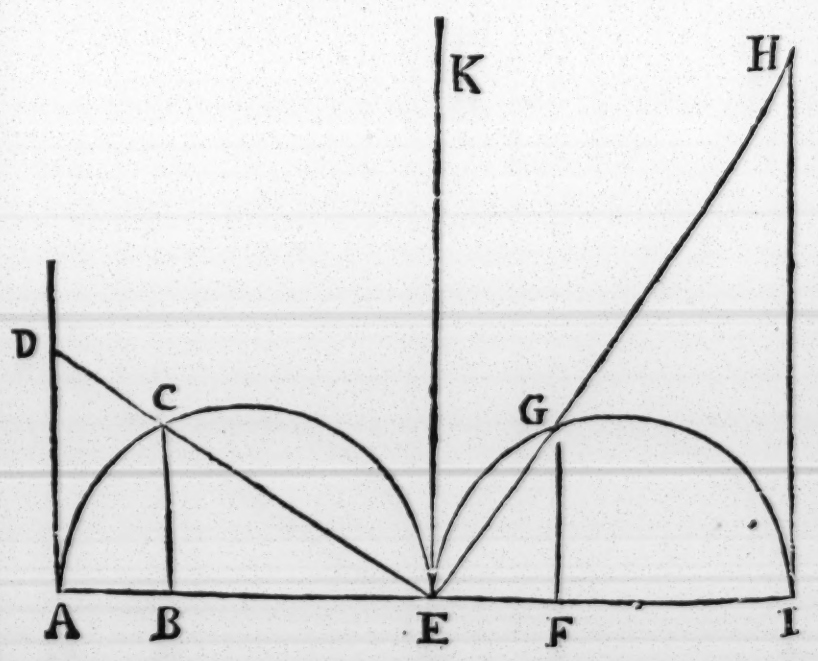
INFLECTION-POINT *of any Curve*, in Geometry, ſignifies the Point or Place where the Curve begins to bend back again a contrary way: As for Inſtance;

When a Curve Line, as *A F K*, is partly Concave and partly Convex towards any Right-Line, as *A B*, or towards a fix'd Point, then the Point *F*, which divides the Concave from the Convex Part, and conſequently is at the Beginning of one, and End of the other, is called the Point of *Inflection*, as long as the Curve, being continued in *F*, keeps its Courſe the ſame; but 'tis called the Point of *Retrogreſſion*, when it inflects back again towards that Part or Side from whence it took its Original: *See the next Figure ſave one.*

Before the Theory of this Inflection *and* Retrogreſſion of Curves *can be underſtood, a certain Principle muſt be explain'd, which is this, as communicated by Mr.* Ditton.

Whatſoever finite Quantity (or if it be a Fluxion 'tis all one) goes on continually increaſing or decreaſing, it cannot change from a Poſitive to a Negative Expreſſion, or from a Negative to a Poſitive one, without firſt becoming equal to an Infinite, or to Nothing: It is equal to Nothing, if it does continually decreaſe, and equal to an Infinite, if it does continually increaſe.

To illuſtrate this, Let there be two Circles touching one another in the Point *E*, their Diameters *A E* and *E I*, lying in one and the ſame Right-Line. Let *A E* or *E I* be $= d$. Let the Diſtance between the Extremity *A*, and any Ordinate in either of the Circles be $=$ to x perpetually. I conſider now, what will be the Expreſſions of the Lines intercepted between *E* the Point of Contact of the Circles; ſuch as are the Lines *E B* and *E F* intercepted between *E* and the Ordinates *C B* and *G F*. 'Tis certain therefore, That taking a Point, as *B*, any where between *A* and *E*, that then the Expreſſion of the intercepted *B E* is $d - x$; but taking a Point, as *F*, between *E* and *I*, the Expreſſion of the intercepted *E F*, ſhall be $x - d$. For *A B*, or



A F being taken for x indifferently, the Values of the intercepted Lines will appear with this Change of Signs.

In

In one Case therefore the Expression is Positive, in the other Negative. But as the points *B* or *F* approach to *E*, the Quantities *B E* and *E F* decrease continually, and at the point *E* are equal to nothing.

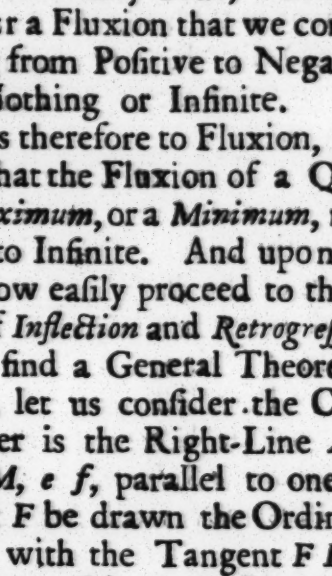
So that it is plain, That there is no passing from a Positive to a Negative Expression, in this Case of a Quantity continually decreasing, without passing thro' nothing. For the other part,

Let us consider the Tangents (as *D A* or *H I*) cut off by Lines continually drawn from *E* the point of the Circles contact. If *C B*, or *G F*, be put equal to *y*, the Expression of any such Tangent will be $\frac{y\,d}{d-x}$, or $\frac{y\,d}{x-d}$, according as we take it on the one or the other side of the point *E*; in one Case therefore 'tis Positive, in the other Negative. But as the Points *B* or *F* approach to *E*, the Tangents *D A* and *H I* encrease continually, and at the Point *E* they become infinite: Therefore a Quantity that continually encreaseth, cannot pass from a Positive to a Negative Expression, without being infinite.

All this is Universally True, whether it be a Finite Quantity or a Fluxion that we consider. There is no changing from Positive to Negative, without passing thro' Nothing or Infinite.

Applying this therefore to Fluxion, it will follow from hence, That the Fluxion of a Quantity, that expresses a *Maximum*, or a *Minimum*, must be equal to Nothing or to Infinite. And upon this Foundation we may now easily proceed to the Speculation of the Points of *Inflection* and *Retrogression*.

In order to find a General Theorem to assist us in this Matter, let us consider the Curve *A F K*, whose Diameter is the Right-Line *A B*; and its Ordinates *P M*, *e f*, parallel to one another. If thro' the Point *F* be drawn the Ordinate Applicate *E F*, together with the Tangent *F L*; and from any other Point as *M*, on the same side with *A F*, he draws the Ordinate Applicate *M P*, as likewise the Tangent *M T*: It is evident,

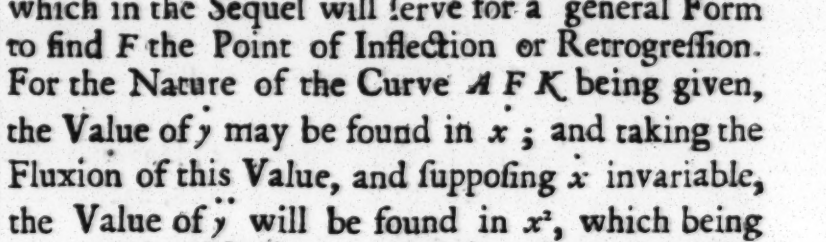


1. In these Curves that have a Point of *Inflection*, that the Abscissa *A P* encreaseth continually, and that the Part *A T* of the Diameter, intercepted between *A* the Original of *X*, and *T* the Concourse of the Tangent and the Axe, encreaseth such time as the Point P fall upon *E*, and after it again begins to diminish: From whence it is apparent, that *A T* must become the *Maximum A L*, when the point *P* falls upon the point *E* required.

2. In those Curves that have a Point of *Retrogression*, 'tis evident, that the part *A T* encreaseth continually, and that the Abscissa encreaseth so long, till the point *T* fall upon *L*, after which it again diminisheth: From whence it is clear, That *A P* must become a *Maximum*, when the point *T* falls upon *L*.

Now if *A E* be put $= x$, *E F* $= y$, then will *A L* be $= \frac{y\,\dot{x}}{\dot{y}} - x$, whose Fluxion, which is $\frac{\dot{y}^2\,\dot{x} - y\,\dot{x}\,\ddot{y}}{\dot{y}^2} - \dot{x}$ (supposing $\dot{x}$ invariable) being divided by $\dot{x}$; the Fluxion of *A E* must become Nothing or Infinite; that is $-\frac{y\,\ddot{y}}{\dot{y}^2}$ = Nothing or Infinite: So that the multiplying by $\dot{y}^2$, and dividing by $-y$, $\ddot{y}$ will be $=$ to Nothing or Infinite, which in the Sequel will serve for a general Form to find *F* the Point of Inflection or Retrogression. For the Nature of the Curve *A F K* being given, the Value of $\dot{y}$ may be found in $\dot{x}$; and taking the Fluxion of this Value, and supposing $\dot{x}$ invariable, the Value of $\ddot{y}$ will be found in $\dot{x}^2$, which being put equal to Nothing, or Infinity, serves in either of these Suppositions to find such a Value of *A E*, as that the Ordinate *E F* shall intersect the Curve *A F K* in *F* the point of Inflection or Retrogression. Of this I shall only now, from the *Analyse des Infiniment Petits*, give one

EXAMPLE.



Let *A F K*, be a protracted Semi-cycloid, whose Base is longer than the Circumference of the generating Circle *A D B*, whose Center is *C*. 'Tis required to find *E* in the Diameter *A B*, so that the Ordinate Applicate *E F* shall cut the Semi-cycloid in *F*, the Point of contrary Flexion.

Sup-

Suppoſe the known Quantities $AD\,B = a$; $BK = b$; $AB = 2c$, and the unknown Quantities $AE = x$, $ED = z$, the Ark $AD = u$, $EF = y$; then by the Property of the Cycloid $y = z + \frac{b\,u}{a}$; and therefore $\dot{y} = \dot{z} + \frac{b\,\dot{u}}{a}$: But by the Property of the Circle $z = \sqrt{2cx - xx}$, and conſequently $\dot{z} = \frac{c\,\dot{x} - x\,\dot{x}}{\sqrt{2cx - xx}}$, and $\dot{u}\left(\sqrt{\dot{x}^2 + \dot{z}^2}\right) = \frac{b\,\dot{x}}{\sqrt{2cx - xx}}$: Therefore ſubſtituting for $\dot{z}$ and $\dot{u}$ their reſpective Values, we have $\dot{y} = \frac{ac\,\dot{x} - a\,x\,\dot{x} + b\,c\,\dot{x}}{a\sqrt{acx - xx}}$, and the Fluxion thereof, (ſuppoſing $\dot{x}$ invariable) is, $\frac{bcx - acx}{2cx - xx \times \sqrt{2cx - xx}} - \frac{bcc \times \dot{x}}{} = 0$; that is, $AE\,(x) = c + \frac{ac}{b}$, and $CE = \frac{ac}{b}$.

Hence it is evident, That to have F, a Point of contrary Fluxion, b muſt be greater than a; for if it be leſs, then CE would exceed CB.

INFLUENCES of the Planets, or Heavenly Bodies, are ſuch Phyſical Powers or Forces, as they are ſuppoſed to have on Sublunary Things.

Mr. *Boyle* is inclined to believe (tho' he had no Opinion of Judicial Aſtrology in other reſpects) that the Planets may have ſome Phyſical Influence or Operation on Bodies belonging to our Globe, from theſe Conſiderations.

1. That it cannot be denied, that all the Affections and Diſpoſitions of Moiſture, Heat, Cold, Drought, the Courſe of all Winds, Showers, Thunder, &c. and whatever elſe helps to produce the great and univerſal Effects of Rarefaction and Condenſation in our Atmoſphere, do in a great Meaſure, if not entirely, depend on the Motion, Poſition, Situation, and Aſpects of the Superior Celeſtial Bodies or Planets. That every Planet hath its own proper Light diſtinct from every other, which Light not being a bare Quality, but deſigned for a further uſe than meer Illumination, muſt be accompanied with ſome peculiar Tincture, Virtue, or Power.

2. That this Light of each particular Celeſtial Body, not being at all Refracted in the Ætherial Spaces, it is tranſmitted thro', deſcends entirely and unchanged into our Atmoſphere.

3. That whatever is received into our Atmoſphere, is alſo received by the Thin and Subtile Air, which is contiguous to the Atmoſphere; which cannot but be capable of being moved, ſtirred, altered, and influenced by theſe differently diſpoſed Lights which penetrate each part of it.

4. And ſince the Thin and Subtile Air is capable of being thus affected, moved and altered by theſe Planetary Virtues, it muſt needs variouſly impreſs, move, agitate and infect the Spirits or Subtiler parts of all Bodies within its reach; and conſequently muſt have a conſiderable influence upon the Bodies wherein ſuch Spirits reſide, and whom they actuate.

5. This is alſo farther confirmed, as true in Fact, by thoſe ſudden ſtrokes of Cramps, Convulſions, Blites, Colds, Peſtilential Invaſions, &c. which do not only often, as it were in an Inſtant, ſeize on our Bodies, but which do alſo continue for a long time, &c.

IN FORMA PAUPERIS, in Law, is when any Man that hath a juſt Cauſe of Suit, either in the Chancery, or any other of the Courts of Common Law, will come either before the Lord Keeper, Maſter of the Rolls, either of the Chief Juſtices, or Chief Baron, and make Oath that he is not worth five Pounds, his Debts paid, either of the ſaid Judges will in his own proper Court, admit him to ſue in *forma Pauperis*, and he ſhall have Council, Clerk or Attorney aſſigned to do his Buſineſs, without paying any Fees.

INFORMATUS NON SUM, or rather *non ſum Informatus*, in Law, is a formal Anſwer made of Courſe by an Attorney, that is commanded by the Court to ſay what he thinketh good in defence of his Client; who being not inſtructed to ſay any thing material, ſays, He is *not informed*, by which he is deemed to leave his Client undefended, and ſo Judgment paſſeth for the Adverſe Party.

INFORMED STARS, are ſuch of the *Fixed-Stars*, as are not caſt into, or ranged under any Form: ſee *Sporades*.

INFRASPINATUS, or *ſupra Scapularis inferior*, is a Muſcle of the Arm, ſo called, becauſe it is placed below the Spine. This ariſes Fleſhly from the inferior part of the *Baſis Scapulæ*, as alſo from its Spine, and Inferior *Coſta* and *Dorſum*; from hence paſſing in a Triangular Form, according to the Figure of the Part, leſſening it ſelf as it marches over the Juncture it becomes Tendinous, and is inſerted like the *Supra Spinatus* to the Head of the *Os Humeri*. This moves the Arm directly backward.

INFUNDIBULUM CEREBRI, the ſame that *Choana*.

INFUNDIBULUM RENUM, is the Pelvis or Baſin thro' which the Urine paſſes to the Ureters and the Bladder.

INFUSION, is an Extraction of the Vertue of Medicines with a convenient Liquour, which if it be Purgative, it is uſually taken at one Doſe; and to this the Name properly agrees.

INGREDIENTS, are the ſeveral Parts or Simples that go to the making of any Compound Medicine; and in general it ſignifies the Conſtitutent Parts or Principles of a mixt Body.

INGRESS, in Aſtronomy, ſignifies the Sun's entring the firſt Scruple of one of the four *Cardinal Signs*, eſpecially *Aries*.

INGRESSU, is a Writ of Entry, whereby a Man ſeeketh Entry into Lands and Tenements: It lies in many Caſes, and hath many ſeveral Forms: ſee *Entry*.

This Writ is alſo called in particular, *Præcipe quod reddat*, becauſe thoſe be formal Words in Writs of Entry.

The Writs, as they lie down in divers Caſes, are theſe, ſet down in the *Old Nat. Brev. viz.*

INGRESSU *ad communem Legem*, is a Writ which lieth where a Tenant for Term of Life, or of another Life, Tenant by Courteſie, or Tenant in Dower, maketh a Feoffment in Fee, and dieth: He in Reverſion ſhall have the aforeſaid Writ againſt whomſoever that is in the Land after ſuch Feoffment made.

INGRESSU *ad Terminum qui præterit*, a Writ which lieth where the Lands or Tenements are Let

to a Man for Term of Years, and the Tenant holdeth over his Term.

INGRESSU *Cauſa Matrimonii prælocuti* : ſee *Cauſa Matrimonii prælocuti.*

INGRESSU *cui ante divortium* : ſee *Cui ante divortium.*

INGRESSU *dum fuit infra ætatem*, is a Writ which lies where one under Age ſells his Lands, *&c.*

INGRESSU *dum non fuit compos mentis*, is a Writ which lies when a Man ſelleth Lands or Tenements, being out of his Wits, *&c.*

INGRESSU *in Caſu conſimili* : ſee *Caſu conſimili.*

INGRESSU *in Caſu proviſo* : ſee *Caſu proviſo.*

INGRESSU *in le per*, is a Writ which lies where one demandeth Lands or Tenements, lett by another after the Term is expired.

INGRESSU *ſine aſſenſu capituli*, is a Writ given by the Common Law, to the Succeſſor of him that alienated, *ſine aſſenſu capituli*, *&c.* and ſo called from thoſe Words contained in the Writ.

INGRESSU *ſuper diſſeiſina in ſe quibus*, is a Writ which lies where a Man is diſſeiſed, and dieth, for his Heir againſt the Diſſeiſor.

INGRESSU *ſur cui in vita*, is a Writ that lies where one demandeth Lands or Tenements of that Tenant that had *Entry* by one, to whom ſome Anceſtor of the Plaintiff did lett it for a Term now expired.

INGROSSATOR *magni Rotuli* : ſee *Clerk of the Pipe.*

INGROSSER, in Common Law, is one that buys Corn growing, or dead Victuals, to ſell again.

Alſo a Clerk that writes Records or Inſtruments of Law in Skins of Parchment.

INGROSSING *of a Fine*, is making the Indentures by the *Chirographer*, and the Delivery of them to the Party unto whom the Cognizance is made.

INGUEN, is that Place from the Bending of the Thigh to the Secret Parts.

INHARMONICAL *Relation*, a Term in Muſick : ſee *Relation Inharmonical.*

INHERITANCE, is a Perpetuity in Lands or Tenements to a Man and his Heirs : For *Littleton lib.* 1. *cap.* 1. ſays, This Word *Inheritance* is not only underſtood where a Man hath *Inheritance* of Lands and Tenements by Deſcent of Heritage, but alſo every Fee-ſimple or Fee-tail that a Man hath by his Purchaſe, may be ſaid by *Inheritance*, for that his Heirs may inherit after him.

INHIBITION, is a Writ to *inhibit* or forbid a Judge from farther proceeding in the Cauſe depending before him : ſee *F. N. B. Fol.* 39. where *Prohibition* and *Inhibition* are put together. But *Inhibition* is moſt commonly a Writ iſſuing out of a higher Court-Chriſtian to a lower and inferior ; and *Prohibition* out of the King's Court to a Court-Chriſtian, or to an inferior Temporal Court.

INJECTION, is the caſting (by a Syringe, *&c.*) ſome liquid Medicine into Wounds or Cavities of the Body, or of the Veſſels ; Clyſters are hence by ſome called *Injections.*

Several Experiments have been made about

INJECTION *of Liquors*, into the Veins of Animals, from whence probably ſome good Hints may be taken ; I ſhall therefore mention ſome of them.

Sir *Fraxaſtati*, Profeſſor of Anatomy at *Piſa* in *Italy*, injected a little *Aqua Fortis* diluted into the Crural and Jugular Vein of a Dog, and he died preſently ; and had (on opening him) all his Blood found fixed, except about the Guts : ſome of the great Veſſels were burſt.

Some *Spirit of Vitriol* being *injected* into the Veins of another Dog, he died not ſo ſoon, but fetched his Breath thick and difficultly, and foamed like an Epileptick ; but dying at laſt, he opened him, and found his Blood fix'd in his Veins Grumous and like Soot.

Oil of Tartar injected, did not kill the Dog, tho' tried upon him ſeveral times ; but he grew more eager for Meat than before, and getting ſome Bones, he gnawed them moſt greedily.

Oil of Sulphur injected, ſwelled the Dog and killed him ; his Blood was found not coagulated, but more thin and florid than ordinary ; which Conſtitution, perhaps, may be as fatal in the Blood, as its being curdled and fixed.

INJUNCTION, is a Writ grounded upon an Interloqutory Order in Chancery ; ſometimes to give Poſſeſſion to the Plaintiff, for want of the Defendant's Appearance ; ſometimes to the King's Ordinary Court, and ſometimes to the Court-Chriſtian, to ſtay Proceedings in a Cauſe upon Suggeſtion made, That the Rigour of the Law, if it take place, is againſt Equity and Conſcience in that Caſe.

INIUM, is the Beginning of the oblongated Marrow, which is the common Senſory, becauſe the Species which are received from the external Organs are conveyed thither by the Nerves. *Blanchard.*

INLAGARY, a Term in Law, ſignifying a Reſtitution of one Outlaw'd to the King's Protection, and to the Benefit or Eſtate of a Subject.

INNATE *Principles*, according to ſome Philoſophers, are primary Notions or Characters which they will have to be ſtamp'd upon the Mind of Man when it firſt receives its Being, and which it brings into the World with it.

INNOMINATA *Tunica Oculi*, the Tunick of the Eye that wants a Name, is a certain ſubtile Expanſion of the Tendons, from the Muſcles which move the Eye to the Circumference of the *Iris* or Horney Membrane.

INNOMINATA *Oſſa*, are two large Bones ſituated on the ſides of the *Os Sacrum*, and in a *Fœtus* may each be ſeparated into three Bones, *Ilium*, *Os Pubis*, and *Iſchium*, joined by Cartilages, and appear diſtinct by three Lines 'till ſeven Years old, but grow all into one Bone at riper Years : they are by ſome called *Cuneiformia.*

INNOMINATUS *Humor*, or *Inſitus*, is a Secondary Humour, as the Ancients call it, wherewith they thought the Body was nouriſhed : For thoſe Nutritious Humours they talked of are four, *Innominatus*, *Ros*, *Gluten*, *Cambium.* *Blanchard.*

INNOTESCIMUS, in Law, are Letters Patents which are always of a Charter of Feoffment, or ſome other Inſtrument not of Record, and ſo ſtyled in the Words of the Concluſion, *Innoteſcimus per præſentes.*

INNS-OF-COURT, are ſo called, becauſe the Students there ſtudy the Laws, to enable them to practiſe in the *Courts of Weſtminſter*, or elſewhere. Theſe are the *Middle* and *Inner Temple*, *Lincolns-Inn*, and *Grays-Inn.* There are alſo two Serjeants-Inns, and eight Inns of Chancery.

INNUENDO, is a Word frequently uſed in Writs, Declarations and Pleadings ; and its Uſe is only to declare and aſcertain the Perſon or Thing which was named or left doubtful before.

INOCULATION, is a kind of Grafting by the Inſertion of the Bud of one kind of Fruit-Tree

into the Bark of another, ſo as to make different Kinds of Fruit grow on the ſame Tree, and the ſame common Sap ſupply them all.

INOSCULATION: ſee *Anaſtomoſis.*

INQUIRENDO, is an Authority given to a Perſon or Perſons, to enquire into ſomething for the King's Advantage.

INQUISITION, in Law, is a manner of proceeding in Matters Criminal, by the Office of the Judge, or by the great *Inqueſt* before Juſtices in *Eyre.*

INQUISITORS, are Sheriffs, Coroners, *ſuper viſum corporis*, or the like, who have Power to enquire into certain Caſes.

INROLMENT, in Law, is the Regiſtring, Recording, or Entring of any Lawful Act in the Rolls of the Chancery, as a Recogniſance acknowledged, or a Statute, or a Fine levied; or in the Rolls of the Exchequer, King's-Bench, or Common Pleas; or in the Huſtings of *London*, or by the Clerk of the Peace in any County.

INSANIA, or *Amentia*, Madneſs, is an Abolition or Depravation of Imagination and Judgment.

INSCONCED, a Term in the Art Military, implying that a Part of an Army hath fortified themſelves with a Sconce or ſmall Fort, in order to defend ſome Paſs, *&c.* See *Sconces.*

INSCRIBED, in Geometry, a Figure is ſaid to be *inſcribed* in another, when all the Angles of the Figure *inſcribed* touch either the Angles, Sides, or Planes of the other Figure.

INSCRIBED *Bodies*: ſee *Regular Bodies.*

INSESSUS, is a Bath for the Belly, proper for the Lower Parts, wherein the Patient ſits down to the Navel. They are for ſeveral Uſes, as for eaſing of Pain, ſoftning of Parts, diſpelling of flatulent Matter, and frequently for exciting the Courſes. *Blanchard.*

INSIMUL *Tenuit*, is one of the Species of the Writ called *Formedon*; which ſee.

INSISTING, the Angles in any Segment, in Geometry, are ſaid to be *inſiſting* upon the Arch of the other Segment below.

INSITIO, the Botanick Word for *Grafting*; it ſignifies in general, the Inſertion and Uniting of any Cyon, Bud, *&c.* into the Subſtance of the Stock, and is of divers Kinds.

INSOLATION, is expoſing of any Body to be warmed or heated by the Beams of the Sun.

INSPEXIMUS, are Letters Patent, ſo called becauſe they begin, after the King's Title, with this Word *Inſpeximus*; and is the ſame with *Exemplification.*

INSPIRATIO, is an alternate Dilatation of the Cheſt, whereby the Nitrous Air is communicated to the Blood, to accend it by the Wind-pipe and its *Veſicular* Parts.

The Cauſe of *Inſpiration* doth not ſeem to conſiſt only in the Dilatation of the Thorax, as is commonly thought, but alſo in the Contraction of the Tunick, which covers the upper part of the *Oeſophagus*, and the moſt cloſe Receſſes of the *Aſpera Arteria. Blanchard.*

INSTANT, is ſuch a Part of Duration wherein we perceive no Succeſſion; or is that which takes up the Time of only one *Idea* in our Minds, without the Succeſſion of another, wherein we perceive no Succeſſion at all.

INSTITUTIONS, or *Inſtitutes*, Part of the Firſt of the Four Tomes or Volumes of the Civil Law, and is a Compendium of the Digeſt drawn into Four Books, compoſed on purpoſe by the Emperor for the Uſe of young Students, that ſo having the firſt Elements of the whole Profeſſion in this little Treatiſe, they might the ſooner gain a competent Knowledge of it, without being diſcouraged by the Largeneſs of the former Books.

INTACTÆ, are Right Lines, to which Curves do continually approach, and yet can never meet with them: Theſe are uſually called *Aſymptotes*; which ſee.

INTEGERS, from the Latin *Integrum*, ſignifies in Arithmetick whole Numbers, in Contradiction to Fractions.

INTENSION, is a Writ that lies againſt him that enters after the Death of a Tenant in Dower, or other Tenant for Life, and holds him out in the Reverſion or Remainder: And every Entry upon the Poſſeſſion of the King, is called an *Intenſion*; as where the Heir of the King's Tenant enters after Office, and before Livery, this is called an *Intenſion upon the King.*

Intenſion, in Natural Philoſophy, ſignifies the Increaſe of the Power or Energy of any Quality, ſuch as *Heat*, *Cold*, *&c.* for of all Qualities, they ſay, they are *Intended* and *Remitted*; that is, capable of Increaſe and Diminution. Under the Word *Quality* you will find it demonſtrated, That the *Intenſion* of all Qualities increaſes reciprocally, as the Squares of the Diſtances from the Center of the Radiating Quality decreaſes.

INTENTION, or *Study*, is when the Mind with great Earneſtneſs, and of Choice, fixes its View on any *Idea*, conſiders it on all ſides, and will not be called off by the ordinary Sollicitation of other *Ideas.*

INTERCALARY-DAY, is the odd Day put in or inſerted in the *Leap-Year.*

INTERCEPTED-AXE, a Term in Conick Sections, ſignifying the ſame with *Abſciſſa*; which ſee.

INTERCOLUMNIATION, is the Space or Diſtance between the Pillars of any Building.

INTERCOLUMNS, or *Intercolumniation*, in Architecture, are the Spaces between Column and Column in any Portico or great Piazza, *&c.*

INTERCOSTAL-ARTERIES, are Arteries, according to ſome, ſo called, becauſe they go to the Regions about the Ribs: The upper beſtows it ſelf among the Muſcles that are between the four higheſt Ribs; and the under one goes to every Muſcle that is between the reſt of the Ribs.

INTERCOSTAL-VESSELS, are the Veins and Arteries that run along the Intervals or Spaces of the lower and upper Ribs; on which account they are diſtinguiſhed into Superior and Inferior.

INTERCOSTALES *Externi & Interni*, are Muſcles placed in the Intervals of the Ribs, as their Names declare. Their Number on each ſide is twice eleven, equal to the Interſtices in which they are lodged. Their Originations are differently aſſigned by Anatomiſts; but 'tis moſt probable that they do ariſe from the lower Edge of each ſuperior Rib, and are inſerted to the upper Edge of each inferior one. Theſe are thin and fleſhy; the Fibres of the External paſs from above obliquely downwards to the Fore-part, or *Oſſa Pubis*: Thoſe of the Internal deſcend in like manner obliquely towards the Back-part, or *Os Sacrum*, their Fibres decuſſating each other like the Letter X.

INTERCUS; ſee *Anaſarca.*

INTEREST, is the Sum reckoned for the Loan or Forbearance of ſome principal Sum lent for (or due at) a certain Time, according to ſome certain Rate, and therefore called *Principal*, becauſe it is the Sum that procreates the *Intereſt*, or from which

the *Intereſt* is reckoned; and is either *Simple* or *Compound*.

I. *Simple Intereſt*, is counted from the *Principal* only, and is eaſily compured by the *Simple* or *Compound Golden Rule*, thus:

Let that which is the principal Cauſe of the *Intereſt* be put into the firſt place; and that which betokeneth Time, be in the ſecond place; and the remaining in the third: Under this Conditional part place the two other Terms, each under its like, and there will be a Blank to ſupply under one of thoſe above, either under the firſt, ſecond, or third:

EXAMPLE.

If 100 l. *in* 12 *Months gain* 6 l. *(this is the Conditional part;) What ſhall* 50 l, *get in* 3 *Months?*

Place them down as in the Rule:

L.	*m.*	*l.*
100	12	6
50	3	

Here the Blank will be under the third place, and by this

RULE I.

Multiply the three laſt for a Dividend, and the two firſt for a Diviſor, the Quotient of theſe gives the ſixth.

That is, $6 \times 50 \times 3 = 900$, and $100 \times 12 = 1200$.
Now 1200) 900.0 (.73 = 15 *s.* required.

But if the Demand had been, In how many Months would 50 *l.* have gained 15 *s.* Or if 100 *l.* in 12 Months gain 6 *l.* What ſhall the Principal be, that in 3 Months would gain 15 *s.* In theſe two Caſes the Blank would have been under the firſt or ſecond Terms: Then by this

RULE II.

Multiply the firſt, ſecond, and laſt for a Dividend, and the third and fourth for a Diviſor; the Quotient is the Anſwer.

l.	*m.*	*l.*	
103	12	6	
	3	.75	= 15 *s.*

Then by the Rule, $100 \times 12 \times .75 = 900.00$.
And $6 \times 3 = 18$) 900. (50 *l.* required.

This Rule ſhews *Simple Intereſt* and all that belongs to it with eaſe, and was thus found;

Put P for the Principal, T for the Time, and G for the Gain in the Conditions; and p, t, g anſwering, it will be, $P : G :: t : p : \frac{Gp}{P}$.

And $T : Gp :: t : \frac{Gpt}{TP} = g$, which is the firſt Rule, that is, multiply the three laſt for a Dividend, and the two firſt for a Diviſor.

And becauſe $\frac{Gpt}{TP} = g$, therefore $Gpt = TPg$; and conſequently $t = \frac{TPg}{Gp}$, and $p = \frac{TPg}{Gt}$, which is the ſecond Rule.

II. *Intereſt Compound*, is that which is counted from the *Principal*; and *Simple Intereſt* forborn, called alſo *Intereſt upon Intereſt*.

And for the reſolving of Propoſitions relating to *Compound Intereſt*, firſt ſtate the Queſtion propos'd, as tho' the Demand lay upon one Pound only; and having found a fit Anſwer (according to the Import of the Queſtion) for one Pound, to a convenient Number of Decimal parts, multiply the Sum or Number of Pounds, &c. propos'd in the Queſtion, into that Anſwer agreeing to one Pound, the Product ariſing from thence will be the Anſwer required.

Mr. *Ward* hath done this very well at the End of his Algebra, thus:

For the eaſier expreſſing of the ſeveral parts given or ſought, they may be repreſented by the following Letters;

Let P = the *Principal* { given or ſought in any Queſtion.
t = the *Time*, { or Number of Years or Days, &c. given or ſought.
a = the *Amount* { of one Pound, for one Year, or Day, &c. according to any Rate propoſed.
z = the *Sum* { or amount of *Principal* and *Intereſt* given or ſought.

Note, That in the Caſes of *Compound Intereſt*, (t) is the Index of the Power of (a).

Now, by conſidering the two following Proportions, a General Theorem may be raiſed, by which all Queſtions in *Compound Intereſt* may be reſolved.

Firſt, 1 l. : a :: a : aa :: aa : a^3 :: a^3 : a^4 :: a^4 : a^5, &c. in $\div$.

That is, *As one Pound: Is to its Amount (or one Pound with its Intereſt) at one Years End:: So is that Amount: To the Amount of one Pound at two Years; and ſo on.*

Whence 'tis plain, That *Compound Intereſt* is grounded upon a Rank of Geometrical Proportionals continued, the laſt of which is known by the Number ſignified by (t) and is a^t.

Secondly, 1 l. : a^t :: P : z; *Ergo* $P\,a^t = z$.

That is, *As one Pound: Is to the Amount of one Pound for any Time propoſed:: So is* 10, 100, 1000, *or any Sum propoſed: To its Amount for the ſame Time.*

From theſe two Proportions the General Theorem $P\,a^t = z$ is ſufficiently demonſtrated, and may be clearly underſtood.

Queſt. 1 *Suppoſe* 250 l. *hath been at Intereſt ſeven Years; What doth it amount to at* 6 per Cent. per Annum, Compound Intereſt?

Here is given $P = 250$ *l.* $t = 7$, and $a = 1.06$.

For $100 : 6 :: 1 : 1.06 = a$, the firſt Year.

Then if a be involved ſo often, until its Index $= t$, *viz.* $a^7 = a^t$, and then multiplied into P, it will produce z, as appears by the Theorem $P a^t = z$.

But $a = 106$, involved 7 times $= 1.50363$.

And $250 \times 1.50363 = 375.9075 = z$.

That is, 375 *l.* 18 *s.* 2 *d.* is the Sum produced from 250 *l.* having been at *Compound Intereſt* ſeven Years (as above propoſed.)

Queſt. 2. *Suppoſe* 375 l 18 s. 2 d. *were to be paid ſeven Years hence; What is it worth in ready Money, abating* 6 per Cent, per Annum, Compound Intereſt?

Here is given $z = 375.9075$, $t = 7$, and $a = 1.06$; to find P.

General Theorem is $P a^t = z$, therefore $\frac{z}{a^t} = P$.

But $a = 1.06$, and involved 7 times $= 1.50363$.

And $\frac{375.9075}{1.50363}$ $\left(\begin{array}{l} = 250 = P; \text{ that is, worth} \\ 250\ l. \text{ ready Money.} \end{array}\right.$

Queſt. 3. *Suppoſe* 250 l. *hath been at Intereſt, and the Amount is* 375 l. 18 s. 2 d. *at* 6 per Cent. Compound Intereſt; *How long hath it been forborn?*

Here is given $P = 250$, $z = 375.9075$, and $a = 1.06$, for one Year; thence to find t, the Index of the Power of a.

General Theorem, $P a^t = z$; *ergo*, $\frac{z}{P} = a^t$.

Conſequently, if a^t be continually divided by a, until it become $\frac{a}{a} = 1$, the Number of ſuch Diviſions will be t: For ſuch Number of Diviſions diſcovers how oft a was involved.

But $\frac{375.9075}{250}$ $\left(= 1.50363 = a^t.\right.$

And $\frac{1.50363}{1.06}$ $\left(= 1.418518.\right.$

Alſo $\frac{1418518}{1.06}$ $\left(= 1.338225\right.$

And ſo on till it become $\frac{1.06}{1.06}$ $(= 1$, which will be at the ſeventh Operation.

Then will $t = 7$, the Number of Years required.

Queſt. 4. *Suppoſe* 250 l. *had been forborn ſeven Years, and the Debtor is willing to give up both Principal and Intereſt, proffering* 375 l. 18 s. 2 d. *to be cleared; What Rate of Intereſt,* per Cent. *(allowing Compound Intereſt) doth he hereby offer to the Creditor?*

Here you have given $P = 250$, $z = 375.9075$, and $t = 7$, to find a.

General Theorem, $P a^t = z$, *ergo* $\frac{z}{P} = a^t$.

That is, $a^t = a^7$, conſequently $\sqrt[7]{\frac{z}{P}} = a$.

But $\frac{z}{P}$ $(= 1.50363 = G.$

Let $a = r + e$.

Then $r^7 + 7 r^6 e + 21 r^5 ee = a^7 = G.$

$\frac{1}{7} r^7 + r^6 e + 3 r^5 ee = \frac{1}{7} G.$

$\frac{1}{7} rr + re + 3 ee = \frac{\frac{1}{7} G}{r^5}.$

$re + 3ee = \frac{\frac{1}{7} G}{r^5} - \frac{1}{7} rr = D.$

Hence this *Theorem*, $\frac{D}{r + 3e} = e$.

Let $r = 1$	$1.50363 = G.$
	$.214804 = \frac{1}{7} G \div 1^5.$
	$-.142857 = \frac{1}{7} rr.$
	. . .
$r = 1$	$.071947 = D$ $(.06 = e.$
$+ 3e = .18$	708
Diviſ. $= 1.18$	$.21480428 = \frac{1}{7} G.$
	$.16051432 = \frac{1}{7} G. \div r^5.$
Firſt $r = 1$	$- .16051428$
$+ e = .06$	$.00000004$
New $r = 1.06 = a$	

Then $1 : 1.06 :: 100 : 6 =$ the Rate of the Intereſt required.

But if in any Queſtions, either of *Intereſt* or *Annuities*, the Time given or ſought be not terminated by whole Years, but by Weeks, Months, Quarters, Half-Years, Three Quarters, &c. for reſolving ſuch Queſtions, firſt reduce ſuch broken or Fractional parts of the Year into Days, *viz.* $\frac{1}{52} = 7$ Days, $\frac{1}{12} = 30.4$ Days, $\frac{1}{4} = 91.25$ Days, $\frac{1}{2} = 182.5$ Days, $\frac{3}{4} = 273.75$ Days; and ſo for any odd Number of Days that falls betwixt ſuch even parts of the Year.

This done, find an Anſwer according to the Demand of the Queſtion, (and agreeing to one Pound as before) for the Number of the Days propoſed.

To perform which, it will be requiſite to reſolve this following Queſtion.

Queſt. 5. *What is the Amount (or Intereſt) of one Pound for one Day, at* 6 per Cent. per Annum, Compound Intereſt?

Put a for the Amount ſought, then 'twill be,

$1 : a :: a : a^2 :: a^3 : a^3 : a^3 :: a^4 : a^5 :: a^6$, &c. $\div$.

That is, *As one Pound: Is to its Amount for one Day:: So is that Amount: To the Amount for two Days:: And ſo is that of two Days: To that of three Days; and ſo on to* 365 *Days.*

The

The laſt of which will be $a^{365} = 1.06$.

Let $a = r + e$.

Then $r^{365} + 365re^{364} + 66430r^{363}ee = 1.06 = G$.

$\frac{1}{365}r^{365} + r^{364}e + 182r^{363}ee = \frac{1}{365}G$.

$\frac{1}{365}rr + re + 182ee \frac{\frac{1}{365}G}{r^{363}}$.

$re + 182ee = \frac{\frac{1}{365}G}{r^{363}} - \frac{1}{365}rr = D$:

Whence this *Theorem*, $\frac{D}{r + 182e} = e$.

Let r = 1.	.00290410 = $\frac{\frac{1}{365}G}{r^{363}}$.	
+ 182 e = .0182	—.00273972 = $\frac{1}{365}rr$.	
Diviſor = 1.0182	.00016438 = D(.00016 = e	
	10182	
New r = 1.0001	625600	
+ 182 e = .01092	606612	
Diviſor = 1.01102		

New r = 1.00016, for a ſecond Operation.

Then is, .00274025636372 = $\frac{\frac{1}{365}G}{r^{363}}$.

—.00274050280986 = $\frac{1}{365}rr$.

Here the Exceſs lieth upon $\frac{1}{365}rr$, and therefore the Difference or new Reſolvend will have the Sign —, and conſequently muſt be — e.

Then	—.0000003464644	= D(-.0000003 = e
r = 1.00016	30003162	
+ 182 e = 1.0000546		
	46414520	(-464 = z.
Diviſor 1.0001054	40004216	
Laſt r = 1.00016	6413004	
— e = .0000003464	6000530	
a = 1.0001596536	409674	
	400040	

This Value of a, is the Amount of 1 *l.* for one Day; from which, if 1 *l.* be ſubſtracted, the Remainder will be the *Intereſt* of 1 a for one Day; *i. e.* .0001596536: Conſequently, if any propoſed Sum be multiplied into either of theſe, the reſpective Product will be the Amount or Intereſt of that Sum for one Day.

Hence, if a Table of the ſeveral Powers of a was calculated, it would be,

$a : a^2 : a^3 : a^4 : a^5 : a^6 : a^7$ = the Amounts.
1, 2, 3, 4, 5, 6, 7, = the Days.
And ſo on to $a^{65} = 1.06$, the Amount for 365 Days.

Such a Table would be very uſeful for the ſpeedy reſolving of all Queſtions relating to *Compound Intereſt*, &c. for any Number of Days leſs than one Year.

III. *Annuities, Penſions, Leaſes in Reverſion*, &c. differ from *Compound Intereſt* in this; that *Compound Intereſt* is grounded upon a Rank of Geometrical Proportionals continually increaſing; but *Annuities*, &c. upon a Rank of Geometrical Proportionals continually decreaſing; and may be thus repreſented,

Let p = the { *Penſion* or *Annuity*; and is the firſt or greateſt Term in the Progreſſion.

t = the { *Time* of Continuance (as in Intereſt) and is the Number of all the Terms except the firſt.

a = the { Rate of Intereſt for one Pound (as before) and is the Common Ratio of all the Terms.

z = the { Sum of all the Terms, except the firſt, and is the Price, or preſent Worth of any Annuity or Penſion, &c.

Hence the Progreſſion will be,

$$p : \frac{P}{a} :: \frac{P}{a} : \frac{P}{aa} :: \frac{P}{aa} : \frac{P}{aaa} :: \frac{P}{aaa} : \frac{P}{aaaa}, \&c. ::.$$

Until it become $\frac{P}{a^t}$; that is, until the Index of the Power of a, be equal to the Time of Continuance of the Annuity.

In this Progreſſion $\frac{P}{a^t}$ is the laſt Term;

Then $z - \frac{P}{a^t}$ is the Sum of all the Antecedents,

And $z - \frac{P}{a}$ the Sum of all the Conſequents.

But, *As one of the Antecedents : Is to its Conſequents :: So is the Sum of the Antecedents : To the Sum of the Conſequents.*

That is, $P : \frac{P}{a} :: z - \frac{P}{a} : z - \frac{P}{a}$.

Therefore $zP - \frac{PP}{a} = \frac{zP}{a} - \frac{PP}{a^t \times a}$.

That is, $za - p = z - \frac{P}{a}$.

Or, $za - z = p - \frac{P}{a}$.

By this Equation may all the Caſes in Annuities or Penſions, &c. (that are bounded by Time) be reſolved, by tranſpoſing the ſeveral Parts thereof, as the Nature of the Queſtion requires.

For Inſtance, *Suppoſe the Yearly Penſion or Leaſe, Years of Continuance, and Rate of Intereſt, were each given; Thence to find the Worth thereof in preſent Money.*

You have given P, t, and a, thence to find z.

The Equation is $za - z = p - \frac{P}{a^t}$.

Therefore $z = \frac{P - \frac{P}{a^t}}{a - 1} = P - \frac{P}{a^t} \div a - 1$.

The like for any other Part, *viz.* P, t, or a.

The

The very Ingenious and Learned Capt. *Halley* hath, in his Obſervations on the *Breſlaw* Bills of Mortality, (in *Philoſ. Tranſ.* N. 196,) ſhewed ſeveral ways of eſtimating the Values of Annuities and Lives, and computing the different Degrees of Mortality, or rather, as he calls it, Vitality; where he proves, That 'tis 80 to 1, that a Perſon of 25 Years old doth not die in a Year: That 'tis 5 and a half to one, a Man of 40 lives 7 Years: That a Man of 30 may reaſonably expect to live between 27 and 28 Years, &c. And he gives Rules for the Valuation of 2 or 3 more Lives, and what an Annuity is worth during the Continuance of any of them, &c.

INTERFORAMINEUM, or *Interfemineum*, the ſame with *Perineum*.

INTERJECTION, in Grammar, is an indeclinable Word uſed in a Sentence, to declare the Affections or Paſſions of the Mind, and to compleat the Senſe of it.

INTERIOR *Polygon*: ſee *Polygon Interior*.

INTERIOR *Talus*: ſee *Talus*.

INTERLOCUTORY *Order*, is that which decides not the Cauſe, but only ſettles ſome intervening Matter relating to the Cauſe; as where an Order is made by Motion in *Chancery*, for the Plaintiff to have an Injunction, to quit his Poſſeſſion till the hearing of the Cauſe; this, or any other ſuch Order not being final, is *Interlocutory*.

INTERMISSIO *Febrium*: ſee *Apyrexia*.

INTERMITTENS *Morbus*, is a Diſeaſe which comes at certain times, and then remits a little.

INTERNAL *Angles*: ſee *Angles Internal*.

INTERNODIUM, in Botany, is the Space contained between any two Knots or Joints of the Stalk of a Plant.

INTERNUS *Auris*, is a Muſcle which lies in a Bony Channel evacuated in the *Os Petroſum*, which makes one of the *Parietes Tympani*: One part of this Channel is without the *Tympanum*, and lies in the upper part of the Bony Paſſage which goes from the Ear to the Palate; the other part, which is within the *Tympanum*, advancing as far as the *Feneſtra Ovalis*, makes in that place a riſing, upon which, as on a Pulley, the Tendon of this Muſcle paſſes to the other Side of the *Tympanum*, and inſerts it ſelf at the poſterior part of the Handle of the *Malleus*, a little below the Inſertion of the External Muſcle, by which means it draws towards the *Os Petroſum*. When this Muſcle acts it pulls the *Manubrium* of the *Malleus* towards the *Os Petroſum*, whereby the *Membrana Tympani* becomes ſomewhat concave outwardly.

INTEROSSEI *Manus*, are the Muſcles of the Fingers, which are diſtinguiſhed into External and Internal; they are aptly ſo named from their Situations. Authors diſagree in their Number, ſome reckoning ſix, others eight, amongſt which they eſteem the *Abductor Minimi Digiti*, and *Indicis*; but Mr. *Cowper* inclines to the firſt Opinion, conceiving the two latter named Muſcles do not deſerve theſe Denominations. They ariſe Fleſhy internally in the Palm from the ſuperior parts of the Metacarpal Bones next the *Carpus*, whence deſcending, they become Tendinous at the firſt Internode of each Finger laterally, and paſs to their Inſertions with the *Extenſor Digitorum Communis*; each Interſtice of the Metacarpal Bones entertaining two Muſcles inſerted to the Sides of the Fingers. When all theſe *Interoſſei* act together, they draw the Fingers near each other, and aſſiſt in their Extenſion, as *Galen* takes notice; at which time they, together with the *Abductor Indicis*, and *Minimi Digiti*, are capable of divaricating the Fingers, which Action cannot be performed without ſome Difficulty by them when they are bended; which Contrivance of the moſt Wiſe Architect is alſo obſerved by *Galen*.

INTEROSSEI *Pedis*, are Muſcles of the Foot; they are reckoned to be ſeven in Number. They derive their Names from their Situation, and may each deſerve a proper Appellation from their Uſe.

The Firſt may be called *Abductor Minimi Digiti*.

The Second, which is the largeſt, draws the next Toe towards the leſſer, and may be called, *Abductor Auricularius*.

The Third antagonizes the former, and is an *Abductor* of the Toe.

The Fourth may be called *Abductor Medii Digiti*.

The Fifth is an *Abductor* of the ſame.

The Sixth is an *Abductor*; and Seventh, *Abductor Indicis Pedis*.

All theſe ariſe Fleſhy from the ſuperior part of the *Oſſa Metatarſi* of the leſſer Toes, and becoming bellied, grow Tendinous at their Inſertions to the firſt Internode of each leſſer Toe laterally.

INTERROGATION, is a Figure in Rhetorick, in which the Paſſion of the Speaker introduces a thing by way of Queſtion, to make its Truth the more conſpicuouſly appear.

INTERRUPTION, as ſome call it, is the ſame with Disjunction of Proportion in Geometry, and is noted thus, (::) and ſignifieth the breaking off of the Ratio in the middle of four disjunct or diſcrete Proportionals, As A : B :: C : D; that is, As A is to B :: So is C to D.

INTERSCAPULARIA, are the Cavities betwixt the Shoulder-blades and the Vertebres.

INTERSECTION, in Mathematicks, ſignifies the cutting of one *Line* or *Plane* by another: Thus we ſay, that the mutual *Interſection* of two Planes, is a Right Line.

INTERSPERSUM *Vacuum*: ſee *Vacuum*.

INTERSPINALES *Colli*; theſe are ſmall fleſhy Muſcles of the Neck, ariſing from the ſuperior parts of each double ſpinal Proceſs of the Neck, except of the ſecond *Vertebra*; and are inſerted to the inferior Parts of all the ſaid double Spines. When theſe Muſcles act, they draw the Spines of the *Vertebræ* of the Neck nearer each other.' Theſe were firſt diſcovered in the Year 1690.

INTERSTELLAR, a Word uſed by ſome Authors, to expreſs thoſe parts of the Univerſe that are without and beyond our Solar Syſtem; and which are ſuppoſed as Planetary Syſtems moving round each fix'd Star as the Center of their Motion, as the Sun is of ours: And if it be true, as 'tis not improbable, That each fix'd Star may thus be a Sun to ſome habitable Orbs that may move round it, the *Interſtellar* World will be infinitely the greater part of the Univerſe.

INTERTRIGO, or *Attritus*, is cutting or fretting the *Cuticula* off of the parts near the Fundament, or betwixt the Thighs.

INTERVAL, in Muſik, is the Diſtance or Difference between any two Sounds, whereof one is more Grave, and the other more Acute. They make ſeveral Diviſions of an *Interval*, as firſt into *Simple* and *Compound*: The *Simple Intervals* are the *Octave*, and all that are within it, as the *Second*, *Third*, *Fourth*, *Fifth*, *Sixth*, and *Seventh*, with their Varieties: The *Compound* ones are all thoſe that are greater than an *Octave*, as the *Ninth*, *Tenth*, *Eleventh*, &c. with their Varieties.

An *Interval* is alſo divided into *Juſt* or *True*, and into *Falſe*: All the above-mention'd *Intervals*, with their

their Varieties, whether *Major* or *Minor* are *Juſt*; but the diminutive or ſuperfluous ones are all *Falſe*: See *Ozanam's Dict. Matth. p.* 653. An *Interval* is alſo divided into a *Conſonance* and a *Diſſonance*; which ſee.

INTESTATES, in Law, there are two kinds of *Inteſtates*, one that makes no Will at all; another that makes a Will, and nominates Executors, but they refuſe; in which he dies as an *Inteſtate*, and the Ordinary commits Adminiſtration.

INTESTINES, the *Entrails*, *Guts*, or *Bowels*.

INTRUSION, is when the Anceſtor dies ſeized of any Eſtate of Inheritance, expectant upon an Eſtate for Life; and then the Tenant for Life dies, between whoſe Death, and the Entry of the Heir, a Stranger does interpoſe and *intrude*.

INTRUSIONE, is a Writ that lies againſt the *Intruder*.

INTUITION, according to Mr. *Lock*, is the Perception of the certain Agreement or Diſagreement of any two Idea's immediately compared together.

INVIDIATUS, in Law, is when one has been accuſed of ſome Crime, which being not fully proved, he is put *ſub debita fidei juſſione*; i. e. *Suretiſhip*.

INVECTED, a Term in Heraldry, ſignifying directly contrary to *Engrailed*; which ſee.

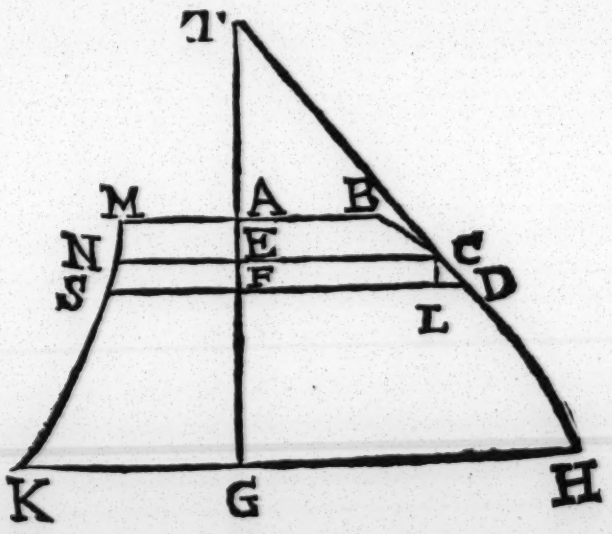
INVENTORY, is the Deſcription or Repertory orderly made of all dead Mens Goods and Chattels, prized by four or more Credible Men, which every Executor or Adminiſtrator is bound to exhibit to the Ordinary at ſuch times as he ſhall appoint.

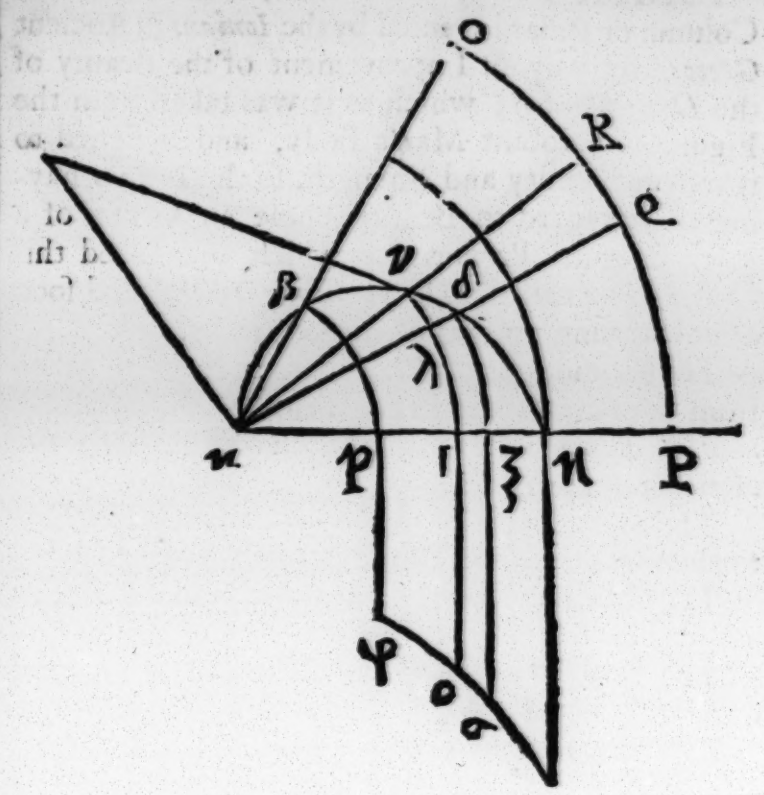
INVERSE *Proportion*, or *Proportion by Inverſion*: ſee the Word *Proportion*, N. 7.

INVOICE, is a Particular of the Value, Cuſtom, and Charges of any Goods ſent by a Merchant in another Man's Ship, and conſigned to a Factor.

INVOLUCRUM *Cordis*: ſee *Pericardium*.

INVOLUTE and *Evolute Figures*, in Mathematicks, are ſuch as theſe:





Let the Space *A B H G* be divided into an infinite Number of Trapezia; and imagine the Portions of the Curve *C D*; and their Sines *C L*, to be flexible like ſo many Threads; and the Ordinates *A B*, *E C*, *F D*, *G H*, to be rigid and inflexible: Then the Trapezia *C E F D*, may be changed into the Trilineal Figures *x γ δ*; *viz.* if the Points *E* and *F* be ſuppos'd to co-incide; and if this be done in all the other Trapezia's, and if all the Points of the Diviſions in the Axis be ſuppos'd to be contracted or meet in *G*, there will be produced a new Figure *x β n*; and the Point *x* will repreſent the Point of Concourſe, wherein all the Points of the Axis *E*, *E*, *F*, *G*, *&c.* meet; and the Figure *x β n* is call'd the *Involuta* of the Figure *A B H G*, and this is call'd the *Evoluta* of that. Now the Properties of theſe Figures are,

1. Becauſe the Rectangle *C L F E* is ſuppos'd to be chang'd into the infinitely little Sector of a Circle *γ x λ*, this Sector is equal to half that Parallelogram, the Angles at *γ* and *λ* being Right Angles, and *λ γ* being = *C L*; and if this be obſerved in all the reſt, all the Rectangles *C E F L*, or the Figure *A B H G*, is equal to twice the Sum of all the Triangles *x γ λ*, or the *Involuta x β n*.

2. Becauſe, by Suppoſition, *C L* = *γ λ*, and *C D* = *γ δ*, and the Angles *L* and *λ* Right Angles; therefore the Triangles *C L D* and *γ λ δ* are ſimilar and equal: Whence, if we ſuppoſe the Angle *T x γ* = *γ λ δ*, then the Triangles *T x γ* and *T E C* will be (becauſe *γ x* = *E C*) ſimilar and equal.

3. The Arch *β p* deſcrib'd with the Radius *x β*, is leſs than the Axis *A G*, and the Axis *ν μ* deſcribed with the Radius *x n*, is greater than the ſaid Axis *A G*, as is evident from the Geneſis of theſe Figures: ſee *Hayes's Fluxions, p.* 109.

INVOLUTION, in *Algebra*, is the raiſing up any Quantity from its Root to any Power aſſign'd; as ſuppoſe *a* + *b* were to be ſquared, or raiſed up to its ſecond Power, they ſay, *involve a* + *b*; that is, multiply it into its ſelf, and it will produce *a a* + 2 *a b* + *b b*, which is the Square or ſecond Power of that Quantity; and if it be involved again, or if that Square be multiplied by the Root, the Cube or third Power will be produced, which is *a a a* + 3 *a a b* + 3 *b b a* + *b b b*.

INWARD *Flanking Angle*, in Fortification, is made by the Courtine and the *Razant Flanking Line of Defence*.

IONICK

IONICK *Order of Architecture*, is the Form of a Column or Pillar invented by the *Ionians* in Ancient *Greece*, by way of Improvement of the Beauty of the *Dorick Order*; which as it was taken from the Figure of a robuſt Man's Body, and deſigned to repreſent Solidity and Strength, ſo the *Ionians* having more regard to Beauty, choſe an Order of a more Elegant Proportion, which occaſioned this Order to be called, *The Feminine Order*; and ſoon after it ſprung up that of the *Caryatides*.

The Promotions of this Pillar, as they are taken from the famous one in the Temple of *Fortuna Virilis* at *Rome*, now the Church of St. *Mary* the *Ægyptian*, are theſe;

The intire Order from the Superficies of the *Area* to the *Cornice*, are 22 Modules or 11 Diameters.

The Column with its Baſe and Capital, contains 18 Modules.

The *Entablature* (*i. e.* the *Architrave*, *Frieſe*, and *Cornice*) contain 4 Modules.

The *Voluta* of the Capital, is of an Oval Form.

The Columns in this Order are often hollow'd and furrow'd with 24 Gutters; and ſometimes 'tis done only to the third part of the Column, reckoning from the Bottom; and then that third part hath its Gutter filled with little Rods or Battoons, all the part of the Hollow above being left empty.

JONTHUS, or *Varus*, is a little hard, callous Swelling in the Skin of the Face. *Blanchard.*

JOURNEYS *Accounts*, is a Term in Law, to be thus underſtood: If a Writ be abated without the Default of the Plaintiff or Demandant, he may purchaſe a new Writ, which if it be purchaſed by *Journeys Accounts*; (that is, within as little Time as he poſſibly can after the Abatement of the firſt Writ) then this ſecond Writ ſhall be as a Continuance of the firſt, and ſo ſhall ought the Tenant or Defendant of his Voucher, Plea, or Non-tenure, Joint-tenancy fully adminiſtred, *&c.* or any other Plea which ariſes upon Matter happening after the Date of the firſt Writ; and 15 Days have been held a convenient Time for the Purchaſe of the new Writ.

JOY, is a Delight of the Mind, from the Conſideration of the preſent, or aſſured approaching Poſſeſſion of a Good; and we are then poſſeſſed of any Good, when we have it ſo in our Power that we can uſe it when we pleaſe.

JOYNTURE, is a Covenant, whereby the Husband, or ſome other Friend in his Behalf, aſſureth unto his Wife, in reſpect of Marriage, Lands or Tenements for a Term of Life: Or otherwiſe

It is ſo called, either becauſe granted *Ratione Juncturæ in Matrimonio*; or becauſe the Land in *Frank-marriage* is given jointly to the Husband and Wife, and after to the Heirs of their Bodies, whereby the Husband and Wife be made Joint-Tenants during the Coverture.

IRIS, is that fibrous Circle next to the Pupil of the Eye, diſtinguiſhed with Variety of Colours: ſee *Uvea Membrana*. 'Tis ſo called from its Similitude to a Rainbow, (in Latin *Iris*.)

Alſo thoſe changeable Colours which ſometimes appear in the Glaſſes of Teleſcopes, Microſcopes, *&c.* are called *Iris* for the ſame Reaſon; as is that coloured *Spectrum*, which a Triangular Priſmatick Glaſs, will project on a Wall, when placed (at a due Angle) in the Sun-beams: ſee *Rain-bow*.

IRONY, is a Trope in Rhetorick, by which we ſpeak contrary to our Thoughts; as to ſay, *Such a one is a very honeſt Man*, when we know he is notoriouſly Corrupt.

IRON-SICK, a Ship or a Boat is ſaid to be *Iron-ſick*, when her Spikes are ſo eaten with Ruſt or Nails, and ſo worn away, that they make Hollows in the Planks, whereby the Ship leaks.

IRRADIATION, is a Word uſed by *Van Helmont*, and ſome other Chymiſts, to expreſs the Operation of ſome Mineral Medicines, which they will have to impart their Virtue, without emitting any thing Material or Subſtantial out of them, or without the Emanation of any Corporeal Effluvia.

Thus, for Inſtance, They tell you, That ſome Antimonial Preparations, as is *Glaſs* and *Crocus Metallorum*, will give an Emetick Quality to Wine, *&c.* without any manner of Diminution of its Weight: But it doth not appear that they were well enough exerciſed in Statical Experiments, either to have nice Scales, or to know how to uſe them, and therefore, doubtleſs, do too boldly call that Diminution, which was only not ſo ſenſibly ſo to them: But how a Body ſhould communicate its Vomitive Quality to a Liquor, without impregnating it with ſome of its fine and ſubtile Emetick Particles, is hardly poſſible to conceive.

IRRATIONAL *Numbers*: ſee *Surd Numbers*.

IRRATIONAL *Quantities*: ſee *Rational Quantities*.

IRREGULAR *Bodies*, are Solids which are not terminated by equal and like Surfaces.

IRREGULAR *Fortification*: ſee *Fortification*.

IRREGULAR *Lines* or *Curves*: ſee *Regular*.

ISAGON, in Geometry, is ſometimes uſed for a Figure conſiſting of equal Angles.

ISCHÆMA, are Medicines that ſtop the Blood, which, with a binding, cooling, or drying Virtue, cloſe up the Openings of the Veſſels, or diminiſh and ſtop the Fluidity or violent Motion of the Blood. *Blanchard.*

ISCHIAS, the Gout in the Hip.

ISCHIAS *Major*, is a Branch of the *Crural Vein* which goes to the Muſcles and Fat of the Leg, and is divided afterwards into ſeveral Branches, which are diſtributed to the Toes.

ISCHIAS *Minor*, a Branch alſo of the *Crural Vein*, being but a little one, and is wholly ſpent on the Muſcles and Skin, which are about the upper Joint of the *Femur*.

ISCHIUM, is the Hip or Huckle-Bone.

ISCHURETICA, are Medicines which force Urine, in the Caſe of a Suppreſſion of it.

ISCHURIA, is ſuch a Suppreſſion of Urine in the Bladder, that little or nothing of it can be diſcharged.

ISLES, in Architecture, are Sides or Wings of a Building.

ISOCHRONE, Vibrations of a Pendulum, are ſuch as are made in the ſame ſpace of Time, as all the Vibrations or Springs of the ſame Pendulum are, whether the Arks it deſcribes be longer or ſhorter; for when it deſcribes a ſhorter Ark, it moves ſo much the ſlower; and when a long one, proportionably faſter.

ISOMERIA, in Algebra, is the ſame with *Converſion of Equations*, (ſee *Equations*, N. 1.) or of clearing any Equation from Fractions.

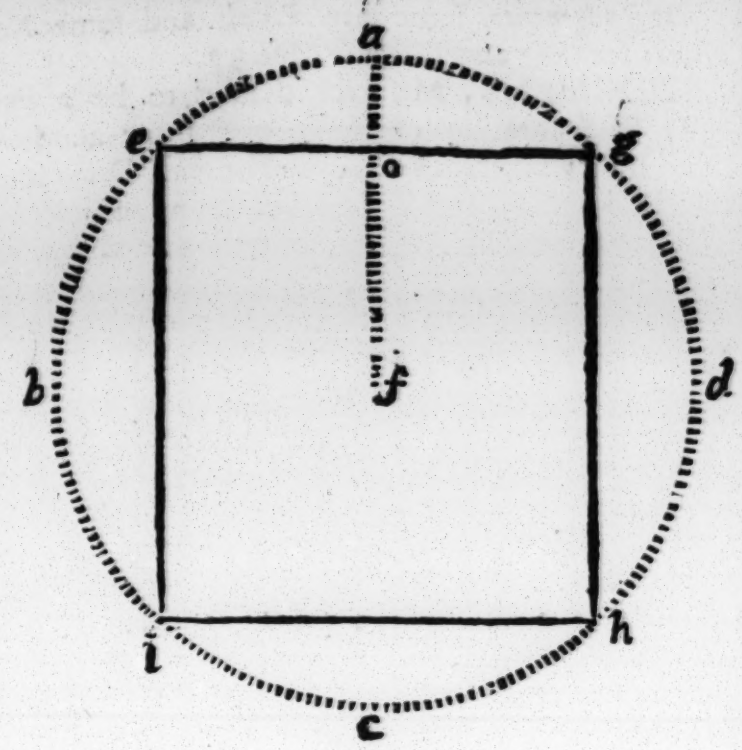
ISOPERIMETRICAL *Figures*, in Geometry, are ſuch as have equal *Perimeters* or *Circumferences*.

Of all *Iſoperimetrical Figures*, the *Circle* is the greateſt.

For if a Right Line could be diſpoſed into the Form of the Circumference of a *Circle*, it would contain more Space than any other Figure or *Regular Polygon* whatſoever.

As

As ſuppoſe the Circumference of the *Circle a b c d*, to be diſpoſed into the Form of a Square, or any other *Regular Polygon*: ſo that all the Sides *e g*, *g h*, *h i*, and *i e* together, may be equal to the



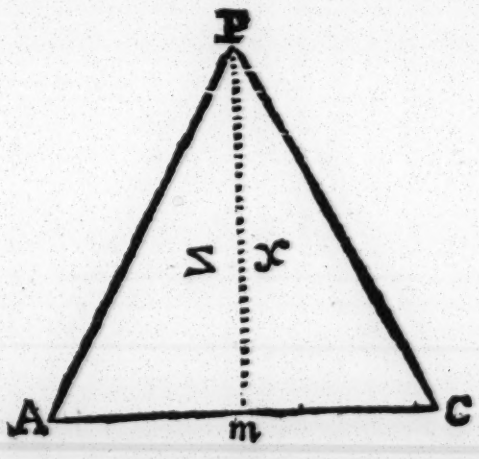
Circumference of the Circle *a b c d*; I ſay the *Circle* is greater than that *Square*.

For the *Circle* is equal to a Rectangle-Triangle, one of whoſe Legs is the Radius *f a*, and the other the Circumference. And the *Polygon* is equal alſo to ſuch a Triangle, one of whoſe Legs is the ſame Circumference *a b c d*, or the Sum of the Sides *g e i h*: And the other Leg is the Line *f o*, but as *f o* is leſs than the Radius *f a*, ſo the Triangle, which is equal to the *Polygon*, muſt be leſs than that which is equal to the *Circle*: Therefore the *Square* or *Polygon* muſt be leſs than the *Circle*. W. W. D.

ISOSCELES-TRIANGLE: ſee *Triangle*.

PROP. I.

The Angles oppoſite to the equal Sides of an *Iſoſceles-Triangle* are equal; and a Line drawn from the Top (or Vertex) cutting the Baſe into two equal Parts, is perpendicular to the Baſe.



Let the *Iſoſceles-Triangle* be *A P C*, and let its Baſe *A C* be ſuppoſed to be divided into two equal Parts in *m*.

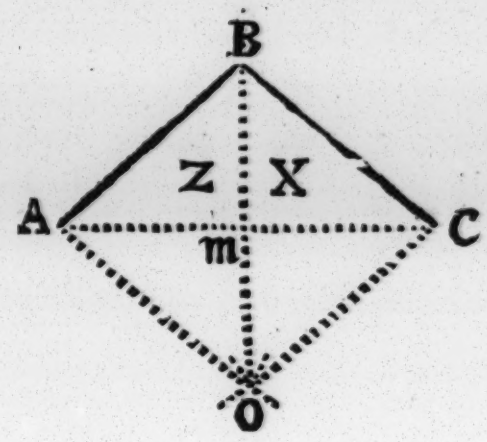
I ſay *P m* is perpendicular to *A C*; and the Angle *P C A*, is equal to the Angle *P A C*.

Demonſtration.

For the Triangle *Z* hath all its Sides equal to thoſe of *X*, and therefore muſt have all its Angles alſo reſpectively equal to thoſe in *X*: And then the Angle *P m A* = *P m C*, becauſe they are both right; therefore *P m* is perpendicular to *A C*, and the Angle *P A m* = *P C m*. Q. E. D.

PROBLEM I.

To Divide a Right Line into Two equal Parts.



Let the Line given be *A C*, opening the Compaſs to any Diſtance more than half the Line *A C*, and ſetting one Foot in *C*, ſtrike an Ark both above and below the middle of the Line; then keeping them at the ſame Diſtance, ſet one Foot in *A*, and croſs the former Arks in *O* and *B*; a Ruler laid from *O* to *B*, ſhall cut the Middle of the *A C*, or divide it into two equal Parts.

Demonſtration.

Draw the Lines *A B*, *B C*, *B O*, *A O*, and *C O*.

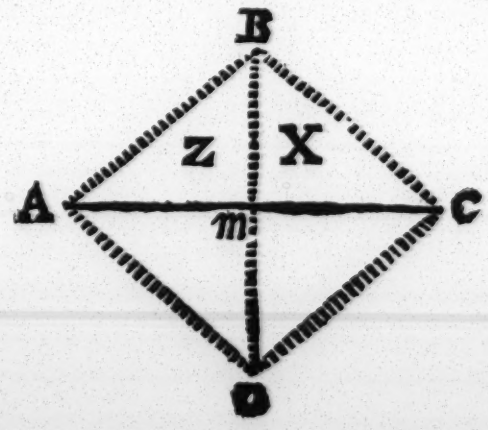
1. Then will the Triangles *B A O*, and *B C O*, have all their three Sides reſpectively equal, and conſequently be equal to one another; and therefore the Angle *C B O* = Angle *A B O*.

2. The Triangles *Z* and *X*, have the ſame two Angles *A B m*, and *C P m* equal, and the Side *A B* equal to the Side *B C*, and *B m* common to both: Therefore all are equal, and conſequently *A m* = *C m*. Q. E. D.

N. B. By this Problem alſo, a Perpendicular may be let fall to the middle of any given Line; for here 'tis plain, *B m* is perpendicular.

PROBLEM II.

To Divide an Angle given into Two equal Parts.
Let the given Angle be A B C.



Open your Compaſs to any convenient Diſtance, and ſetting one Foot in *B*, croſs the Legs of the Angle in *A O*, ſtrike an Ark below as at *O*, and removing the Compaſs to *A*, croſs the former Ark in the Point *O*, ſo a Line drawn from *B* to *O* ſhall Biſſect the Angle.

The Demonſtration is the ſame with that of the laſt Problem.

ISSUANT, a Term in Heraldry, when a Lion, or other Beaſt, is drawn in a Coat of Arms juſt iſſuing out of the Bottom Line of any *Chief*, *Feſſe*, &c. but if it come out of the Middle of any Ordinary, they call it *Naiſſant*; that is, *Naſcent*, juſt coming out as it were from the Womb.

ISSUE, a Term in Common Law, having divers Applications; ſometimes 'tis taken for the Children begotten between a Man and his Wife; ſometimes for Profits growing from Amerciaments or Fines; and ſometimes from Profits of Lands or Tenements; ſometimes for that Point of Matter depending in Suit, whereupon the Parties join, and put their Cauſe to the Trial of the Jury: And yet in all theſe it hath but one Signication, which is an Effect of a Cauſe proceeding, as the Children be the Effect of the Marriage between the Parents: The Profits growing to the King or Lord, from the Puniſhment of any Man's Offence, is the Effect of his Tranſgreſſion: The Point referred to the Trial of Twelve Men, is the Effect of Pleading or Proceſs.

Iſſue in this laſt Signification, is either *General* or *Special*.

General Iſſue, ſeemeth to be that whereby it is referred to the *Jury* to bring in their Verdict, whether the Defendant hath done any ſuch thing as the Plaintiff layeth to his Charge.

For Example:

If it be an Offence againſt any Statute, and the Defendant plead, *Not Guilty*; this being put to the Jury, is called, *The General Iſſue*.

And if a Man complain of a private Wrong, which the Defendant denieth, and pleads no Wrong nor Diſſeiſin, and if this be referred to the Jury, it is likewiſe the *General Iſſue*.

The *Special Iſſue* then muſt be that, when Special Matters being alledged by the Defendant in his Defence, both Parties joyn thereupon, and ſo grow rather to a Demurrer, if it be *Quæſtio Juris*, or to Trial by the Jury, if it be *Quæſtio Facti*.

ISTHMUS, in Geography, is a little Neck or Part of Land joining a *Peninſula* to the *Continent*.

ISTHMUS, in Anatomy, according to ſome, is that Part which lies betwixt the Mouth and the Gullet, like a Neck of Land; alſo the Ridge that ſeparates the Noſtrils.

ITINERARIUM, is a Chyrurgeon's Inſtrument, which being fixed in the Urinary Paſſage, ſhews the Neck or Sphincter of the Bladder, that an Inciſion may be more ſurely made to find out the Stone: 'Tis uſually thruſt up thro' the Cavity of a Fiſtulous Catheter, which ſaves it from wounding the *Urethra* as it goes.

ITHMOIDEA *Oſſa*: ſee *Ethmoides*.

JUBA, a Botanick Word, ſignifying a ſoft looſe Beard, which hangs at the Ends of the Husks of ſome Plants of the *Frumentaceous Kind*; as particularly in *Millet*.

JUDGE and *Judges*, have all their Commiſſions bounded with this Limitation, *Facturi quod ad juſtitiam pertinet ſecundum legem & conſuetudinem Angliæ*.

The *Judge* at his Creation takes this Oath, "That he ſhall indifferently miniſter Juſtice to all "them that ſhall have any Suit or Plea before "him; and this he ſhall not forbear to do, tho' "the King by his Letters, or by expreſs Word of "Mouth, ſhould command the contrary, &c.

JUDGMENT, in Law, is the Cenſure of the Judges ſo called, and is the very Voice and Final Doom of the Law, and therefore is always taken for unqueſtionable Truth.

Of *Judgments*, ſome are *Final*, and ſome *Not Final*: ſee *Coke* and *Littleton*, *Fol.* 39.

JUDGMENT, Mr. *Lock* defines to be a Faculty of ſeparating carefully one from another, thoſe Idea's wherein any, even the leaſt Difference can be found, thereby to avoid being miſled by Similitude and by Affinity, to take one thing for another.

Others define it to be that Action of the Mind, by which aſſembling together ſeveral Idea's, we either deny or affirm *This* to be *That*.

Thus, conſidering the Idea of the Earth, and the Idea of Roundneſs, we affirm or deny the *Earth to be Round*.

JUGALE *Os*, the ſame that *Zygoma*.

JUGULAR-VEINS, are thoſe Veins which go towards the Skull by the Neck; and are of two ſorts, *viz.* External and Internal.

The *External Jugulars* aſcend on the Outſide of the Neck, and are uſually open'd where one is let Blood in that Part for any Diſtemper in the Head, *Quinſey*, &c.

The *Internal Jugulars* ariſe from the *Subclavian*, by the ſides of the Wind-pipe, and paſſing along the Skull in two Branches, are diſperſed thro' the *Dura Mater*, &c.

JUGULUM, the ſame that *Furcula*.

JULAP, from the Greek ζυλάπα, or, as ſome ſay, from the Perſick Word *Juleb*, which ſignifies a *ſweet Potion*; is a grateful Medicine compoſed of Diſtilled Waters, Spirits, &c. and ſweetened to the Patient's Palate with Sugar, or ſome agreeable Syrup.

JULIAN-YEAR, is the *Old Account* of the Year, inſtituted by *Julius Cæſar*, which to this Day we uſe in *England*, and call it the *Old Style*, in Contradiſtinction to the *New Account*, framed by Pope *Gregory*, which is Eleven Days before ours, and is called the *New Style*.

JULIAN-PERIOD, is a Cycle of 7980 Conſecutive Years, produced by the continual Multiplication of the three Cycles, *viz.* That of the *Sun* of 28 Years, that of the *Moon* of 19 Years, and that of the *Indiction* of 15 Years; ſo that this *Epocha*, although but Artificial or feign'd, (and which was the Invention of the famous *Julius Scaliger*) is yet of very good Uſe; in that every Year within the Period, is diſtinguiſhable by a certain peculiar Character; for the Year of the *Sun*, *Moon*, and *Indiction* will not be the ſame again, 'till the whole 7980 Years be revolved: *Scaliger* fix'd the Beginning of this Period 764 Years before the Creation.

For the finding the Year of the Julian Period, *you have this Rule*,

Multiply the *Solar Cycle* by 4845, the *Lunar* by 4200, and the *Indiction* by 6916;

Then divide the Sum of Products by 7980, and the Remainder of the Diviſion (without having Regard to the Quotient) ſhall be the Year enquired after.

Example.

Let the Cycle of the *Sun* be 3, of the *Moon* 4, and of the *Indiction* 5.

Multiply

Multiply 8485 by 3, 'twill be 14535; and 4200 by 4 = 16800; and 6916 by 5, gives 35580.

The Sum of the Products is 65915, which divided by 7896, gives 8 in the Quote, and leaves 2075 for a Remainder, which is the Year of the *Julian Period*.

JULUS, is a Botanick Word for thoſe *Catalins*, as ſome call them, or long Wormlike Tufts, or *Palms*, as they are called in Willows, which at the Beginning of the Year grow out of, and hang pendulous down from Hazels, Wallnut-Trees, &c.

The Accurate Mr. *Ray* thinks them to be a kind of Collection of the *Stamina* of the Flowers of the Tree; becauſe in Fertile Trees and Plants they have abundance of Seminal Veſſels or Seed-Pods.

JUPITER: The Proportion of *Jupiter* to our Earth, is about 60 to 1.

The Periodical Time of *Jupiter*'s Revolution about the *Sun*, is in the Space of 12 Years, or 4380 Days; and he revolves round his Axis in the Space of 10 Hours; which very ſwift Motion may cauſe that Exceſs of his Equatorial Diameter above his Polar, which you will find below; whereas in the Sun and Moon, which take, the one 27, the other 28 Days in their Revolution round their Axis, there is no ſuch Inequality between their Polar and Equatorial Diameters obſerved.

The Mean Diſtance of *Jupiter* from the Sun, according to *Kepler* 519650; to *Bullialdus* 522520; according to the Periodical Time of its Revolution 520116: Such Parts of which the Mean Diſtance between the Earth and Sun is 100000; that is, about 280862640 Engliſh Miles.

According to Mr. *Caſſini*, *Jupiter*'s greateſt Diſtance from the Earth is 142919; his mean Diſtance 115000; and leaſt Diſtance 87081 Semi-diameters of the Earth.

And the Diameter of *Jupiter* is equal to 27 and a Half Semi-diameters of the Earth.

Wherefore the Globe of *Jupiter* muſt be greater than that of the Earth by 2460 times.

The Semi-diameter of *Jupiter*, ſeen from the Sun, is but 19 Seconds, $\frac{1}{4}$.

In the Year 1664, *Campani* by the help of an excellent Teleſcope) obſerved certain Protuberances and Inequalities in the Surface of this Planet.

He ſaw alſo in his Body the Shadows of his *Satellites*, and followed them with his Eye till he ſaw them go off the Disk.

In the ſame Year, *May* the 9th, 2 Hours, *P. M.* Mr. *Hook*, with a Teleſcope of 12 Foot, obſerved a ſmall Spot in the biggeſt of the three obſcurer Belts of *Jupiter*; and within two Hours after he found that the ſaid Spot had moved from Eaſt to Weſt about half the Length of the Diameter of *Jupiter*.

Mr. *Caſſini* obſerved alſo, near the ſame Time, a permanent Spot in the Disk of *Jupiter*; by whoſe help he not only found that *Jupiter* turns about upon his own Axis, but alſo the Time of ſuch Converſion, which he eſtimates to be 9 Hours, and 56 Minutes.

Which was alſo confirmed by better Obſervations of a Spot in the Year 1691.

The Equatorial Diameter of *Jupiter* to his Polar one, Sir *Iſ. Newton* computes to be as 40 $\frac{3}{5}$ to 39 $\frac{2}{5}$.

Captain *Halley*, in his Preface to his Catalogue of the Southern Stars, ſaith, That he found *Jupiter* to move ſwifter than he is ſuppoſed to do by the Aſtronomical Tables.

The ſame Learned Perſon thinks, That the Reaſon of the Error (of about 3 or 4 Minutes in Time) of the Tables in calculating the Eclipſes of the *Satellites*, ariſes from ſome ſmall Excentricity in the Motion of the Planet, and from the Oval Figure of his Body newly mentioned, whoſe quick Rotation round his Axis by the *Vis Centifuga*, dilates his Equinoctial Parts, and makes his Meridians much Elliptical, ſo as to be diſcernable by the Teleſcope.

The Sun's Heat in *Jupiter*, is at moſt not above one twenty fifth part of what it is with us; and conſequently 'twould be very uncomfortable living there (if at all poſſible) for Men of our Conſtitution; and yet ſome are very fond of thinking *Jupiter* an excellent Place to live in.

The Diſtance of *Jupiter* from the Sun, is above five times as great as that of the Earth from the Sun, (ſee *Gregory*'s *Aſtron.*) and conſequently the Diameter of the Sun to any Eye in *Jupiter*, will be not a fifth part of what it appears to us, and therefore his Disk will be above 25 times leſs, and in the ſame Proportion will his Light and Heat be.

The Artificial Day and Night (each of 5 Hours) is of the ſame length in *Jupiter* all over his Surface; becauſe the Axis of his Diurnal Revolution, is nearly at Right Angles to the Plane of his Annual Orbit round the Sun.

Although *Jupiter* hath four Primary Planets below him; yet an Eye placed there, and of no ſharper Sight than one of ours, could never behold any one of them, unleſs as Spots tranſiting over the Sun's Disk, when they happen to be between the Jovial Eye and the Sun: For *Mars*, which goes furtheſt of all from the Sun, will not in *Jupiter* be ſeen above 18 Degrees from him; and ſince that Planet is but ſmall, and reflects but a weak Light, ſo near the Sun it cannot be viſible: So that *Saturn* is the only Planet that can be ſeen in *Jupiter*, except his own four Moons or Satellites.

The Sun's Parallax ſeen from *Jupiter*, will ſcarce be ſenſible any more than *Saturn*'s; neither being much above 20 Seconds; ſo that the Sun's apparent Diameter in *Jupiter* will not be above 6 Minutes: But the outermoſt of his Satellites will appear almoſt as great as the Moon doth to us; *viz.* of five times the Diameter, and 25 times the Disk of the Sun, ſeen from the ſame Planet; and if the other Satellites are not leſs than the outermoſt, they will yet appear much greater, (and the Learned Mr. *Hugens* conceives them not much leſs than our Earth) and gives the Planet a good Light in the Nights, which alſo can never there be very long.

Dr. *Gregory*, (from whence this comparative Aſtronomy is collected) ſaith alſo, That an Aſtronomer placed in *Jupiter*, would eaſily compare the Diſtances of the four inferior Planets with the Diameters of *Jupiter*, as we do the Diſtances of us from the Planets, by comparing them with the Diameter of the Earth: And this would be done as to the four neareſt ones, eaſier than we compute the Diſtance of the Moon by the Earth's Diameter; for the Horizontal Parallax of the remoteſt of the Planets ſeen from *Jupiter*, is above twice as great as the Horizontal Parallax of the Moon ſeen from the Earth, and therefore muſt be very ſenſible and conſiderable. And tho' the Globe of *Jupiter* be vaſtly large, in compariſon of our Earth; yet the Sun's Parallax, when he's beheld from *Jupiter*, will not be quite 20 Seconds, and conſequently ſcarce ſenſible: Nor will the Parallax of *Saturn*, (though when in Oppoſition to the Sun, and next to *Jupiter*) be much greater; and therefore 'twill be very difficult for the *Jovial Aſtronomer* to eſtimate the Diſtance of *Saturn*, or of the Sun, from that Planet.

Indeed, if he can discover that *Jupiter* moves round the *Sun*, he may be able (as the Doctor shews, *Prop.* 3.) to determine the Ratio of the Distance of *Jupiter* and *Saturn* from the *Sun*, otherwise not.

Our *Jovial Astronomer* therefore, by the Help of his Senses, would distinguish two kinds of Planets; four nearer to him, which are the Satellites, and two (as the *Sun* and *Saturn*) more remote; and these latter would appear with a lesser Diameter, the former with a greater: Of the remotest, the Sun would appear in a Diameter about six Minutes, but the Diameter of *Saturn* would scarce be $\frac{1}{2}$ of a Minute.

Of the four nearer Planets or Satellites, the Fourth would appear to an Eye in *Jupiter* of the Bigness the Moon doth to us; that is, with a Diameter five times greater, and a Disk twenty five times greater than the *Sun* doth there: Besides, the four nearer, and apparently greater ones, will be distinguished from the more remote and lesser ones, in this, That in the nearer Planets, the Squares of the Periodick Times, are as the Cubes of their Distances from the Center of *Jupiter*; which would by no means be true, if any one of the greater were compared with any one of the lesser. And although the nearer these Planets are, they appear the greater; yet the Sun will be immensely more bright than they; for from their Faces, which depend upon their Situation, with respect to the Sun, they will appear like so many Moons: From whence a Spectator in *Jupiter* will have four kinds of Months, according to the Number of Moons. There will be contained above 2407 of the least Months in a Year, and about half the Number of Months next to these: The Number of the Months of the third Satellite contain'd in a Year, will be nearly subduple of the second, or subquadruple of the first; and the Months of the greatest will be about 254: So that although the Notation of Time be much more intricate in *Jupiter*, by reason of the great Number of Days which their Year contains; yet it is much facilitated by these four kinds of Months; for in the least Month there are only 4 Days and a Quarter, but in the greatest something more than 40.

Besides, these Moons suffer an Eclipse when they, being in Opposition to the Sun, happen to fall into the Shadow of *Jupiter*; and again, when they, (being in Conjunction with the Sun, project their Shadows to *Jupiter*, they make an Eclipse of the Sun to an Eye placed in that Region of *Jupiter*, where the Shadow falls (which Region is a very small part of *Jupiter*'s Surface) just as our Moon does: But because the Orbits of those Moons about *Jupiter*, are in a Plane which is inclined to, or makes an Angle with *Jupiter*'s Orbit about the Sun, and are all of them nearly in the same Plane, excepting the second, which deviates a little; upon this Account, I say, their Eclipses are Central, and consequently most lasting, when the Sun is in one of the Nodes of those Moons: But when the Sun is out of this Position, the Eclipses may be Total, though not Central, because the Breadth of *Jupiter*'s Shadow, is nearly decuple the Breadth of any of the Satellites; and the apparent Diameter of any of those Moons, is nearly quintuple the apparent Diameter of the Sun. And this remarkable Inequality of the Diameters, and the small Inclination the Plane of the Orbits of the Satellites has to the Plane of *Jupiter*'s Orbit round the Sun, is the Reason why in each Revolution there happens Eclipses both of the Satellites and of the Sun, though the Sun be at a considerable Distance from the Nodes: And the inferior of these Satellites, though the Sun to a Spectator in *Jupiter*, be at his greatest Distance from their Nodes, are nevertheless Eclipsed, and Eclipse the Sun; but the remotest of them in this Case, for two Years together, escapes falling into *Jupiter*'s Shadow, and *Jupiter* into its Shadow; and the Phænomena of partial Eclipses in the intermediate Times and Places, will be apparent to a Spectator in *Jupiter*. Farther, it sometimes happens here, that one Moon Eclipses another, whose Phasis is sometimes very different, nay, contrary to the Eclipse of a Moon, falling into the Shadow of *Jupiter*, which was described above; for in this the Oriental Limb is first darkened, and the Occidental Limb emerges last; but in others of them the Occidental Limb is first darkened, and the Oriental Limb emerges last; and in others contrarily.

The Shadow of *Jupiter*, though it go far beyond its Satellites, yet does not reach any other Planet, as the Shadow of all other primary Planets do; for no other Planet, except *Saturn*, could be immerged in it, tho' it was infinite; but the Shadow of *Jupiter* cannot reach *Saturn*, except the Diameter of *Jupiter* were half the Diameter of the Sun, and it is scarce $\frac{1}{3}$ of it.

If the Surface of *Jupiter* were chiefly Water, and we suppose the Seas there to be Navigable, the Sailors would have great Advantages, as well because the Nights are very short, and very light from the Numbers of their Moons; as because these Moons would be of singular use to 'em in directing their Courses.

For from those manifold Eclipses, the Longitude of a Place would be easily determined, and Hydrographical Tables accurately constructed, which is very Advantageous in so vast a Globe as that of *Jupiter*; whose Surface being Centuple, (nay, according to *Hugens*, 400 times as much) the Surface of the Earth would render its Mensuration very laborious: But the Flux and Reflux of the Sea, occasion'd by these four Moons, (for the Force of the Sun would be very little there) would be very different, and besides, would be very difficultly brought to a Calculation.

JURATS, are in the Nature of Aldermen, for Government of their several Corporations: As the *Mayor* and *Jurats* of *Maidstone*, *Rye*, *Winchelsea*, *&c.* So *Jersey* hath a Bayliff and Twelve *Jurats*, or sworn Assistants, to Govern the Island.

JURISDICTION, is a Dignity which a Man hath conferred on him to do Justice in Cases of Complaint.

JURIS *Utrum*, is a Writ that lieth for the Incumbent, whose Predecessor hath alienated his Lands or Tenements.

JUROR, is one of those twenty four or twelve Men, which are sworn to deliver a Truth upon such Evidence as shall be given them touching the Matter in question.

JURY, in Common Law, signifies either twenty four or twelve-Men sworn to enquire of the Matter of Fact, and declare the Truth upon such Evidence as shall be delivered them touching the Matter in Question: Of which *Jury* some may, and some may not be impannel'd: See *F. N. B. Fol.* 165.

In *England* there are three sorts of Trials, *viz.* one by Parliament, another by Battle, and the third by Assize or Jury.

The Trial by *Assize*, (be the Action Civil or Criminal, Publick or Private, Personal or Real) is referred

ferred for the Fact to a Jury, and as they find it, ſo paſſeth the Judgment.

This *Jury* is not only uſed in Circuits of Juſtices Errant, but alſo in other Courts and Matters of Office: And though it appertains to moſt Courts of the Common Law; yet it is moſt notoriouſly in the Half-year Courts of the Juſtices Errants, commonly called, the *Great Aſſizes*; and in the Quarter-Seſſions, and in them it is moſt ordinarily called a *Jury*, and that in a Civil Cauſe; whereas in other Courts 'tis uſually called an *Inqueſt*, and in the Court-Baron, a *Jury of the Homage*.

In the *General Aſſize* there are uſually many *Juries*, becauſe there be ſtore of Cauſes both Civil and Criminal commonly to be tried; whereof one is called, *The Grand Jury*, and the reſt *Petit Juries*; whereof it ſeemeth there ſhould be one in every Hundred.

The *Grand Jury* conſiſts of Twenty four Grave and Subſtantial Gentlemen, or ſome of the better ſort of Yeomen, choſen indifferently by the Sheriff out of the whole Shire, to conſider of all Bills of Indictment preferred to the Court; which they do either approve, by writing upon them, *Billa Vera*; or diſallow, by indorſing *Ignoramus*. Such as they do approve, if they touch Life and Death, are further referred to another *Jury* to be conſidered of, becauſe the Caſe is of ſuch Importance; but others of lighter Moment, are upon their Allowance, without more Work, fined by the Bench; except the Party traverſe the Indictment, or challenge it for Inſufficiency, or remove the Cauſe to a higher Court by *Certiorari*; in which two former Caſes it is referred to another *Jury*; and in the latter, tranſmitted to a higher: And preſently upon the Allowance of this Bill by the Grand Inqueſt, a Man is ſaid to be indicted: Such as they diſallow are delivered to the Bench, by whom they are forthwith cancelled or torn.

The *Petit Jury* conſiſts of Twelve Men at the leaſt, and are empannelled as well upon Criminal, as upon Civil Cauſes: Thoſe that paſs upon Offences of Life and Death, do bring in their Verdict, either Guilty, or not Guilty; whereupon the Priſoner, if he be found Guilty, is ſaid to be Convicted, and ſo afterwards receiveth Judgment and Condemnation; or otherwiſe is acquitted and ſet free. Thoſe that paſs upon Civil Cauſes Real, are all, or ſo many as can conveniently be had, of the ſame Hundred where the Land or Tenement in Queſtion doth lie, being four at the leaſt; and they, upon due Examination, bring in their Verdict either for the Demandant or Tenant.

JURY-MAST, ſo the Seamen call whatever they ſet up in the room of a Maſt loſt in a Fight, or by a Storm; which, if they can ſave it, ſome great Yard, which they put down into the Step of that loſt Maſt, faſtening it into the Partners, and fitting to it the Miſſen, or ſome leſſer Yard, with Sails and Ropes, as they can, they make a hard ſhift to ſail with it inſtead of the Maſt which they have loſt.

JUSTICE, ſignifies him that is deputed by the King to do Right by way of Judgment. Of theſe *Juſtices* there are divers ſorts in *England*; of the manner of whoſe Creation, with other Appurtenances, read *Forteſcue, Cap. 51.*

JUSTICE *of the Common-Pleas*, is a Lord by his Office, and with his Aſſiſtants originally did hear and determine all Cauſes at the Common Law; that is, all Civil Cauſes between Common Perſons, as well Perſonal as Real; for which Cauſe it is called, *The Court of Common-Pleas*, as diſtinguiſhing it from *The Pleas of the Crown*, or the *King's Pleas*, which are Special, and appertaining to him only.

JUSTICE *of the Foreſt*, or *Juſtice in Eyre of the Foreſt*, is a Lord by his Office, and hears and determines all Offences within the Foreſt, committed againſt Veniſon or Vert: Of theſe there be two, whereof one hath Juriſdiction over all Foreſts on this Side *Trent*, the other of all beyond.

JUSTICE *of the King's-Bench*, is a Lord by his Office while he enjoys it, and the Chief of the reſt: His Office (eſpecially) is to hear and determine all Pleas of the Crown, *viz.* ſuch as concern Offences committed againſt the Crown, Dignity, and Peace of the King; as Treaſons, Felonies, Mayhems, and ſuch-like: He alſo, with his Aſſiſtants, heareth all Perſonal Actions, and Real alſo, if they be incident to his Juriſdiction.

JUSTICES *of Aſſize*, are ſuch as were wont by Special Commiſſion to be ſent into this or that County, to take Aſſizes for the Eaſe of the Subjects; for whereas theſe Actions paſs always by Jury, ſo many Men might not, without great Damage and Charge, be brought up to *London*, and therefore Juſtices for this Purpoſe, by Commiſſion particularly authoriſed, were ſent down to them: And twice every Year they go the Circuit, by two and two, through all *England*, diſpatch their ſeveral Buſineſſes by ſeveral Commiſſions; for they have one Commiſſion to take *Aſſizes*, another to deliver Gaols, and another of *Oyer* and *Terminer*, *&c.*

JUSTICES *in Eyre*, are thoſe who were ſent with Commiſſion into divers Counties to hear Cauſes, eſpecially thoſe that were termed *Pleas of the Crown*: And this was done for the Eaſe of the People, who would elſe have been hurried to the *King's-Bench*, if the Cauſe were too high for the County-Court.

JUSTICES *of Gaol-Delivery*, are ſuch as are ſent with Commiſſion to hear and determine all Cauſes appertaining to ſuch, as for any Offence are caſt into the Gaol.

JUSTICES *of Niſi Prius*, are now all one with *Juſtice of Aſſize*; for it is a common Adjournment of a Cauſe in the *Common-Pleas*, to put it off to ſuch a Day, *Niſi prius juſticiarii venerint ad eas partes ad capiendas Aſſiſas*: And upon this Clauſe of Adjournment, they are called *Juſtices of Niſi Prius*, as well as *Juſtices of Aſſize*, by reaſon of the Writ or Action they have to deal in.

JUSTICIES *of Oyer and Terminer*, were Juſtices deputed upon ſome ſpecial or extraordinary Occaſion, to hear and determine ſome peculiar Cauſes.

JUSTICES, is a Writ directed to the Sheriff, for the diſpatch of Juſtice in ſome Special Cauſe, of which he cannot by his ordinary Power hold Plea in his County-Court.

By this Writ *Juſticies*, the Sheriff may hold Plea of a great Sum; whereas of his ordinary Authority he can hold no Pleas, but of Sums under forty Shillings.

JUXTA-POSITION, is the ranging the Particles or Corpuſcles of any mix'd Body into ſuch an Order, Poſition, or Situation, that the Particles being contiguous to one another, ſhall determine or denominate a Body to be of ſuch a Figure or Nature, or to be indued with ſuch Properties as are the proper Reſult of ſuch a Configuration and Diſpoſition of Parts.

KALENDAR : See *Calendar.*

KALENDS : See *Calends.*

KECKLE ; when the Cables of a Ship gaul in the Hawſe, or the Bolt-ropes do ſo againſt the Ship's Quarter, the Seamen wind ſome ſmall Ropes about them ; and this ſerving of theſe Ropes is called *Keckling.*

KEDGING, at Sea, is when a Ship is brought up or down in a narrow River, the Wind being contrary to the Tide, and yet ſhe is to go with the Tide ; then they uſe to ſet their Fore-ſail, or Fore-top-ſail and the Miſſen, and ſo let the Ship drive with the Tide, that ſo they may ſtat her about ; and if ſhe happen to come over too near the Shoar, they have a ſmall Anchor in the Head of their Boat with a Hawſer faſtened to it from the Ship, which Anchor they then let fall in the Middle of Stream, and ſo wind or turn her Head about, lifting the Anchor up again when ſhe is come fully about : This Work is called *Kedging*, or to *kedge* up a River, and the Anchor made uſe of is called the

KEDGER, or *Kedge-Anchor.*

KEEL, is the loweſt Piece of Timber in a Ship, in the Bottom of her Hull ; one End whereof is at the *Stern*, the other at the *Stem* : Into this are all the Ground-Timbers and Hooks faſtened, and bolted fore and aft. When a Ship hath a deep Keel, ſhe is ſaid to have a *Rank Keel* ; and this ſerves well to keep her from rowling ; but if ſhe is over-floaty and rowls too much, a new *Keel* is ſometimes put on, called a *Falſe Keel.*

KEEL-ROPE, a Hair-Rope running between the *Keelſon* and the *Keel* of a Ship, to clear and *Limber-Holes* when they are choaked up with Balaſt, *&c.*

KEELSON, the next Piece of Timber in a Ship to her Keel, lying right over it next above the Floor-Timber.

KEEPER *of the Great Seal*, is a Lord by his Office, and ſtiled *Lord-Keeper of the Great Seal of* England : He is one of the King's Privy-Council ; through whoſe Hands paſs all Charters, Commiſſions, and Grants of the King under the *Great Seal* ; without which *Seal* all ſuch Inſtruments by Law are of no force : For the King is, in the Interpretation of Law, a Corporation, and paſſeth nothing firmly but under the ſaid Seal, which is as the publick Faith of the Kingdom, in the high Eſteem and Reputation juſtly attributed thereto.

This *Lord-Keeper* hath the ſame Place, Authority, Preheminence, Juriſdiction, Execution of Laws, and all other Cuſtoms, Commodities, and Advantages, as the *Lord-Chancellor of* England hath for the Time being. He is conſtituted by the Delivery of the *Great Seal* to him, and taking his Oath.

KEEPER *of the Privy Seal*, is a Lord by his Office, through whoſe Hands paſs all Charters ſigned by the King, before they come to the *Great Seal*, and ſome things which do not paſs the *Great Seal* at all. He is of the King's Privy-Council, and one of the Great Officers of the Kingdom.

KEEPER, or *Chief Warden of the Foreſt*, is he who hath the principal Government of all things belonging to the ſame.

KENKS, in the Sea Phraſe, are Doublings in a Cable or Rope, when 'tis handed in or out, ſo that it doth not run ſmooth ; or when any Rope makes Turns, and doth not run ſmooth and clever in the Block, they ſay it makes *Kenks.*

KENNETS, in a Ship, are ſmall Pieces of Timber nailed to the Inſide of the Ship, unto which the *Tacks* and *Sheets* are *belayed*, (as they call it ;) *i. e.* faſtened.

KETCH, a ſmaller Veſſel, but of the ſame Form with a *Hoy.*

KEVELS, or *Chevils*, are ſmall Pieces of Timber nailed to the Inſide of a Ship, unto which the *Tacks* and *Sheets* are belayed or faſtened.

KEY, in Muſick, is a certain Tone, whereto every Compoſition, whether it be long or ſhort, ought to be fitted or deſign'd : And this Key is ſaid to be either *Flat* or *Sharp*, not in reſpect of its own Nature, but with Relation to the Flat or Sharp Third, which is joined with it : See *Muſick*, *Vol.* II.

KIDNEYS : ſee *Reins.*

KINGDOM, a Term uſed by the Chymiſts, who, according to their Cant in other things, call the Three Orders of Natural Bodies, *Animal*, *Vegetable*, and *Mineral*, by the Name of *Kingdom.*

Thus they would ſay, Thoſe Bodies which belong to the *Animal Kingdom*, abound moſt in Volatile Salt.

KING'S-BENCH, is the Court or Judgment-Seat, where the King of *England* was ſometimes wont to ſit in his own Perſon ; and therefore it was moveable with the Court or King's Houſhold, and called *Curia Domini Regis*, and *Aula Regia*, as *Gwin* reports in his *Preface to his Reading*, and that therein, and in the Court of Exchequer, which were the only Courts of the King till *Henry* the Third's Days, were handled all Matters of Juſtice, as well Civil as Criminal.

This Court of the *King's-Bench*, was wont in Ancient Times to be eſpecially exerciſed in all Criminal Matters and Pleas of the Crown, leaving the handling of private Contracts and Civil Actions to the *Common-Pleas*, and other Courts.

KNAVE-LINE, is a Rope in a Ship, faſtened to the Croſs-Trees under the Main or Fore-Top, whence it comes down by the *Ties* to the *Ramhead*, and there 'tis reeved through a Piece of Wood of about two Foot long, and ſo is brought to the Ship's Side, and there haled up taught to the Rails.

Its Uſe is to keep the Ties and Hallyards from turning about one another, as they are apt to do when new and firſt uſed ; and therefore after they are a little uſed and ſtretched, this *Knave-Line* is taken away, of no further Uſe.

KNECK, in the Sea-Language, is the twiſting of a Rope or Cable as it is veering out.

KNEES, are Pieces of Timber in a Ship bowing like a Knee, which are uſed to bind the Beams and Futtocks together, being bolted ſtrongly into them both.

Hence ſuch Timber as is uſeful for this Purpoſe, is called,

KNEE-TIMBER : Thus the Cut-water of a Ship, is called, *The Knee of the Head.*

KNETTELS ; ſo the Seamen call two Pieces of Spun-yarn put together untwiſted.

KNIGHTS, a-board a Ship, are two Pieces of Timber, in each of which go four Shivers, three

for the Halliards, and one for the Top-Ropes. They are uſually ſhaped into the Form of ſome Head; one of them ſtandeth aft the Main-maſt, and therefore is called the *Main-Knight*; the other ſtandeth abaft the Fore-maſt on the ſecond Deck; and this is called the *Fore-Knight*.

KNIGHT-SERVICE was a Tenure, whereby ſeveral Lands in this Nation were held of the King, which drew after it Homage, Eſcuage, Wardſhip, Marriage, *&c.* but taken away by 12 *Car.* II. *cap.* 24.

KNOTS; there are two ſorts of Knots uſed at Sea, one they call a *Bowlin-Knot*, becauſe by this Knot the Bowlin Bridles are faſtened to the Crengles: This is very faſt, and will not ſlip.

The other is a *Wale-Knot*, which is a round Knob or Knot, made with 3 Strands of a Rope; this Knot ſerves for the *Topſail-Sheets* and *Stoppers*.

The Diviſions alſo of the Log-Line are called Knots: Theſe are uſually ſeven Fathom, or forty two Feet aſunder, but they ſhould be Fifty Feet; and then as many Knots as the Log-Line runs out in half a Minute, ſo many Miles doth the Ship ſail in an Hour; ſuppoſing her to keep going at any equal Rate, and allowing for Yaws, Leeway, *&c.* See *Log*.

LABEL, is a long thin Braſs Ruler, with a ſmall Sight at one end, and a Center-hole at the other; commonly uſed with a Tangent-line on the Edge of a Circumferenter, to take Altitudes, *&c.*

LABIA LEPORINA, are ſuch Lips, as by reaſon of their ill make will not come together, which ſome call *Roſtra leporina*; we *Hare Lips*.

LABIAL *Letters*, are (by the Grammarians) accounted ſuch, as in their Pronunciation require chiefly the Uſe of the Lips to form their Sound.

LABORANT, he that attends on and works under a Chymiſt, while he is about any Proceſs or Experiment.

LABORALIS, in the Common Law, is a Writ that lies againſt ſuch as having not whereof to live, do refuſe to ſerve; or for him that refuſeth to ſerve in Summer where he ſerved in Winter.

LABORATORY, or *Elaboratory*, a Room fitted on purpoſe for Chymical Operations, and furniſhed with Variety of Furnaces and Inſtruments neceſſary to that Art.

LABYRINTH, is the Second (ſome ſay the Third) Cavity of the Ear, hollowed in the *Os Petroſum*; and is made of three winding ſemi-circular Pipes, which open by five Orifices into the *Veſtibulum*.

LAC LUNÆ, or *Flores Argenti*, is the Chymiſts Word for a white porous friable Earth, inſipid, but diſſoluble in Water, which it will tinge with a milky Colour: It is a *Sublimate* from a Matter commonly found in Silver Mines, whence the Name.

LACERTUS: ſee *Brachium*.

LACHRYMALE *Punctum*, vel *Foramen*, is an Hole in the Noſe, by which the Matter or Liquor of the Tears paſſes to the Noſtrils. If this Hole grow hard and brawny, from an Ulcer in one of the Glandules at the Corners of the Eyes, thence ariſes a *Fiſtula Lachrymalis*.

LACHRYMÆ, are a Moiſture which is ſeparated by the Glandules of the Eye to moiſten the Eyes; which if it be too much, ſo that it cannot be received by the *Punctum Lachrymale*, it falls from the Eyes in Drops, and is called Tears.

Whatever alſo is ſtrained through, and drops out naturally, is let out by Inciſion, from any Part of a Plant, whether it be *Gum*, *Roſin*, *Oil*, *&c.* is called *Lachrymæ*.

LACONICUM, *Caldarium* and *Aſſa*, or *Balneum æreum*, was formerly a Cellar made to provoke Sweat; which was done by an Hot Vapour, or a Dry Heat included therein. *Blanchard*.

LACTEAL *Veins*, or *Veſſels*: ſee *Vaſa Lactea*.

LACTUCIMINA, the ſame that *Apthæ*.

LACTUMIÆ, the ſame that *Achores*.

LACUNAR, in Architecture, is an arched Roof or Cieling, more-eſpecially the Planking or Flooring above the *Portico's*.

LACUNÆ, are little Pores or Paſſages in the *Vagina* of the Womb, but no where greater than in the lower Part of the Urinary Paſſage: There flows a certain ſerous pituitous Matter out of theſe *Ductus*'s, which lubricates the *Vagina*.

LADDERS in a Ship, are uſually Three: The *Entring-Ladder* is in the *Waſte*, and made of Wood. The Second is the *Gallery-Ladder*, made of Ropes, and hung over the Galleries and Stern of Ships, and are to enter by the Stern of the Ship, out of the Boat, when the Weather is foul, and the Sea high. The Third, *viz. Boltſprit-Ladders* are at the *Beak-Head* made faſt over the Boltſprit, to get upon it; and are only uſed in great Ships.

LADLE, an Inſtrument to load great Guns with Powder. It ought to be ſo proportioned, that two Ladles-full may charge the Piece: Therefore their *Breadth* muſt be 2 Diameters of the Shot; and their Length for double-fortified Cannon 2 and $\frac{1}{2}$ of the Shot; for ordinary Cannon it muſt not exceed 2; but for Culverins and Demi-Culverins, it may be three Diameters of the Shot; and 3 and $\frac{1}{2}$ for leſſer Pieces, in order to load at twice: If you would load at once, this Length of the Ladle muſt be doubled; and obſerve this, That a Ladle 9 Balls in Length, and 2 Balls in Breadth, will hold juſt the Weight of the Iron Shot in Powder.

LAMBITIVE, a pectoral Medicine, to be lick'd off the End of a piece of Licorice-ſtick, the ſame with *Eclegma*: which ſee.

LAMBOIDES, is the backward Suture of the Brain, ſo called, from its Likeneſs to the Letter Λ, *Lambda*.

LAMELLÆ, are the little thin Plates, conſtituted by a Net-work of very ſmall Fibres, of which the *Shells* of Shell-fiſhes conſiſt, or are compoſed.

LAMINÆ, the Plates or Tables of the Skull, being two in Number; whereof the outer is thicker and ſmoother; but the inner more hard, and furrowed on its inner Surface.

LAMPADIAS, a kind of bearded Comet, reſembling a burning Lamp, being of ſeveral ſhapes; for ſometimes its Flame or Blaze runs tapering upward like unto a Sword, and ſometimes it is double or triple-pointed.

LANCETTE, is a Chyrurgeon's little Knife, ſtraight-pointed, two-edged ; uſed in opening Veins, cutting of Fiſtula's, opening of the Fundament, Yard, or Womb that is ſhut.

LAND-*Fall*, a Sea-Term, ſignifying to *fall in with the Land*: Thus when a Ship out at Sea, expects to ſee Land in a little time, and it ſo happens that ſhe doth, they ſay, That they have *made a good Land-fall*.

LAND-*layed* ; they ſay, The Land is *layed*, when a Ship is juſt got out of Sight of the Land.

LAND-*lock'd* : A Ship is ſaid to *ride Land-lock'd* when ſhe is at Anchor in ſuch a Place where there is no Point open to the Sea ; ſo that ſhe is ſafe from the Violence of Winds and Tide.

LAND-*ſhut-in*, is when another Point of Land hinders the ſight of that which a Ship came from ; then they ſay, The Land is *ſhut in*.

LAND-*To*, is when a Ship lies ſo far off from the Shore, that ſhe can but juſt ken Land ; then ſhe is ſaid to lie *Land-to*.

LANGREL-*Shot*, is a ſort of Shot uſed at Sea : It is made of two Bars of Iron, with a Joint in the middle, by which means it can be ſhortened, and ſo put the better into the Gun ; and at each End there is an half Bullet, either of Lead or Iron : when 'tis diſcharged, it flies out at length, and is of uſe to cut the Enemies Rigging, *&c.*

LANIS *de creſcentia Walliæ traducendis abſque Cuſtuma, &c.* is a Writ that lieth to the Cuſtomer of a Port, for the permitting one to paſs over Wools without Cuſtom, becauſe he hath paid Cuſtom in *Wales* before.

LANNIERS, or *Lanniards*, in a Ship, are ſmall Ropes reeved into the *Dead-mens-eyes*, of all the *Shrowds* and *Chains* : Their Uſe is to *ſlacken*, or *ſet taught* the *Shrowds* : The *Stays* alſo of all *Maſts* are *ſet taught* by *Lanniers* : That Rope which faſtens the *Stopper* of the *Halliards* to them, is alſo called a *Lannier*.

L'ANSPESADE, is an inferior Officer ſubordinate to the Corporal, to aſſiſt him in his Duty, and ſupply his Place when he is abſent : He is exempt uſually from all common Duty, except the *Rounds*, and *Sentinels Perdue*.

LAPIDESCENT, that which can turn any Body into a ſtony Nature : Thus thoſe Waters, which by having ſome ſtony Particles diſſolved and ſwimming in them, do in their Courſe depoſite them on the Leaves, Graſs, Sticks, *&c.* that they run over, and ſo produce what are called Petrifications ; theſe are properly *Lapideſcent Waters*.

LAPIS *Infernalis* : ſee *Infernal Stone*.

LAPIS *Prunellæ* : ſee *Sal Prunellæ*.

LAPIS *Medicamentoſus*, is made of two Ounces of Colcothar ; Litharge, Alom and Bole-armoniack, of each 4 Ounces, mingled and put into an unglazed Pan ; and then good Vinegar is poured upon it, to cover it 2 Fingers Height : Cover it, and let it ſtand 2 Days in Digeſtion ; then add 8 Ounces of Nitre, and 4 Ounces of Sal-armoniack ; and ſetting the Pot over the Fire, evaporate all the Moiſture ; after which calcine the remaining Maſs, and keep it for Uſe. 'Tis diſſolved in Water, when uſed, and is a famed Styptick. *Ctolius* gives a Deſcription of a *Lapis Medicamentoſus*, but *Lemery* prefers this before it.

There is alſo a Stone called *Lapis Admirabilis*, whoſe Compoſition ſee in *Lemery, ult. Edit. p.* 429. Alſo another called *The Philoſopher's Stone*, ibid.

LAQUEUS, in Chyrurgery, is a Band ſo tied, that if it be attracted, or preſſed with Weight, it ſhuts up cloſe : Its Uſe is to extend broken or diſjointed Bones, to keep them in their Places when they are ſet, and to bind the Parts cloſe together.

LARBOARD, the Left-hand ſide of a Ship, when you ſtand with your Face to the Head.

LARCENY, in Law, is a wrongful taking away another Man's Goods, with a Mind to ſteal them ; and in reſpect of the Thing ſtollen, is of two ſorts, *viz. Great*, which is called *Theft ſimple*, where the Things ſtollen exceed the Value of Twelve Pence, and that is *Felony* : and *Petit Larceny*, when the Goods ſtollen exceed not the Value of Twelve Pence.

LARGE : The Sea-men ſay, a Ship goes or ſails *Large*, when ſhe goes neither before the Wind, nor upon a Wind, but as it were quartering between both. Wherefore *Large*, *Quartering*, *Veering*, *Lasking*, or *Roomer*, are all of the ſame Signification.

LARMIER, a flat ſquare Member in *Architecture*, which is placed on the *Cornice* below the *Cymatium*, and jets out fartheſt ; being ſo called from its Uſe, which is to diſperſe the Water, and to cauſe it to fall at a Diſtance from the Wall, Drop by Drop, or as it were by Tears : for *Larme* in *French* ſignifies a Tear : ſee *Corona*.

LARYNGOTOMIA, the ſame with *Bronchotomia*.

LARYNX, is properly the Head or Top of the Wind-pipe, or *Aſpera Arteria* ; and it conſiſts of Five *Cartilages*. The Firſt Pair is called *Scutiform*, becauſe ſomething like a Shield, which conſtitutes the Protuberance in the Neck, called *Adam's* Apple : The Second Pair is called *Annular*, becauſe it is round like a Ring : The Third and Fourth Cartilage ſome reckon but one ; but if the Membrane be taken off, it appears to be Two, and is called *Guttulis* and *Glottis* : The Fifth is called *Epiglottis*, which covers the Opening of the Wind-pipe at the Top. Its Uſe is in the Formation of the Voice and Reſpiration.

LASH, the Sea Word for binding up to the Ship's ſide, the Muskets, Buts of Water or Beer, or Pieces of Timber to make *Fiſhes* or ſpare Top-Maſts ; or when any thing is thus faſtened to the Ship, 'tis called *Laſhing*.

But the *Laſhers* are properly thoſe Ropes only which bind faſt the Tackles and the Breeches of the Ordnance, when they are haled or made faſt within Board.

LASHED, a Sea-Term, ſignifying *made faſt* : The Carpenter ought to take Care that there be ſpare Yards *laſhed* faſt to the Ship's ſides ; *i. e.* faſtened there to uſe on Occaſion.

LASKETS, or *Latches*, are ſmall Lines like Loops, faſtened by ſowing into the *Bonnets* and *Drablers* of a Ship ; in order to lace the *Bonnets* to the *Courſes*, or the *Drablers* to the *Bonnets*.

LASKING, when a Ship ſails neither by a Wind, nor directly before the Wind, ſhe is ſaid to go *Lasking* ; which is much the ſame as *Veering*, or going with a Quarterly Wind.

LASSITUDE : ſee *Copus*.

LASSITUDO *Ulceroſa*, is a Symptom uſually attending the cold Fit of an intermitting Fever, conſiſting in a Soreneſs and Wearineſs of all the Joints and Bones.

LATCHES, are thoſe Parts of a Clock, which lock up and unlock the Work.

LATERAL *Equation*, in *Algebra*, is ſuch an one which hath but one Root ; whereas every Quadratick hath 2, every Cubick 3 Roots, *&c.* And ſuch Equations can be determined and conſtructed by the Interſection of two Right Lines, which is a Compoſition of $1 + 1 = 2$. But a Quadratick cannot

cannot be determined or constructed without a ſtrait Line and a Circle cutting each other: See *Wallis's Algebra*, p. 275. *Engl. Edit.*

LATION, is the Tranſlation or Motion of a Body from one Place to another in a Right Line; and ſo is much the ſame as *Local Motion.*

LATISSIMUS *Dorſi*, or *Aniſcalptor*, or *Terſor*, is a Muſcle of the Arm, which receives its firſt Appellation from its large Dimenſions, it with its Partner covering the whole Back; the latter from the Uſe that is ſometimes made of it: Its thin, broad, tendinous Origination is continued from the Seven Inferior Spires of the *Vertebra* of the *Thorax*, and all thoſe of the Loins and Superior Parts of the *Os Sacrum*, and the Poſterior Part of the *Os Ilium*; beginning to grow Carnous as it paſſes over the *Longiſſimus Dorſi* and *Sacrolumbus*; and in its Progreſs over the Curvated Part of the Ribs, it receives ſeveral *Faſciculi* of fleſhly Fibres ariſing from thence, which by their Conjunction compoſe a thick Body, ſtill leſſening it ſelf in its Dimenſions, as it marches towards the *Axilla*; and running over the Inferior Angle of the *Scapula*, from whence ſometimes does ariſe a Fleſhy Part of it; which I have obſerved (ſays M. *Cowper*) in thoſe Bodies in whom the *Teres Minor* was abſent, is at laſt inſerted, by a ſhort, but flat ſtrong Tendon, to the *Os Humeri.*

LATITAT, is a Writ whereby all Men in Perſonal Actions are called Originally to the *King's-Bench*: And it hath this Name, as ſuppoſing that the Defendant doth lurk and lie hid; and therefore being ſerved with this Writ, he muſt put in Security for his Appearance at the Day. And by this Writ, a Man being brought in, is committed to the Marſhal of the *King's-Bench*; in whoſe Cuſtody when he is, he may be ſued upon an Action in that Court.

LATITUDE *of a Place*, is an Arch of the Meridian of that Place, intercepted between its *Zenith* and the *Equator*: Or 'tis an Arch of the Meridian, intercepted between the *Pole* and the *Horizon*; and therefore called the *Poles Height*, &c. It's counted on the brazen Meridian on the Globes.

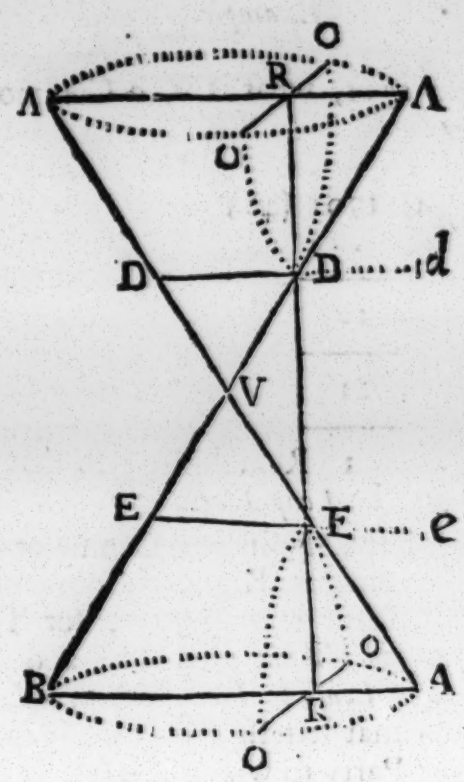
LATITUDE, in *Navigation*, is the Diſtance of a Ship from the Equinoctial, either North or South, and is counted on the Meridian: ſo that if a Ship ſail towards the Equinoctial, ſhe is ſaid to *depreſs the Pole*; but if ſhe ſail from the Equinoctial, or from a leſſer Latitude to a greater, ſhe is ſaid to *raiſe the Pole*: And whenever a Ship ſails to or from the Equinoctial, either North or South, her Way gain'd thus is called her *Difference of Latitude.*

LATITUDE *of a Star or Planet*, is its Diſtance from the *Ecliptick*, being an Arch of a Circle of Longitude, reckoned from the Ecliptick towards its Poles.

LATITUDE *Heliocentrick of a Planet*: See *Heliocentrick.*

LATUS *Rectum*, a Term in Conicks, being the ſame with the *Parameter*; which ſee.

LATUS *Tranſverſum* of the *Hyperbola*, is a Right Line lying between the Vertexes of the two *Oppoſite Sections*: Or that Part of the Common Axis which is between the Vertexes of the Upper and Lower Cone, as the Line *E D* in the following Figure; where alſo *D d* and *E e* may be the *Parameters*, or *Latus Rectums*, belonging to the two oppoſite Sections *G L R O*, and *O E O R.*



To this *Latus Tranſverſum* anſwers the longeſt Diameter in the *Ellipſis*, which *Apollonius* calls the *Tranſverſe Axis* or *Diameter.*

LATUS *Primarium*, is a Right Line belonging to a *Conick Section*, drawn thro' the Vertex of the *Section* of the *Cone*, and within it; as the Line *E E* or *D D* in the preceding Figure.

LAVAMENTUM, the ſame with *Fobus.*

LAUDANUM, is meant only of a Medicine made of an *Opiate*, and that they call an *Opiate Laudanum*, from its excellent Qualities. 'Tis an Extract of the finer and purer Part of Opium, made with Water and Spirit of Wine, and then evaporated to its due Conſiſtence: Of this there are many ways, but *Lemery's* ſeems the beſt: See his *Courſe of Chymiſtry*, laſt Edit. p. 618.

LAUNCH, in the Sea Phraſe, is to *put out*: Thus they ſay, *Launch* a Ship out of the Dock, or out of the Key; *Launch* the *Boat*, *Launch* the *David* in or out; *Launch* out the *Capſtan Bars.* Alſo when they have hoiſted up a Yard high enough, they ſay, in another Senſe, *Launch ho!* that is, Hoiſt no more: Alſo in ſtowing any thing in the Hould of a Ship, they cry, *Launch aft* or *Launch forward on:* ſo when they are pumping, if the Pump ſucks, they ſay *Launch ho!* that is, Pump no more.

LAWS *of Motion*: ſee *Motion.*

LAXATIVES, or *Looſening Medicines*, are thoſe which, with their benign Particles, ſoftning and ſcouring the Inteſtines, cleanſe them of their Excrements.

LAY *the Land*, a Sea Phraſe, which is uſed for ſailing out of Sight of Land; for then they ſay, they have *laid the Land*: And if another Point of Land exclude the Sight of a former, they ſay, they have *ſhut the firſt Land in.*

LEAP-YEAR, or *Biſſextile*, is every fourth Year and ſo called from its *Leaping* a Day more that Year than in a Common Year: For in the Common Year any fixed Day of a Month changeth ſucceſſively the Day of the Week; but in the *Leap-Year* it skips or *leaps* over one Day.

Note, The Common Year hath 365 Days in it, but the *Leap-Year* 366, and then *February* hath 29 Days, which in Common Years hath but 28.

To find the *Leap-Year* you have this Rule:

Divide by 4; *what's left ſhall be,*
For Leap-Year 0; *for paſt*, 1, 2, *or* 3.

Example.

In the Year 1701, what is it, a Common Year, or a *Leap-Year*.

4) 1701 (425

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1 Remainder; ſo that it is the Firſt Year after the *Leap-Year*.

LEASE, in Law, ſignifies a Demiſe or Letting of Lands or Tenements, Right of Common, Rent, or any Hereditament unto another, for Term of Years or Life, for a Rent reſerved; and is either written, called a *Leaſe by Indenture*, or a *Leaſe Parol*. The Party that letteth this *Leaſe*, is called the *Leſſor*; and the Party to whom it is let, is the *Leſſee*: And a *Leaſe* hath in it Six Points: 1. Words ſufficient to import a Demiſe. 2. A *Leſſee* named. 3. A Commencement from a Day certain. 4. A Term of Years. 5. A Determination. 6. A Reſervation of Rent.

LEAVER: ſee *Lever*.

LEAVES, are the Notches of the *Pinion* of a Watch: ſee *Pinion*.

LEDGES in a Ship, are ſmall Pieces of Timber lying athwart Ships, from the *Waſte-Trees* to the *Roof-Trees*, which ſerve to bear up the *Nettings*, or the *Gratings* over the Half-Deck.

LEGACY, in Law, is a particular Thing given by a laſt Will and Teſtament: For if a Man transfer his whole Right or Eſtate upon another, that the *Civilians* call *Hereditary*; and he to whom it is ſo transferred, they call *Hæres*; but in Common Law he is called *Heir* only, to whom all the Man's Lands and Hereditaments deſcend by Right of Blood: The former is *Hæres factus*, the latter *Hæres natus*.

LEE, a Word diverſly uſed at Sea; they mean generally by it, the Part oppoſite to the Wind: Thus the

LEE-*Shore*, is that on which the Wind blows; and therefore to be under the Lee of the Shore, is to be cloſe under the Weather-ſhore, or under Wind. When they ſay,

A-LEE *the Helm*, they mean, put the Helm to the Leeward ſide of the Ship. They ſay alſo, Take care of the

LEE-*Latch*; which is a Word of Command to the Man at the Helm, ſpoken by him that commands, or *Cons*, to take care that the Ship don't go to the *Leeward* of her Courſe: Wherefore they call a

LEEWARD Ship, one that is not faſt by a Wind, or which doth not ſail ſo near the Wind, nor make her Way ſo good as ſhe ſhould.

To lay a Ship by the *Lee*, or to *come by the Lee*, is to bring her ſo, that all her Sails may lie flat againſt her Maſts and Shrouds, and that the Wind may come right upon her Broad-ſide. The way to do which, if all a Ship's Sails be abroad, is to bear up the Helm hard to Windward, to let riſe the Fore-tack, veer the Main-ſheet, and take in the Miſſen-maſt, or at leaſt to *peck* it up; which is called *Spelling the Miſſen*.

LEE-FANG, is a Rope in a Ship, reeved into the *Crengles* of the Courſes, when the Bottom of a Sail is to be haled in, that ſo the Bonnets may be laced on; this Rope is alſo of uſe to take in the Sail.

LEET, and *Court-Leet*, is a Court out of the Sheriff's Turn, and inquires of all Offences under the Degree of High-Treaſon that are committed againſt the Crown and Dignity of the King. But thoſe Offences which are to be puniſhed with Loſs of Life or Member, are only inquirable there, and to be certified over to the Juſtices of Aſſize.

LEETCH *of a Sail*, (aboard a Ship) ſignifies the outward Edge or Skirt of the Sail from the Earing to the Clew; or rather the middle of the Sail between theſe two.

LEETCH-LINES, are ſmall Ropes faſtened to the *Leetch* of the Topſails (only) and then reeved into a Block at the Yard, juſt by the Topſail Ties. Their uſe is to hale in the *Leetch* of the Sail, when the Topſails are to be taken in; which is always firſt done, and then the Sail can be taken in with the greater Eaſe.

LEGAN: ſee *Flotſon*.

LEGGS *of the Martnets*, is the Term for thoſe ſmall Ropes in a Ship, which are put thro' the *Bolt Ropes* of the *Main* and *Foreſail*, in the *Leetch* of each. They are above a Foot in Length, and at either End are ſpliced into themſelves: They have alſo a ſmall Eye, into which the *Martnets* are faſtened by two *Hitches*, and the End is ſeized into the ſtanding part of the *Martnets*.

LEGGS *of a Triangle*: When one ſide of a Triangle is taken as a Baſe, the other two are called *Leggs*.

LEGUMEN, in Botanicks, is that Species of Plants which we call Pulſe; and they are ſo named becauſe they may be gathered by the Hand without cutting. Mr. *Ray* reckons all thoſe Plants which have a *Papilionaceous*, or Butter-fly-like Flower, among the *Legumina*.

LEMMA, is a Term uſed chiefly by Geometrick Writers, and ſignifies a Propoſition, which ſerves previouſly to prepare the way for the more eaſie Apprehenſion of the Demonſtration of ſome Theorem, or for the Conſtruction of ſome Problem. Thus to prove that a Pyramid is $\frac{1}{3}$ of a Priſm or Parallelopiped of the ſame Baſe and Height with it, (the Demonſtration of which, after *Euclid*'s way, in Lines, is a little difficult to conceive) we may premiſe this *Lemma*; which you will find proved under the Word *Progreſſion*, *That the Sum of a Series of the Squares of Numbers in Arithmetical Proportion, beginning from* 0, *and going on in the Natural Order*; *as* 0, 1, 4, 9, 16, 25, 36, &c. *is always ſubtriple of the Sum of as many Terms equal to the greateſt*; or, in other Words, is always $\frac{1}{3}$ of the greateſt Term multiplied by the Number of the Terms.

Thus alſo to find the *Inflection* of a Curve Line, (if it hath any Inflection) this *Lemma* muſt be firſt premiſed, *That a Tangent may be drawn to the given Curve in a given Point*.

LENIENTIA, the ſame with *Laxantia*.

LENO and *Linon*, is that part of the Brain called *Torcular Herophili*, that Place where the third Cavity of the *Dura Meninx* is joined to the firſt, ſecond, and fourth.

LENS, is a Term in Opticks for a ſmall Convex, or Plano-Convex, a Concave, or Concavo-Convex Glaſs.

LENTA *Febris*, the ſlow or lingering Fever, is uſually reckoned among the *Symptomatical*, and proceeds from ſome hidden Putrefaction ſticking to ſome Bowel, ſo that its Subſtance is almoſt corrupted. Such a kind of Fever is often bred in the Conſumption of the Lungs, and degenerates into an *Hectick*. *Blanchard*.

LENTIFORME *Prominences*: See *Corpora Striata*.

LENTIGINES, are what we call *Freckles*.

LEO, is the Fifth of the Twelve Signs of the *Zodiack*.

LEPIDOIDES, is the Scaly Suture of the Skull: See alſo *Mendoſa*.

LEPRA *Arabum*, the ſame with *Elephantiaſis Græcorum*.

LEPROSIE, is a dry Scab, whereby the Skin becomes ſcaly like Fiſh: It differs from *Leuce* and *Alphus*, in that a *Leproſie* is rough to the Touch, and cauſes an Itching; for the Skin is the only Part affected, and therefore that being flead off, the Fleſh underneath appears found and well.

LEPROSO *Amovendo*, is a Writ that lies for a Pariſh, to remove a Leper or Lazar, that thruſteth himſelf into the Company of his Neighbours, either in Church or in other Publick Meetings, to their Annoyance or Diſturbance.

LEPTUNTICA, are attenuating cutting Medicines, which part or cut the croſs and viſcous Humours with their acute Particles.

LEPUS, the *Hare*, a Southern Conſtellation, containing 13 Stars.

LESSER *Circles of the Sphere*, are thoſe whoſe Planes do not paſs through the Center of the Sphere; and which do not divide the Globe into two equal Parts, but are parallel to *Greater Circles*: As the Tropicks and Polar Circles, and all Parallels of Declination and Altitude; which latter being parallel to the Horizon, are called *Almacanters*.

LESSOR and *Leſſee*, are Terms of the Common Law: The *Leſſor*, is he that Leaſeth out Lands or Tenements to another for Term of Life, for Years, or at Will: And the Perſon to whom ſuch a Leaſe is made, is called the *Leſſee*.

LETHARGUS, a *Lethargy*, is a Diſeaſe cauſing an heavy Sleep, like that Diſtemper called *Coma*, but accompanied with a Fever and a *Delirium*; and is ſuppoſed to be an Heap of too much or incongruous moiſt Matter within the Pores of the *Cortical* Subſtance of the Brain. This Diſtemper does not ſeem to come of it ſelf, but rather from the Demigration of Fevers.

LETTERS *Patent*, are Writings ſealed with the Great Seal of *England*, whereby a Man is authorized to do or enjoy any thing that otherwiſe of himſelf he could not. And they are ſo termed of their Form, becauſe they be open, with the Seal affixed, ready to be ſhewed for Confirmation of the Authority given by them. Common Perſons may grant *Letters Patents*; but they are rather call'd *Patents*, than *Letters Patents* to make *Denizens*; yet for Difference ſake, thoſe granted by the King are called *Letters Patent Royal*.

LETTER *of Attorney*, is a Writing authorizing an *Attorney*; that is, a Man appropriated to do a lawful Act in our ſtead: As a *Letter of Attorney* to give Seiſin of Lands, to receive Debts, to ſue a Third Perſon, *&c.*

LETT-FALL, the Word at Sea for putting out a Sail when the Yards are aloft, and the Sail is to come down from the Yard; but when the Yards are ſtricken down, then the Sail is looſed below, before they hoiſe the Yard. Neither is it properly ſaid of *Top-ſails*, becauſe they lie on the Top; and therefore the Word for them is, *Heave out your Top-ſails*. Nor can it be applied to the *Mizzen*; for to it the Word is, *Strike the Mizzen, and ſet it*. So that in Strictneſs it belongs only to the *Main-ſail*, *Fore-ſail*, and *Sprit-ſail*, when their Yards are hoiſted up aloft.

LEVANT and *Couchant*, is when Cattel have been ſo long in another Man's Ground, that they have lain down, and are riſen again to feed.

LEVARI *Facias*, is a Writ directed to the Sheriff, for levying of a Sum of Money upon Lands and Tenements of him that hath forfeited a Recognizance.

LEVARI *Facias damna de diſſeiſitoribus*, is a Writ directed to the Sheriff, for the levying of Damages, wherein the *Diſſeiſor* hath formerly been condemned to the *Diſſeiſee*.

LEVARI *Facias reſiduum debiti*, is a Writ directed to the Sheriff, for the levying the Remnant of a Debt upon Lands and Tenements, or Chattels of the Debtor that hath in part ſatisfied before.

LEVARI *Facias, quando vicecomes returnavit quod non habuit emptores*, is a Writ commanding the Sheriff to ſell the Goods of the Debtor which he hath already taken, and returned that he could not ſell them, and as much more of the Debtor's Goods as will ſatisfie the whole Debt.

LEVATORES *Ani*, are Muſcles, which ariſe fleſhy from each ſide of the *Oſſa Pubis*, internally within the *Pelvis*, as alſo from part of the *Os Iſchium* and *Sacrum*: From theſe Places, like Lines drawn from a Circumference towards a Center, its Fibres deſcend over the *Muſculi Marſupiales* to their Implantation at the lower end of the *Inteſtinum Rectum* in the *Anus*. The Uſe of theſe Muſcles is chiefly to ſuſpend and draw the *Anus* upwards, leſt the *Fæces* ſhould be burthenſom to the *Sphincter*.

LEVATOR *Scapulæ*, is a Muſcle of the Shoulder-Blade, by ſome called *Levator Patientiæ*, becauſe we make uſe of it in large Inſpirations, in order to expire; as when we ſigh (as they call it.) This lies immediately under the *Cucullaris*, ariſing by ſo many ſeparate Originations from the Second, Third, Fourth, and Fifth Tranſverſe Proceſſes of the *Vertebræ* of the Neck; which uniting into one large fleſhy Body, deſcends obliquely to its Inſertion at the ſuperior Angle of the *Scapulæ*: Its Name declares its Office.

LEUCE, is a Cutaneous Diſeaſe, when the Hairs, Skin, and ſometimes the Fleſh underneath, turns white; the Fleſh being pricked with a Needle, is not ſenſible, nor emits Blood, but a Milky Humour. It differs from *Alphus*, in that it penetrates deeper, and changes the Skin, ſo that the Hairs are changed too.

LEUCOMA, is a White Scar in the Horny Tunick of the Eye; the ſame with *Albugo*.

LEUCOPHLEGMATIA, is a pituitous Dropſy, or a Dropſy that ſeizes the whole Body; which in the Beginning is called *Cachexia*, and differs from it only in Degree.

LEVEL *of Carpenters*, is an Inſtrument made of a long piece of Wood at bottom, and with an upright one to hold a Thread and Plummet, which plays about a perpendicular Line there drawn; and when it falls exactly on it, then is the bottom piece in a true Level, or Horizontal Poſition.

LEVEL, is an Inſtrument made of Wood or Braſs, with two Sights and a Glaſs, almoſt filled with coloured Spirit of Wine, but ſo as to leave room for a Bubble of Air to play up and down in it: It hath a Cover, divided into ſeveral equal Parts, whereby to adjuſt the Bubble; with a Spring to fit it to the Three-legg'd Staff, and a long Screw, to rectify the Bubble by the Help of a Plummet that hangs on one of the Sights. Sometimes, inſtead of the long Screw and Spring, there is fitted a Rack, being two Semi-circles at Right Angles, with a Thread or Worm upon two endleſs Screws; which,

with a Key, readily brings the Inſtrument to a true *Level*; and ſometimes to help the Sight, there is added a *Teleſcope*. There alſo belongs to this Inſtrument two or more *Station-Staves*; and it is uſed by *Ingineers*, *Surveyers*, *&c.* to find the true Level for conveying Water to ſupply Towns, making Rivers Navigable, dreining Bogs, *&c.* See *Vol.* II.

LEVER, is the ſecond *Mechanical Power*; and ſo conſidered, is only a *Balance* ſupported by a *Hypomochlion*; only the Center is not in the Middle, as it is in the common *Balance*, but near one End; for which Reaſon 'tis uſed to elevate or raiſe a great Weight; whence comes the Name *Lever*.

LEVIGATION, in Chymiſtry, is the *grinding* any hard Matter to a very fine, or as they ſay, an impalpable Powder upon a Marble, as the Painters grind their Colours.

LEVITY, is the Diminution or Want of Weight in any Body, when compared with another that is heavier; and in this Senſe is oppoſed to *Gravity*. The Schools maintain there is no ſuch thing as *Poſitive* or *Abſolute Levity*; and this they would have to be the Cauſe of the Emergency of Bodies lighter in Specie than Water, up to the Surface of that Liquor. But beſides that, the common Senſe of Mankind diſcovers *Gravity* and *Levity* to be only Relative and Comparative Things; the Honourable Mr. *Boyle* hath by many Experiments ſhewn, That the riſing of Bodies from the Bottom to the Surface of Water, if lighter ſpecifically than it, is by no means ſolvable nor accountable by any ſuch Notion as that of *Poſitive Levity*, but exactly agreeable to the Laws of the *Hydroſtaticks*: See his *New Experiments about the Poſitive or Relative Levity of Bodies*, and *Hydroſt. Paradoxes*.

LIBEL, ſignifies the Original Declaration of any Action in the Civil Law; as alſo a Criminous Report of any Man caſt abroad, or otherwiſe unlawfully publiſh'd, and then called *Famoſus Libellus*; and this is either *In Scriptis*, or *Sine Scriptis*: *In Scriptis*, is when an *Epigram*, or other Writing, is compoſed or publiſh'd to another's Diſgrace, which may be done *Verbis aut Cantilenis*; as where this is maliciouſly repeated or ſung in the Preſence of others; or elſe *Traditione*, when the *Libel*, or any Copy of it, is delivered out to ſcandalize the Party. *Famoſus Libellus ſine Scriptis*, may be two-fold: 1. *Picturis*, as to paint the Party in a ſhameful and ignominious manner; Or, 2. *Signis*, as to fix a Gallows, or other ignominious Signs, at the Door of the Party, or elſewhere.

LIBELLO *habendo*: See *Copia Libelli deliberanda*.

LIBERA *Chaſea habenda*, is a Writ Judicial, granted to a Man for a free Chace belonging to his Mannor, after he hath by a Jury proved it to belong to him.

LIBERTATE, is a Writ iſſuing out of the *Chancery* to the Treaſurer, Chamberlains, or Barons of the *Exchequer*, or Clerks of the *Hamper*, *&c.* for the Payment of any Annual Penſion, or other Sums granted under the Great Seal: Or ſometimes to the Sheriff, *&c.* for the Delivery of any Lands or Goods taken upon Forfeits of Recognizance. It lies alſo to a Gaoler, for the Delivery of a Priſoner that hath put in Bail for his Appearance.

LIBERTATIBUS *Allocandis*, is a Writ that lies for a Citizen or Burgeſs of any City or Borough, that contrary to the *Liberties* of the City or Town whereof he is, is impleaded before the King's Juſtices, or Juſtices Errant, or Juſtice of the Foreſt, *&c.* to have his Privilege allowed.

LIBERTATIBUS *Exigendis in Itinere*, is a Writ whereby the King willeth the Juſtices in *Eyre* to admit of an Attorney for the Defence of another Man's *Liberty* before them.

LIBERTY, is the Power a Man hath to do, or forbear doing, any particular Action, according as its Doing or Forbearance has the actual Preference in the Mind; which is the ſame thing as to ſay, according as he himſelf *wills* it.

LIBRA, one of the Twelve Signs of the *Zodiack*, being exactly oppoſite to *Aries*.

LIBRATION *of the Moon*, (ſee *Evection*) is of three Kinds:

1. Her *Libration in Longitude*; which is a Motion ariſing from the Plane of that Meridian of the Moon, (which is always, nearly, turned towards us) being directed not to the Earth, but towards the other Focus of the Moon's Elliptical Orbit; and ſo to an Eye on the Earth ſhe ſeems to librate to and again in Longitude, or according to the Order of the Signs in the Zodiack. This *Libration* is of no Quantity twice in each Periodical Month; *viz.* when the Moon is in her Apogee, and in her Perigee; for the Plane of her Meridian abovemention'd, is directed alike to both the Foci.

2. Her *Libration in Latitude*; which ariſes hence, That her Axis not being perpendicular to the Plane of her Orbit, but inclined to it, ſometimes one of her Poles, and ſometimes the other, will *nod* (as they call it) or dip a little towards the Earth; (as is the Caſe of the Poles of the Earth towards the Sun) and conſequently ſhe will appear to librate a little, and to ſhew ſometimes more of her Spots, and ſometimes leſs of them, towards each Pole: Which *Libration* depending on the Poſition of the Moon, in reſpect of the Nodes of her Orbit with the Ecliptick, (and her Axis being perpendicular nearly to the Plane of the Ecliptick) is very properly ſaid to be in *Latitude*.

And this is compleated in the Space of the Moon's *Periodical Month*; or rather while the Moon is returning again to the ſame Poſition, in reſpect of her Nodes.

3. There is alſo a *Third kind of Libration*, by which it happens, that though another Part of her is not really obverted to the Earth, as in the former *Librations*, yet another is illuminated by the Sun: For ſince her Axis is perpendicular nearly to the Plane of the Ecliptick, when the Moon is moſt Southerly, in reſpect of the Ecliptick *North Pole*; ſome Parts nearly adjacent to it will be illuminated by the Sun; while, on the contrary, the South Pole will be in darkneſs, In this Caſe therefore, if it happen that the Sun be in the ſame Line with the Moon's Southern Limit; then will ſhe, as ſhe proceeds from Conjunction with the Sun towards her aſcending Node, appear to dip her Northern Polar Parts a little into the dark Hemiſphere, and to raiſe her Southern Polar Parts as much into the Light; and the contrary to this will happen the next Fortnight, while the New Moon is deſcending from her Northern Limit; for then her Northern Polar Parts will appear to emerge out of Darkneſs, and the Southern Polar Parts to dip into it. And this *ſeeming Libration*, or rather theſe Effects of the former *Libration in Latitude*, depending upon the Light of the Sun, will be compleated in her *Synodical Month*. *Greg. Aſtron. Lib.* 4. *Sect.* 10.

LICENSE *to ariſe*, is a Liberty given by the Court to a Tenant that is Eſſoined *de malo lecti* in a real Action: For the Law is, That in this Caſe he may not ariſe out of his Bed, or at leaſt go out of his Chamber, until he have been viewed by Knights thereunto appointed, and have a Day aſſigned him to

to appear: And the Reaſon of this is, That it may appear whether he cauſed himſelf to be Eſſoined deceitfully, or not; and therefore if the Demandant can prove that he was ſeen abroad before the View or *Licenſe* of the Court, he ſhall be adjudged to be deceitfully Eſſoined, and to have made Default.

LICENTIA *Surgendi*, is a Writ whereby the Tenant Eſſoined *de malo lecti*, obtaineth Liberty to riſe.

LICHEN, barbarouſly called by ſome *Serpigo* or *Zerma*: *Halliabbus* calls it *Petigo* and *Sarpedo*; the Vulgar *Voliacita*. *Lichens* are certain Aſperities of the Skin, and as it were Tumours, which itch much, and ſend forth Matter. The *Greeks* and *Arabians* have made two ſorts of *Lichens*; the one mild and gentle, the other fierce and cruel: And according to *Avicen*, ſome are moiſt; which being rubbed, ſend forth a kind of Dew; others are dry: And the Moiſt are more ſafe; but the Dry is made of ſalt pituitous Matter, turn'd into Melancholy Blood. And again he writes, That one *Impetigo* brings off the Skin, by reaſon of its great Dryneſs, and another does not; and that one is Ambulatory and Malignant, and another Fixed and Standing; as alſo one is Old, another Freſh. Hence it appears, That the *Scabies* of *Corn*. *Celſus* was nothing but theſe *Lichens* of the *Greeks*, and the *Impetigo*, of the *Arabians*. It comes in any Part of the Body but eſpecially in the Face and Chin, as *Galen* has it: For a *Lichen*, ſays he, is a moſt ungrateful Diſtemper in the Chin, becauſe, it makes it itch exceedingly, and ſtretches out the Parts affected: It is not a little dangerous; it ſpreads over the whole Face, and ſometimes reaches the Eyes, and at laſt makes the Perſon affected extream filthy and loathſome. *Blanchard*.

LICHEN *of the Greeks*, is *Pliny*'s *Impetigo*, or an Inequality of the Skin, extending it ſelf to the neighbouring Parts, and accompanied with an extraordinary Itching, and dry Pimples. *Blanchard*.

LIE *under the Sea*: The Sailors ſay a Ship lies under the Sea, when her Helm being made faſt *a-Lee*, ſhe lies ſo *a-Hull*, that the Sea breaks upon her *Bow*, or her *Broad-ſide*.

LIEGE, is a Word borrowed from the *Feudiſts*, and hath two ſeveral Significations in the Common Law, ſometimes being uſed for *Liege-Lord*, and ſometimes for *Liege-Man*. *Liege-Lord*, is he that acknowledgeth no Superior; *Liege-Man*, is he that oweth Allegiance to his *Liege-Lord*.

LIEN, the ſame with *Spleen*; which ſee.

LIENTERIA, is a kind of Looſeneſs, where the Meat or Aliment taken in, is ſent out of the Body before it be altered, or at leaſt before it be digeſted,

LIFE-RENT, in Law, is a Rent or Exhibition which a Man receives, either for Term of Life, or for Suſtentation of Life.

LIFTING-PIECES, are Parts of a Clock which do lift up and unlock the Detents in the Clock-part.

LIFTS, are Ropes in a Ship belonging to the Yard-arms of all Yards: And their Uſe is to *Top the Yard-arms*, *i. e.* to make the Ends of the Yards hang higher or lower, as Occaſion ſerves. The *Top-ſail Lifts* do ſerve as *Sheats* for the Top-gallant Yards, as well as for *Lifts* to the Top-ſail Yards. The Haling of theſe Ropes is called *Topping the Lifts*: Thus they ſay, *Top a Starboard*, or *Top a Port*; *i. e.* hale upon the *Starboard* or *Larboard-Lift*.

The *Lifts* for the Sprit-ſail Yard, they call *Standing-Lifts*.

LIGAMENTUM: A *Ligament* is a ſolid and very fibrous Part of an Animal Body, proceeding almoſt from Matter like a *Cartilage*, different in Size, Number and Situation, broad and round, cold; as it comes near the Conſtitution of a Membrane or a *Cartilage*, drier or moiſter, harder or ſofter, more or leſs, tough and flexible. Its Uſe is to connect the Parts, eſpecially Bones, that they may better perform their Motions. Thoſe which tie the Bones together are wholly inſenſible, and the others have but a dull Senſe.

LIGAMENTUM *Ciliare*: See *Ciliare Ligamentum*.

LIGEANCY, is ſuch a Duty or Fealty as no Man may owe to more than one Lord; and therefore it is moſt commonly uſed for the Duty and Allegiance which every good Subject owes to his *Liege-Lord* the King.

Ligeantia, ſays my Lord *Coke*, *eſt duplex, ſicut ſubditus tenetur Regi ad Obedientiam, ita Rex tenetur ſubdito ad Protectionem*: And in another Place, *Duplex eſt Ligamen inter Regem & populum, &c. Vid. 7 Rep. Calvin's Caſe.*—— Which Paſſages ſome will have to be an expreſs Authority in Law, to prove the Original Contract between the King of *England* and the People.

LIGHT, is uſed to ſignify Three Things:

1. That Senſation which ariſes in us from the View of any Luminous Object, as the Sun, a Star, or a Candle.

2. *Light* ſignifies the Cauſe of that Senſation in us, as it is an Action or Property exiſting in the Luminous Body.

3. By this Word ſome alſo underſtand the *Action* of the *Medium* interpoſed between us and the Luminous Object; and others, That *Train of Rays*, which coming forth from thence, pervades the *Medium* before it can come to affect our Eyes.

Light is undoubtedly produced by Motion, but yet 'tis not every Motion that will produce *Light*. The Learned Dr. *H.* in his *Micrography*, *P.* 55. judges the Motion that produces *Light* ought to have theſe Requiſites: 1. That it be *exceeding quick*, like the Motions of Fermentation and Putrefaction; (as you ſee in ſhining Pickles and rotten Wood:) 2. It muſt be a *Vibrative Motion*, and alſo have its Vibrations exceeding ſhort: This he concludes from the ſhining of Diamonds, when chafed or rubbed.

As to the Trajection of *Light* through the Medium, the moſt freely that can be, he well obſerves, 1. That the Medium muſt be ſuſceptible and impartible of this Motion. 2. That the Parts of it muſt be Homogeneous. 3. That their Conſtitution be ſuch, that *Light* may be propagated through them as ſoon as poſſible: Though he aſſerts, That it can by no Means be Inſtantaneous; and ſeems (ſo long ago) fully ſatisfied, That Light requires much the ſame Time for its Trajection, as Mr. *Romer* found it afterwards to do by the Eclipſes of *Jupiter*'s Satellites: See *Philoſ. Tranſ. N.* 136. *P.* 198.

The Incomparable Sir *Iſaac Newton* allows, with other Aſtronomers, about 10 Minutes of an Hour for the Motion of a Ray of *Light* from the Sun to the Earth. *Princip. P.* 231.

He found alſo, by plain and repeated Experiments, That the Rays of *Light* being in the Air, and paſſing near or through the Edges of any opacous or tranſparent Body, (ſuch as Pieces of Gold or Silver Coin, or ſquare Pieces of thoſe Metals;

the Edges of Knives, or of broken Glaſs, &c.) are always *bent* or *incurvated* towards ſuch Bodies, as if they were *attracted* by them; and of theſe, thoſe Rays which paſs neareſt the Edges, are moſt *incurvated*.

And from hence it will follow, That the Refraction of the Rays of *Light*, (eſpecially of thoſe which fall near the Edges of Bodies) is not made juſt at the Point of Incidence, but a little before the Rays enter into the denſer Medium, and a little after they are gotten within it.

The ſame Perſon found alſo by curious Experiments made with *Priſms*, That the vividly coloured Image, tranſmitted through a Hole, in a darkened Room, oppoſite to the Sun-beams, and caſt on a white Wall, was five times as long as it was broad: This ſtrange Diſproportion between the Length and Breadth of the coloured Spectrum put him upon ſeveral Thoughts; but at laſt he thought of this *Experimentum Crucis*: He took two Boards, and placed one cloſe behind the Priſm at the Window, ſo that the *Light* paſſing through a ſmall Hole purpoſely made in it, might fall on another Board placed nearer the Wall, at about 12 Foot Diſtance from the former; and having alſo a ſmall Hole in it too, for ſome of the incident *Light* to paſs thro'. Behind this Board he placed a ſecond Priſm, that the Rays paſſing through it and the two Holes in the Boards, might be again refracted before it came to the Wall. Then he turned the firſt Priſm at the Window ſlowly about its Axis, ſo as to make the ſeveral Parts of the Image caſt on the ſecond Board ſucceſſively paſs through the Hole in it, that ſo he might obſerve to what Places on the Wall the ſecond Priſm would refract them. And then he ſaw plainly, *by the Variation of thoſe Places, that the* Light *tending to that End of the Image towards which the Refraction of the firſt Priſm was made, did in the ſecond Priſm ſuffer a Refraction conſiderably, the* Light *tending to the other End.* And ſo the true Cauſe of the Length of that Image was detected to be no other, than that *Light conſiſts of Rays differently refrangible*; which, without reſpect to any Difference in their Incidence, were according to their Degrees of Refrangibility tranſmitted towards divers Parts of the Wall. From whence he juſtly concluded, That *Light it ſelf was an Heterogeneous Mixture of differently Refrangible Rays. Philoſophical Tranſactions*, N. 80.

He demonſtrates alſo, That ſince *Light* is always propagated in Right Lines, it cannot poſſibly conſiſt in Action only, (*Prop.* 41, 42. *Lib. Princip. Phil. Mathem.*) as the *Carteſians* do aſſert.

In another Place of the *Tranſactions* he gives the following Definitions and Propoſitions.

DEFINITIONS.

1. *Homogeneal*, *Similar*, or *Uniform Light*, is that whoſe Rays are equally refrangible.

2. *Heterogeneal Light*, is that whoſe Rays are unequally refrangible.

Note, There are but Three Affections of *Light* in which he obſerved its Rays to differ; *viz. Refrangibility*, *Reflexibility*, and *Colour*: And thoſe Rays which agree in *Refrangibility*, agree alſo in the other two; and therefore may well be defined *Homogeneal*, eſpecially ſince Men uſually call thoſe things *Homogeneal*, which are ſo in all other Qualities that come under their Knowledge; though in other Qualities their Knowledge extends not to, there may poſſibly be ſome *Heterogeneity*.

3. Thoſe *Colours* he calls *Simple* or *Homogeneal*, which are exhibited by *Homogeneal Light*.

4. And thoſe Compound or *Homogeneal*, which are exhibited by *Homogeneal Light*.

5. Different Colours he calls not only the more eminent Species, Red, Yellow, Green, Blue, Purple, but all other the minuteſt Gradations; much after the ſame manner, that not only the more eminent Degree in Muſick, but all the leaſt Gradations are eſteem'd different Sounds.

PROPOSITIONS.

1. The Sun's *Light* conſiſts of Rays differing by indefinite Degrees of Refrangibility.

2. Rays which differ in Refrangibility, when parted from one another, do proportionably differ in the Colours which they exhibit. Theſe two Propoſitions are Matter of Fact.

3. There are as many Simple or Homogeneal Colours, as Degrees of Refrangibility; for to every Degree of Refrangibility belongs a different Colour, by *Prop* 2. And that Colour is Simple, by *Def.* 1. and 3.

4. Whiteneſs, in all reſpects like that of the Sun's immediate *Light*, and of the uſual Objects of our Senſes, cannot be compounded of two ſimple Colours alone; for ſuch a Compoſition muſt be made by Rays that have only two Degrees of Refrangibility, by *Def.* 1. and 3. And therefore it cannot be like that of the Sun's *Light*, by *Prop.* 1. Nor for the ſame Reaſon, like that of ordinary White Objects.

5. Whiteneſs, in all reſpects like that of the Sun's immediate *Light*, cannot be compounded of Simple Colours, without an indefinite Variety of them: For to ſuch a Compoſition there are required Rays endued with all the indefinite Degrees of Refrangibility, by *Prop.* 1. And thoſe infer as many Simple Colours, by *Def.* 1, and 3. and *Prop.* 2. and 3.

6. The Rays of *Light* do not act on one another, in paſſing through the ſame Medium.

7. The Rays of *Light* ſuffer not any Change of their Qualities from Refraction.

8. Nor afterwards from the adjacent quiet *Medium*. Theſe two Propoſitions are manifeſt *de facto* in *Homogeneal Light*, whoſe Colour and Refrangibility is not at all changeable, either by Refraction, or by Contermination of the quiet *Medium*.

And as for *Heterogeneal Light*, it is but an Aggregate of ſeveral ſorts of *Homogeneal Light*; no one ſort of which ſuffers any more Alteration than if it were alone, becauſe the Rays act not upon one another, by *Prop.* 6. and therefore the Aggregate can ſuffer none.

9. There can no Homogeneal Colours be reduced out of *Light* by Refraction, which are not commixt in it before; becauſe, by *Prop.* 7, and 8. Refraction changeth not the Qualities of the Rays, but only ſeparates thoſe which have divers Qualities, by means of their different Refrangibility.

10. The Sun's *Light* is an Aggregate of an indefinite Variety of Homogeneal Colours, by *Prop.* 1, 3, and 9. And hence it is, that Homogeneal Colours may be called Primitive or Original.

That *Light* is a Body, M. *Molyneux*, in his *Dioptricks*, proves from the various Properties of it; As,

1. By the Affection of its being *Refracted*, 'tis manifeſt, that *Light*, in its Paſſage through this and t'other Diaphanous Body, does find a *different Reſiſtance*. Now 'tis unconceivable how any thing but Body ſhould ſuffer *Reſiſtance*; but we may conceive

ceive the Reſiſtance that *Light* ſuffers in its Paſſage through different Diaphanous Bodies to proceed from the Medium hindering the *Diffuſion* or *Diſtribution* of *Light* through *more* of the Parts of this Medium, and conſequently it may be ſaid to be *leſs illuminable*: For from the Nature of it, *Light* endeavours to *diffuſe* it ſelf: And the contrary, by how much *Light* does more equally or uniformly affect the Parts of the Medium, which it enlightens; or by how much it communicates its *Energy* to *more* of the *Particles* of the enlightened *Space*, that Medium may be ſaid to be by ſo much the *more illuminable*, or *leſs to reſiſt* the Progreſs of *Light*. Whence it is, that by how much the affected Parts of the Medium are *more ſolia* and *ſmall*, and admit between them the *leſs Space* for any other *Heterogeneous* Matter that ſuffers not by *Light*, by ſo much the Medium is ſaid to be *more enlightned*.

And 'tis certain, That *Reſiſtance* muſt proceed from the *Contact* of two *Bodies*; and *Contact*, either *Active* or *Preſſive*, belongs *only to Body*.

The Second Property that confirms *Light* to be a *Body*, and a *Body* moved or thruſt forward, is, That it requires *Time* to paſs from one Place to another, and does it not in an *Inſtant*, but is only of all Motions the *quickeſt*: For Mr. *Romer* has demonſtrated, beyond all Contradiction, from the Obſervations of the *Immerſions* and *Emerſions* of the *Satellites* of *Jupiter*, *That Light requires the Time of one Second to move the Space of* 3000 *Leagues*, or 9000 *Miles*, *which is near the Earth's Diameter*; as may be ſeen in the *Journal des Sarvans*, 1676. *Decemb.* 7. *Philoſophical Tranſactions*, *Num.* 136. Or Sir *Iſaac Newton's Philoſ. Natur. Math. Lib.* 1. *Schol. Prop.* 96. where 'tis aſſerted, That *Light* requires about 10 Minutes Time to come from the *Sun* to the *Earth*: And 'tis moſt evident, without this Allowance for the Time ſpent in *Light*'s Motion, the Appearances of the *Satellites*, *Eclipſes*, and *Emerſions*, are not to be explicated by any *Excentricity*, or other Hypotheſis.

A Third Proof that *Light* is a *Body*, is, That it cannot by any Art or Contrivance whatſoever, be *increas'd* or *diminiſh'd*; that is to ſay, we cannot magnify (for Inſtance) the *Light* of the *Sun*, or a *Candle*, no more than we can magnify a Cubick Inch of *Gold*, or make it *more* than a Cubick Inch: For whenever we ſee *Light* increaſed, 'tis by robbing it of ſome other Part of the Medium of its *Light*, or by bringing the *Light* that naturally ſhould have been diffuſed through ſome other Part, to the more enlightned Place: Thus, for Inſtance, in a Burning-Glaſs, by which the *Light* of the *Sun* is highly increaſed in its *Focus*, or Burning-Point, we are firſt to conſider, That in this *Focus* the Image of the *Sun* is projected, as being the *diſtinct* Baſe of the Glaſs: And Secondly. We may obſerve all round about this bright Spot of the Sun's Image, there is caſt the ſtrong Shadow of the whole Breadth of the Burning-Glaſs: For all the Rays from the Sun, that would have fallen on this broad ſhaded Space, are now brought together, and crowded cloſe in this bright Spot, there raiſing a vigorous *Light* and violent Heat.

This is abundantly confirmed by an eaſy Experiment: For cover all the Burning-Glaſs, except one ſmall round Space in its Middle, juſt the Bigneſs of the bright burning Spot in its Focus; and though there be a ſhaded Space round the bright Speck, as before, yet we ſhall not be ſenſible of any *Increaſe* either of *Light* or *Heat*; which plainly ſhews, That this *Increaſe* of *Light* (when the Glaſs is all bare (proceeds from the crowding together of thoſe Rays that would have fallen on the reſt of the Glaſs, and which (were not the Glaſs interpoſed) would have fallen on the ſhaded Space round about the bright Speck.

There ſeems but one Objection againſt what is here laid down; and that is, That *Light* is *increaſed* by Reflexion, without depriving any Place of the *Light* it would otherwiſe receive; or without bringing to the enlightened Part any *Light* that would otherwiſe eſcape it, or never come at it. But if we conſider the Matter more attentively, we ſhall find it otherwiſe: For ſuppoſe an *Hole* of a Foot Square in the Side of a Chamber, and that a Candle were placed cloſe to, and juſt before the Middle of this Hole; there is but half this Candle that now enlightens this Room, the other half of its Rays proceeding directly out at the Hole: Let now a Looking-Glaſs be placed ſo, as juſt to fill up this *Hole*; the Rays which before would have gone out at the Hole, are now reflected into the Room; ſo that the Hemiſphere without the Chamber, which was enlightened whilſt the Hole continued open, is now robbed of its *Light*; and all this *Light* is now reflected into its Room, whereby the *averſe* Side of the Flame is made to enlighten, as well as the Side *directly* expoſed to the Chamber. What is ſaid of this Caſe, may be accommodated to all: For ſo a Looking-Glaſs lying horizontally, and reflecting the Sun-beams to the Ceiling of the Room, does plainly hinder the direct Progreſs of the Rays to ſome other Part, and conſequently robs that Part of its *Light*. This is evident, by ſuppoſing an Hole behind the Glaſs, as in the former Caſe.

From whence 'tis manifeſt, how vainly they attempt, who offer at *increaſing Light uniformly*, that is, equally throughout the whole Sphere of a Luminous Body, or Radiating Point: Such are the Pretences of thoſe that would perſwade the World of Contrivances for making the ſmall Flame of a Lamp enlighten *ſtrongly* a whole Chappel, Hall, or Court, by being hung up in the midſt thereof: For theſe things are impoſſible to be effected in Nature, and they had as well pretend to create *Light*; for there is no other way of *increaſing* it, unleſs by robbing another Place of its *Light*, and then 'tis not *uniformly increaſed*. We have a very ſenſible Inſtance of this in the *new-invented Lanthorns*, now much uſed in *London*, which, by the Convex-Glaſſes in their Sides, do ſtrongly throw thoſe Rays along the Walks of the Paſſengers, which, would otherwiſe (were the Glaſſes away, and the round Holes left open) be ſpent on Parts of the Streets not frequented; whereby the untrodden Parts of the Streets are robbed of their *Light*, more ſtrongly to ſupply and enlighten the Paths where the *Light* is requiſite.

The Intenſeneſs of *Light* (as alſo of *Heat*) is always proportionable to the Denſity of the Rays that produce it: And that Denſity always is in all Places, or at all Diſtances from the Center of Radiation, as the Squares of ſuch Diſtances *reciprocally*: See *Quality*.

In the *French* Memoirs of the Royal Academy of Sciences, there is an Account of a New Theory of *Light*, which is ſtarted by M. *Malebranche*: He thinks *Light* and *Colours* do ariſe from Vibrations of the inſenſible Parts of Bodies, as Sounds do: And therefore, according to the Degree of the Rapidity of the Motion of the Parts of a Luminous Body, it will appear enlightened more or leſs; and in leſſer Degrees of ſuch vibrating Motion, it will appear not Luminous, but of ſuch and ſuch Colours: ſee *Vol.* II.

LIKE *Quantities*, in *Algebra*, are ſuch as are expreſs'd by the ſame Letters equally repeated in each Quantity. Thus 2 *b* and 3 *b*, and 9 *ff* and 3 *ff*, are *like Quantities*; but 2 *b* and 3 *b b*, and 9 *ff* and 3 *f f f*, are *unlike* ones; becauſe the Quantities have not every where the ſame Dimenſions, nor are the Letters equally repeated.

LIKE *Signs*, in *Algebra*, are when both are Affirmative, or both Negative; but if one be Affirmative, and the other Negative, they are *unlike Signs*. Thus + 64 *d* and + 5 *d* have *like Signs*; but 9 *ff* and — 7 *ff* have *unlike Signs*.

LIKE *Figures*, in *Geometry*, are ſuch as have their Angles equal, and the Sides about theſe equal Angles proportional.

LIKE *Arks*, in the Projection of the Sphere in *Plano*, are Parts of Leſſer Circles, containing an equal Number of Degrees with the correſponding Arks of Greater ones.

LIKE *Solid Figures*, in *Geometry*, are ſuch as are contained under like Planes, equal in Number.

LIMBER *Holes*, in a Ship, are little ſquare Holes cut in the Bottom of all her Ground-timber and Hooks, about 3 or 4 Inches ſquare: Their Uſe is to let the Water to the Well of the Pump, which elſe would reſt between thoſe Timbers where the Keel-Rode runs.

LIMB, ſignifies the outermoſt Border or graduated Edge of an *Aſtrolabe*, or the like Mathematical Inſtrument; or the Circumference of the primitive Circle in any Projection of the Sphere in *Plano*: Alſo the outermoſt Border of the Sun's or Moon's Disk in an Eclipſe of either Luminary.

LIMIT *of a Planet*, is the greateſt Heliocentrick Latitude; which ſee.

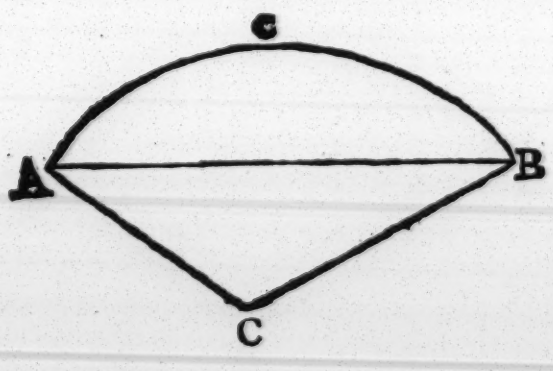
LIMITATION *of Aſſize*, is a certain Time ſet down by Statute, wherein a Man muſt alledge himſelf, or his Anceſtor, to have been ſeized of Lands. ſued for by a Writ of Aſſize.

LIMITED *Problem*, (for ſo I tranſlate Mr. *Ozanam*'s Word *Ordonne*) ſignifies a Problem that hath but one only Solution, or which can be done but one only way; as to make a Circle paſs thro' 3 Points given, not lying in a Right Line; to deſcribe an Equilateral Triangle on a Line given.

LINCH *Pins*, are thoſe Pins that keep on the Trucks or Wheels on the Carriage of a Piece of Ordnance.

LINCTUS, the ſame with *Eclegma*; which ſee.

LINE: A Line in Geometry, is a Quantity extended in Length only, and is ſuppoſed to have no *Breadth* or *Thickneſs*. It is made by the Motion of a Point; as, if the Point *A* be moved towards *B*,



it will by its Motion trace out or deſcribe a *Line*; which, if it go the neareſt way between *A* and *B*, will be a *Right* or *Straight Line*, whoſe Definition therefore will be the *neareſt or ſhorteſt Diſtance between any two Points*. But if the Point go any way about, as in any of the Lines *A C B*, then it will trace out either a *Crooked Line*, as the upper *A C B*; or elſe two or more *Straight ones*, as in the lower *A C B*.

From which Geneſis or Production of a Line, ſeveral Conſequences will fairly follow; ſome of which are needleſs Propoſitions in *Euclid*.

1. Two Right Lines cannot include a Space; but if drawn from the ſame Point to the ſame Point, will always be *coincident*; and drawn any how elſe, can only meet and make an Angle, but can never bound or terminate a Space. *Axiom.* 14. 1 *Euclid*.

2. In any Triangle, as *A C B*, any two ſides, as *A C* and *C B* taken together, are longer than the third *A B*; becauſe *A B* is the ſhorteſt Diſtance between the two Points *A* and *B*. 20 *e*. 1 *Euclid*.

3. A Tangent (or Line touching the Circumference of a Circle) can touch it but in one Point, and conſequently will be all of it without the Circle. 16. *e*. 3 *Euclid*.

4. A Right Line drawn between any two Points in the Circumference of a Circle, falls all within the Circle. 2 *e*. 3 *Euclid*.

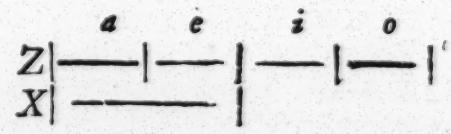
LINE *of Meaſures*, ſo Mr. *Oughtred* calls the Diameter of the primitive Circle in the *Projection of the Sphere in Plano*; or that Line in which the Diameter of any Circle to be *projected* falls.

LINE *of Numbers*, is a Line ſo called by its Inventor Mr. *Gunter*, and therefore frequently called *Gunter's Line*. This is uſually placed on a Ruler, or the Back of a Sector; and running parallel with it, you have the *Artificial Lines*, as we uſually call them.

LINES and their *Properties*; ſee *Vol.* II.

The Second Book of *Euclid* treats moſtly of Lines, and of the Effects of their being divided, and then multiplied into one another; as alſo do the firſt Six Propoſitions of Book the 13th. The former of which you have here very briefly demonſtrated Algebraically.

1. If there be two Lines z and x; one of which, as z, is divided into any Number of Parts, as into $a+e+i+o$. the Rectangle under the two whole Lines $z\ x$, is equal to the Sum of all the Rectangles made by x multiplied into the Parts of z.



That is $z\ x = x\ a + x\ e + x\ i + x\ e$. This is ſo plain, it needs no Proof.

2. If a Right Line, as z, be divided into two Parts $a+e$, the Rectangles made by the whole Line, and both its Parts are equal to the Square of the whole Line: ſee *Fig.* 2.

That is, $z\ a + z\ e = z\ z$.

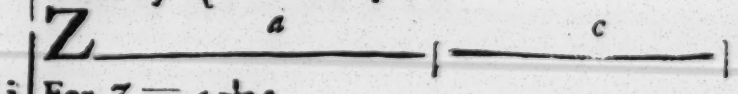
For $z\ a = a\ a + a\ e$.

And $z\ e = a\ e + e\ e$.

Therefore $z\ z = a\ a + z\ a\ e + e\ e$. *Q. E. D.*

3. Let the Line z be cut into $a+e$; then ſhall the Rectangle under the whole Line (z) and the Part (a) be equal to the Square of that Part a, together with the Rectangle made by the two Parts a and e.

That is, $z\ a = a\ a + a\ e$.

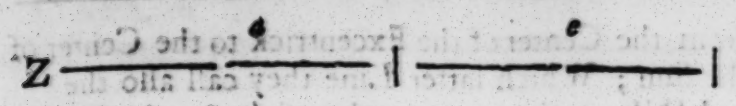


For $z = \frac{a+e}{}$

And $a+e \times a = a\ a + a\ e$. *Q. E. D.*

4. The Square of any Line, as z, divided into any two Parts a and e, is equal to both the Squares of thoſe Parts together, with the Rectangles made out of thoſe Parts.

That is, $z\ z = a\ a + 2\ a\ e + e\ e$.

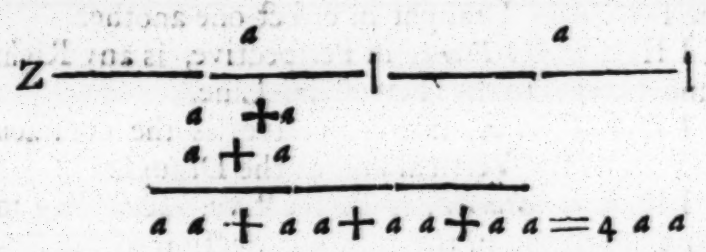


Multiply $a+e$ by it self, and the Thing is plain.

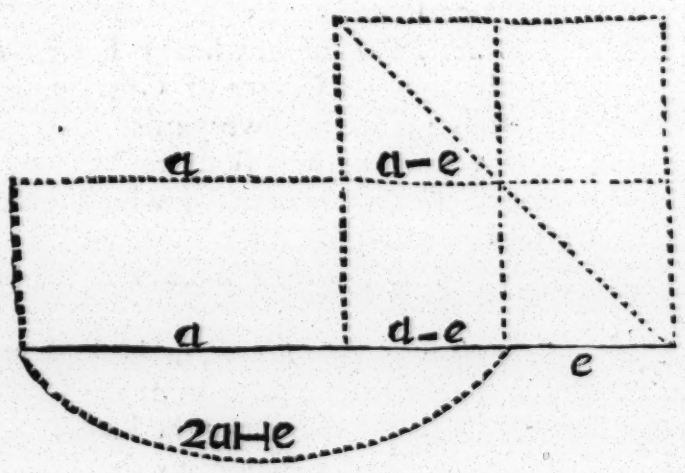
$$\begin{array}{r} a+e \\ a+e \\ \hline aa+ee \\ +ae+ee \\ \hline aa+2ae+ee \end{array}$$

COROLLARIES.

Hence 'tis plain, that the Square of any Line is equal to four times the Square of its half. For ſuppoſe Z to be biſſected, then each Part will be a; and multiplying $a+a$ by it ſelf, the thing will plainly appear.

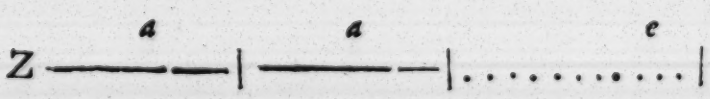


5. If a Line be divided into two Parts equally, and into two other Parts unequally, the Rectangle under the unequal Parts, together with the Square of the intermediate Part, the Difference between the equal and unequal Parts, is equal to the Square of half that Line.



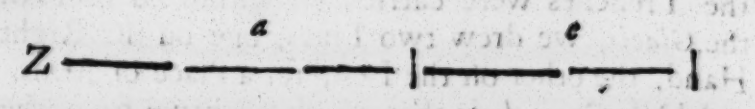
Let the whole Line be $2a$, then each Part will be a; let the leſſer unequal Part be e, then the greater unequal Part will be $2a-e$; which multiplied by e, produces $2ae-ee$: To which adding the Square of the Difference, or intermediate Part $a-e$, which is $aa-2ae+ee$, the Sum will be only aa, the Square of half the Line.

6. If a Line be biſſected, and then another Right Line be added to it, the Rectangle or Product of the whole augmented Line multiplied by the Part added, together with the Square of the half Line, is equal to the Square of the half Line, and part added, as one Line.



Let the firſt Line be $2a$, and the Part added e, then the whole will be $2a+e$; which multiplied by e, produces $2ae+ee$, and the Square of half the Line a a being added to it, it will be $2ae+ee+aa$, which is equal to the Square of $a+e$, by *Prop.* 4.

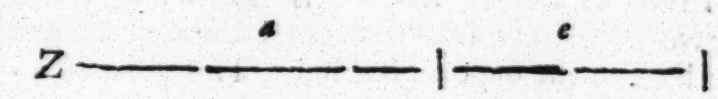
7. If a Quantity or Line be divided any how into two Parts, the Square of the whole added to the Square of one of the Parts, ſhall be equal to two Rectangles contained under the whole Line and that Part, added to the Square of the other Part.



Let a be one Part, and e the other; the Square of the whole, and if the leſſer Part e, makes $aa+2ae+2ee$. Then if the whole $a+e$ be multiplied twice by e, it will produce $2ae+2ee$; and if to this be added the Square of the other Part aa, the Sum will be

$aa+2ae+2ee$, equal to the former.

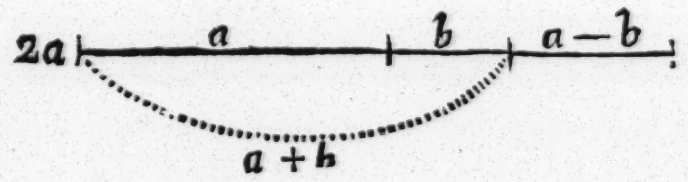
8. If a Line cut any how into two Parts, the Quadruple Rectangle under the whole Line and one of the Parts, added to the Square of the other Part, is equal to the Square of the whole, and the other Part added to it, as if it were but one Line.



Let the whole Line be $a+e$, then four times that multiplied by e (or the Quadruple Rectangle under that and e) will be $4ae+4ee$; to which adding the Square of the other Part aa, the Sum will be $aa+4ae+4ee$.

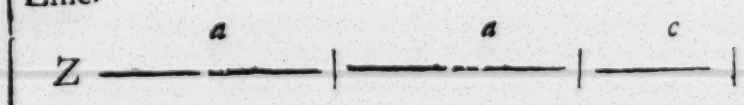
And if you ſquare $a+2e$, which expreſſes the whole Line, with e added to it, the Product will be the former Sum of $aa+a4ae+4ee$.

9. If a Line be biſſected, and alſo cut into two other unequal Parts, the Sum of the Squares of the unequal Parts will be double to the Sum of the Squares of the half Line, and of the Difference between the two unequal Parts.



Let the whole Line be $2a$, and the Difference between the equal and unequal Parts b; then the greater unequal Part will be $a+b$, and the leſſer $a-b$: The Sum of the Squares of the unequal Parts will be $2aa+2bb$. which is double to the Square of half the Line added to the Square of the Difference. *Q. E. D.*

10. If a Line be biſſected, and then another Line added to it; the Square of the whole increaſed Line, together with the Square of the Part added, is double the Sum of the Squares of the half Line, and of the half Line and Part added, taken as one Line.



Let the whole Line be $2a$, and the Part added e; then the whole increaſed Line will be $2a+e$; and the half Line and Part added, will be $a+e$. The Sum of the Squares of $2a+e$, and of e, is $4aa+4ae+2ee$; which is plainly double to aa, and $aa+2ae-ee$ added together. *Q. E. D.*

LINE, in Fortification, is that which is drawn from one Point to another, in delineating a Plane

upon Paper. But in the Field it is ſometimes taken for a Ditch bordered with its Parapet, and ſometimes for a Row of *Gabions*, or Sacks of Earth, extended in Length on the Ground, to ſerve as a ſhelter againſt the Enemies Fire. Thus they ſay, when the Trenches were carried on within 30 Paces of the *Glacis*, we drew two Lines, one on the Right Hand, the other on the Left, for a Place of Arms.

LINE *Capital*, is that which is drawn from the *Angle of the Gorge* to the *Angle of the Baſtion*.

LINE *Cogritel*, is that which is drawn from the *Angle of the Center* to that of the *Baſtion*.

LINE *of Defence*, is that which repreſents the Courſe of the Bullet of any ſort of Fire-Arms, more eſpecially of a Muſquet-Ball, according to the Situation which it ought to have to defend the Face of the Baſtion.

LINE *of Defence Fix'd or Fichant*, is that which is drawn from the *Angle of the Curtain* to the *flank'd Angle* of the oppoſite *Baſtions*; nevertheleſs without touching the Face of the Baſtion. This muſt never exceed 800 Feet, which they reckon the Diſtance a Muſquet-Ball will do Execution.

LINE *of Defence Razant*, is that which being drawn from a certain Point of its Curtain, Raſeth the Face of the oppoſite Baſtion. This is called alſo the *Line of Defence Stringent* or *Flanking*.

LINE of *Approach*, or of *Attack*, ſignifies the Work which the Beſiegers carry on under *Covert*, to gain the Moat, and the Body of the Place.

LINE of *Circumvallation*, is a *Line* or *Trench* cut by the Beſiegers within Cannon ſhot of the place, which rangeth round their Camp, and ſecures its Quarters againſt the Relief of the Beſieged.

LINE *of Contravallation*, is a Ditch border'd with a Parapet, which ſerves to cover the Beſiegers on the ſide of the place, and to ſtop the Sallies of the Garriſon.

LINES *within ſide*, are the Moats towards the place, to prevent the like Sallies.

LINES *without ſide*, are the Moats towards the Field, to hinder Relief.

LINES *of Communication*, are thoſe that run from one Work to another. But the *Line of Communication*, more eſpecially ſo called, is a continued Trench with which a *Circumvallation* or *Contravallation* is ſurrounded, and which maintains a *Communication* with all its *Forts*, *Redoubts*, and *Tenables*.

LINE *of the Baſe*, is a Right Line which joins the points of the two neareſt *Baſtions*.

To LINE *a Work*, is to ſtrengthen a Rampart with a firm Wall, or to encompaſs a Parapet or Moat with good Turff, *&c.*

LINEA *Apſidum*, or the *Line of the Apſes*, in the Old Aſtronomy, is a Line paſſing through the Center of the World. and the Center of the Excentrick; and whoſe two Ends are, one the *Apogee*, the other the *Perigee* of the Planet. That part of this Line which lies between the Center of the World and that of the Excentrick, is called the *Excentricity*.

LINE *of Greateſt or Leaſt Longitude of a Planet*, is that part of the *Linea Apſidum* reaching from the Center of the World to the *Apogee* or *Perigee* of the Planet. But the

LINE *of Mean Longitude*, is one drawn through the Center of the World at Right Angles to the *Linea Apſidum*, and is there a new Diameter of the *Excentrick* or *Deferent*; and its Extream Points are called the *Mean Longitudes*.

LINE *of the mean Motion of the Sun*, in the Old Aſtronomy, is a Right Line drawn from the Center of the World as far as to the Zodiack of the *Primum Mobile*, and parallel to a Right Line drawn from the Center of the Excentrick to the Center of the Sun; Which latter Line they call alſo the

LINE *of the mean Motion of the Sun in the Excentrick*, to diſtinguiſh it from the former; which is the Line of mean Motion in the Zodiack of the *Primum Mobile*.

LINE *of the Sun's True Motion*, is a Line drawn from the Center of the World to the Center of the Sun, and produced as far as the Zodiack of the *Primum Mobile*.

LINE *Horizontal*, is a Right Line parallel to the *Horizon*.

——In *Dialling*, it is the common Section of the *Horizon* and the *Dial-Plane*.

——In *Perſpective*, it is the common Section of the Horizontal Plane, and that of the Draught or Repreſentation, and which paſſes through the principal Point.

LINE *Geometrical*, in Perſpective, is a Right Line drawn any how on the Geometrical Plane.

LINE *Terreſtrial*, in Perſpective, is a Right Line, wherein the Geometrical Plane, and that of the Picture or Draught interſect one another.

LINE *of the Front*, in Perſpective, is any Right Line parallel to the Terreſtrial Line.

LINE *Vertical*, in Perſpective, is the common Section of the Vertical and of the Draught.

LINE *of Station*, is Perſpective, according to ſome Writers, in the common Section of the *Vertical* and *Geometrical* Planes. Others, as *Lamy*, mean by it the perpendicular Height of the Eye above the Geometrical Plane. Others, a Line drawn on that Plane, and perpendicular to the Line, expreſſing the Height of the Eye.

LINE *Objective*, in Perſpective, is the Line of an Object, from whence the Appearance is ſought for in the Draught or Picture.

LINE *of Gravitation*, of any heavy Body, is a Line drawn through its Center of Gravity, and according to which it tends downwards.

LINE *of Direction*, of any Body in Motion, is *that* according to which it moves, or which directs and determines its Motion.

LINE *of the ſwifteſt Deſcent of a heavy Body*: See the *Cycloid*.

LINE *of the Anomaly of a Planet*, in the Ptolemaick Syſtem, a Right Line drawn from the Center of the Excentrick to the Center of the Planet.

LINE *of the Apogee of a Planet*, in the Old Aſtronomy, is a Right Line drawn from the Center of the World, through the point of the *Apogee*, as far as the Zodiack of the *Primum Mobile*.

LINE *of the Nodes of a Planet*, in the New Aſtronomy, is a Right Line from the Planet to the Sun, being the common Interſection of the Plane of the Planets Orbit with that of the Ecliptick.

LINE *Synodical*, in reference to ſome Theories of the Moon, is a Right Line ſuppoſed to be drawn through the Centers of the Earth and Sun: And if it be produced quite thro' the Orbits, 'tis called the

LINE *of the True Syzygies*. But a Right Line imagined to paſs through the Earth's Center, and the mean Place of the Sun is called the

LINE *of the Mean Syzygies*.

LINE *Horary*, or the *Hour-lines*, in Dialling, are the common Interſections of the Hour-Circles of the Sphere, with the Plane of the Dial.

LINE *Subſtylar*, is that Line on which the Style or Cock of the Dial is Erected, and is the Repreſentation of ſuch an Hour-Circle as is perpendicular to the Plane of that Dial.

LINE *Equinoctial*, in Dialling, is the common Interſection of the Equinoctial, and the Plane of the Dial.

LINES, in the Art of War, ſignify the Poſition of an Army ranged in Order of Battel, extending themſelves to ſuch a length, or as far as the Ground will allow, to prevent flanking. Armies do uſually place themſelves in three Lines: The firſt of which is the *Van*, or *Advanc'd Guards*; the ſecond the *Main Body*; the third the *Rear-Guard*, or *Reſerve*. There is left the Diſtance of about 150 Paces between the two firſt Lines, and about double that Diſtance between the ſecond and laſt. To

LINE *Hedges*, is to plant Muſqueteers all along them under their Covert, to fire upon an Enemy that comes open, or for a Defence againſt Horſe.

LINEA *Alba*, is a Concourſe of the Tendons of the Muſcles of the *Abdomen*, excepting the Tendons of the ſtraight ones; for the Tendons of the oblique Muſcles unite, and meet ſo on both Sides, that they make a kind of Tunick that covers the *Abdomen*, as if they were all but one Tendon. It is white, and not fleſhy, proceeding from the *Cartilago Enſiformis* to the *Os Pubis*; and is narrower below the Navel than above.

LINEAR *Problem*, in Mathematicks, is ſuch an one as can be ſolved Geometrically by the Interſection of two Right Lines; as *to meaſure an inacceſſible Height by the means of two unequal Sticks or Staves.* This is alſo called a *ſimple Problem*, and is capable but of one Solution.

LINEAR *Numbers*, are ſuch as have relation to Length only; as (*v. gr.*) ſuch as repreſent one ſide of a plane Figure: And if the plane Figure be a Square, the *Linear Number* is called a *Root*.

LINES *of Chords, Sines, Tangents, Secants, Verſed Sines, &c.* See *Scale*.

LINED *Moat*, a Term in Fortification: See *Moat*.

LINGOT, the Term in Chymiſtry for the *Molds* they make to caſt melted Metals, or the *Regulus of Antimony, &c.* into.

LINGUA, the Tongue, is an oblong, broad, thick Member, and thicker at the Root, and thinner and ſharper at the End; of a moderate Bigneſs, that it may move more quickly. In the exterior or upper Part of the Tongue there are a great many little Bodies, which break out from the Surface of the Tongue, and bending a little, incline backwards towards the Root, ſo that they look like a Comb to card Wool. Theſe Cartilaginous Bodies, in an Ox eſpecially, ſeem to reſemble the Figure of a Boar's Tooth. In the lower Part they have a certain Cavity. They are made of a thick tenacious fibrous Matter, which ſeems like a Heap of little Rods: About the Sides of the Tongue they grow ſmaller and ſmaller, ſo that they almoſt diſappear; and certain Membranous Bodies are placed at their Baſis, which appear at firſt of a Conical Figure, and then by and by of a more obtuſe one, and of a pappy Subſtance. All the little Protuberances are cloathed with the Membranes of the Tongue: They are firmly implanted in a certain tenacious Tunick of the Tongue, there being under them a craſs, viſcous or nervous Subſtance, eſpecially in thoſe Places where there are remarkable Pits in the Tongue diſpoſed in like Order and Manner; ſo that in the inner Part of the Tongue there are a great many of them, which are firmly implanted in a kind of viſcous Body. When the Membrane that covers the whole Tongue is taken off, there appears a certain Glutinous Subſtance; then a Nervous Pappy Body, ſomething Yellow, which ſpreads like the Membrane, and diſcovers ſeveral remarkable Nervous Protuberances, diſpos'd and order'd in a wonderful Order. The next Things that appear are like Nipples, in greater abundance than thoſe before-mentioned, and of another Order; for as many little Protuberances as cover the Outſide of the Tongue, ſo many Nervous Nipples of this ſort are found within. Theſe proceed from the common pappy Subſtance, grow tolerably high, and ſhoot out further into Nervous Sprouts from the Top of them; about which you diſcover innumerable little Protuberances proceeding from the Stock, and of an equal Height, only ſlenderer, like a Cone, and which go within their proper Cavities, ready made in the craſs viſcous Subſtance before-mentioned, and at laſt end toward the outermoſt Membrane. Farthermore, the Subſtance of the Tongue is Muſculous: The Central Parts of the Tongue conſiſt of ſeveral ſorts of Fibres, long, tranſverſe and oblique, which being mutually interwoven with one another, look like a Coverlid or Blanket. It owes its Motion to peculiar Muſcles of its own, wherewith it is contracted and abbreviated. The Pairs of Muſcles are the *Styloglosſum*, *Baſioglosſum*, *Genioglosſum*, *Ceratoglosſum* and *Myloglosſum*; which ſee. *Blanchard*.

LINGUALIS, is taken by ſome to be a large and fleſhy Muſcle ariſing from the Baſis of the *Os Hyoides*, and runs forward to the Tip of the Tongue; and *Spigelius* gives it this Uſe, That its tranſverſe Fibres do thicken, and as it were conſtringe the Tongue, and dilate it by its oblique Fibres, and bring it towards the Palate by its right Fibres: But it is diſputable whether it be a *Muſcle* or not.

LINTER: See *Scapha*.

LINUM *Vivum*: See *Aſbeſtine Cloth*.

LIONCELES, the Herald's Term for *Lions*, when there is more than two of them born in any Coat of Arms, and no Ordinary between them; and 'tis all one as a ſmall or young Lion.

LIPOTHYMIA, or *Lipoſychia*, is a ſwooning or fainting away, being an imperfect *Syncope*; which ſee.

LIQUIDS, are ſuch Bodies as have all the Properties of *Fluidity* (ſee that Word); and withal, have their Particles ſo formed, figured or diſpoſed, that they do adhere to the Surfaces of ſuch Bodies as are immerſed in them, which we call *wetting*: And this Property of Liquid Bodies is ſometimes called *Humidity* or *Moiſture*.

LIQUOR *of Fix'd Nitre*: See *Fix'd Nitre*.

LIST, in Architecture, is a ſtraight upright Ring, which runs round the lower Part of any of the Columns juſt above the *Tore*, and next to the Shaft or Body of the Pillar.

LISTEL, a ſmall Band, or a kind of a Rule in the Mouldings of Architecture: Alſo the Space between the Channellings of Pillars.

LITERAL *Algebra*: See *Algebra*.

LITHARGE, what, and how made, ſee *Purification of Silver*.

LITHIASIS, the Breeding of the Stone in the Kidneys or Bladder.

LITHONTRIPTICKS, are Medicines which break the Stone, either in the Bladder or the Kidneys.

LITHOTOMIA, is the Grand Operation of cutting the Stone out of the Bladder; and is thus deſcribed by *Blanchard*. The Operator lays the ſick Perſon upon a ſoft Pillow, in the Boſom or Lap of ſome ſtrong Man, after he has leap'd three or four times from on high, then he ties the Hands on

each ſide faſt to the Sole of the Foot, and two People ſtanding on each ſide hold the Knees as open as poſſible. After this, the Operator moiſtening one Finger of his Left-Hand, or if Neceſſity require the two foremoſt, with Oyl of White Roſes, thruſts them up into the Fundament, and with his Right-Hand preſſes the Upper Parts of the Secrets lightly, that by this means the Stone may be brought to the *Perinæum*; which when he has forced thither, with his Fingers, he cuts with a two-edged Knife, proportionably to the Bigneſs of the Stone, in the Left Side, betwixt the Teſticles and the Fundament, near to the Suture of the *Perinæum*, bringing the Stone towards the Knife: And if the Stone come not out, either of its own Accord, or by thruſting of the Fingers, he draws it out with the *Forceps*; *i. e.* a pair of Pincers, or ſome ſuch Inſtrument of Art. The Stone being drawn out, and all the Bands being looſed, he cloſes the Wound duly, applies Remedies, ſtops the Blood, and takes Care that the Wound be cloſed up, leſt the Urine ſhould continually drop through. This Way is called *Apparatus minor*, and is uſed eſpecially in Boys, though it be frequently practiſed too in Adult Perſons in theſe Countries. This we in *England* call *Cutting upon the Gripe*, and is the Method that our *Suters* always cut by: But in the *Apparatus major*, or the greater Operation, which we call *Cutting upon the Staff*, the Patient, bound as before, is ſet upon a Table, and held there; then the Chyrurgeon thruſts in his Inſtrument, called *Itinerarium*, by the Urinary Paſſage into the Bladder, as far as the very Stone; and cutting an Hole, as before, he puts another Inſtrument called *Conductor*, into the hollow Part of the *Itinerarium*, through the Wound; then the *Itinerarium* being taken out of the Urinary Paſſage, he puts in the Inſtrument called *Forceps* (a ſort of Pincers) or any other fit to pull out the Stone through the Wound before made, that he may lay hold of the Stone, and bring it out: This being done, the Wound is bound up, and conſolidated, as 'tis in Children; only if it be large, it is ſtitched up, and an Inſtrument of Silver applied to it for Two or Three Days, which is uſeful to let out concreted Blood, Phlegm, and Gravelly Urine. There is yet another Way of taking out the Stone, to wit, By making a Hole in the *Abdomen*, by which the Stone is taken out of the Bottom of the Bladder; and in this way no dribling of Urine need to be feared. *Blanchard.*

LITHOTOMIST, is a Chyrurgeon who is skilful in cutting out the Stone of the Bladder.

LITOTES, or *Diminutio*, is a Trope in Rhetorick, by which we ſpeak leſs than we think: As when we ſay, *I cannot commend you*; it implies a ſecret Reprehenſion for ſomething committed that hinders us.

LITTORAL *Shells*, are with the Writers of Natural Hiſtory, ſuch Sea-ſhells as are always found near the Shores, and never far off in the Deep: But ſuch as are found there in the Bottom of the Sea, remote from the Shore, they call Ἐμβύθιοι and *Pelagiæ.*

LIVER *of Antimony*: See *Crocus Metallorum.*

LIVERY hath Three Significations: In one it is uſed for a Suit of Cloth or Stuff that a Gentleman giveth in Coats, Cloaks, Hats, or Gowns, with Cogniſance, or without, to his Servants or Followers. In the other, it ſignifies a Delivery of Poſſeſſion to thoſe Tenants which held of the King *in Capite*, or Knight's Service; for the King, by his Prerogative, hath *primier Seiſin* of all Lands and Tenements ſo holden of him. In the Third Signification, *Livery* is the Writ which lies for the Heir to obtain the Poſſeſſion of Seiſin of his Land at the King's Hands.

LIVERY *of Seiſin*, is a Delivery of Poſſeſſion of Lands or Tenements, or rather Things Corporeal, unto one that hath Right, or a Probability of Right to them. This is a Ceremony in the Common Law, uſed in Conveyance of Lands or Tenements, *&c.* where an Eſtate in Fee-ſimple, Fee-tail, or a Free-hold, ſhall paſs; and is a Teſtimonial of the willing departing of him who makes the *Livery*, from the Thing whereof *Livery* is made; and the Receiving of the *Livery* is a willing Acceptance of the other Party. And it was invented, that the Common People might have Knowledge of the Paſſing or Alteration of Eſtates from Man to Man, that thereby they might be the better able to try in whom the Right of Poſſeſſion of Lands and Tenements were, if they ſhould be impannelled in Juries, or otherwiſe have to do concerning the ſame. Of this *Livery* there be two kinds, *viz.* a *Livery in Deed*, and a *Livery in Law*: A *Livery in Deed*, is when the Feoffer taketh the Ring of the Door, or Turf or Twig of the Land, and delivereth the ſame to the Feoffee in the Name of the *Seiſin* of the Land. A *Livery in Law*, is when the Feoffer ſaith to the Feoffee, being in View of the Houſe or Land, *I give to you yonder Land, to you and your Heirs; and therefore enter into the ſame, and take Poſſeſſion thereof accordingly*: And the Feoffee doth accordingly, in the Life of the Feoffer, enter: This is a good Feoffment.

LIVIDUS: See *Pectineus.*

LIXIVIOUS, or *Lixiviate Salts*, are the fix'd Salts of Plants, *&c.* They are drawn by *Calcination* of the Plant, and then making a Lye or Lixivium of the Aſhes and Water; whence this Name. See *Salts.*

Mr. *Boyle* ſaith, The diſtinguiſhing Mark of *Lixivious Salts*, whereby they differ from Urinous ones, is, That they will turn a Solution of Sublimate in Common Water, into a Yellow Colour: See *Experiments on Colours.*

LIZIERE, a Term in Fortification; the ſame with *Berme*; which ſee.

LOADSTONE: See *Magnet.*

LOBE, a Word uſed moſtly by Anatomiſts for the Diviſion of the Lungs into ſeveral Parts, which they call *Lobes*: And by Botaniſts, for the Diviſion or Parts of the Bulk of Seeds, which uſually conſiſt of two Parts or Lobes; as is very conſpicuous in Beans.

LOBUS *Auris*, is the lower Part or Tip of the Ear.

LOCAL, is whatever is ſuppoſed to be tied or annexed to any particular Place: Thus in Law, they ſay the Thing is *Local*, and annexed to the Free-hold.

And an Action of Treſpaſs for Battery, *&c.* is Tranſitory, not *Local*; that is, it is not needful that the Place where the Battery was committed, ſhould be ſet down as material in the Declaration; or if it be ſet down, the Defendant cannot traverſe it, by ſaying he did not commit the Battery in the Place mentioned in the Declaration, and ſo avoid the Action.

LOCAL *Medicaments*, are thoſe which are applied outwardly, as Plaiſters, Ointments, Salves, &c. Theſe are alſo frequently called *Topicks*.

LOCAL *Problem*, in Mathematicks, is ſuch an one as is capable of an infinite Number of different Solutions: ſo that the Point which is to reſolve the Problem, may be indifferently taken within a certain Extent; as ſuppoſe any where in ſuch a Line, within ſuch a Plane Figure, &c. which is called a *Geometrick Place*, and the Problem is ſaid to be a *Local* or *Indetermined* one. And this *Local Problem* may be either *Simple*, when the Point ſought is in a Right Line; *Plane*, when the Point ſought is in the Circumference of a Circle; *Solid*, when the Point required is in the Circumference of a Conick Section; or, laſtly, *Surſolid*, when the Point is in the Perimeter of a Line of the *ſecond Gender*, as the Geometers call it.

LOCH, or *Lohoch*, the ſame with *Eclegma*.

LOCHIA, are the Natural Evacuations of Women in Child-bed, after the Birth of the *Fœtus*, and the Excluſion of the Membranes call'd *Secundinæ*, or the After-birth.

LOCKER, in a Ship, is a kind of Box or Cheſt made along the ſide of a Ship, to put or ſtow any thing in.

LOCKING-WHEEL, ſee *Count-Wheel*, a Term in Watch-work.

LOCK-SPIT, a Term in Fortification, ſignifying the ſmall Cut or Trench made with a Spade, to mark out the firſt Lines of any Work that is to be made.

LOCULAMENTUM, in Botanicks, is a little diſtinct Cell or Partition within the common *Capſula ſeminalis* of any Plant; as thoſe within the Seeds of Poppies, &c. by which one Parcel of the Seeds is kept diſtinct from another.

LOCUS, or the *Place* of any Body, is rightly, by Mr. *Newton*, diſtinguiſhed into *Abſolute* and *Relative*: And ſo ought *Space* to be accounted; for the

LOCUS *Abſolutus*, or *Primarius* of any Body, is that Part of the abſolute and immovable Space, or extended Capacity, to receive all Bodies which this individual one takes up: But the

LOCUS *Relativus*, or *Secundarius*, is that apparent and ſenſible Place in which a Body is determined to be placed in by our ſelves, and with relation to other adjoyning or contiguous Bodies.

LOCUS *Apparens*, a Term in Opticks: See *Apparent Place of any Object*. 'Tis alſo in Aſtronomy, that Place in which any Planet or Star appears, when viewed from an Eye at the ſenſible Horizon.

LOCUSTÆ, are the Beards and pendulous Seeds of Oats, and of the *Gramina paniculata*; to which the Botaniſts gave this Name from their Figure, which ſomething reſembles that of a Locuſt.

LODGMENT, in Military Affairs, is ſometimes an Incampment made by an Army; or oftner, it is a Retrenchment dug for a Covert or Shelter, when the Counterſcarp, or ſome other Poſt, is gain'd. It is alſo taken for the Place where the Soldiers quarter among the Burghers, either in Huts, Baraques, or Tents.

LODGMENT *of an Attack*, is a Work caſt up by the Beſiegers, during their Approaches in a dangerous Poſt, where it is abſolutely neceſſary to ſecure themſelves againſt the Enemy's Fire; as in a *Covert-way*, in a *Breach*, in the Bottom of the Moat, or elſewhere. This Lodgment conſiſts of all the Materials that are capable to make Reſiſtance, *viz.* *Barrels* and *Gabions* of Earth, *Palliſadoes*, *Woolpacks*, *Mantelets*, *Faggots*, &c.

LOG, and *Log-line*: The *Log* aboard a Ship, is a Piece of Board or Wood about 7 or 8 Inches long, of a Triangular Figure, and with as much Lead caſt into it at one End, as will ſerve to make it ſwim upright in the Water; at the other End of which is faſten'd a ſmall long Line, called The

LOG-LINE; which is wound about a Reel for that Purpoſe, fix'd in the Gallery of the Ship. This Line, for about 10 Fathom from the Log, hath, or ought to have, no Knots or Diviſions; becauſe ſo much ſhould be allowed for the Log's being clear out of the Eddy of the Ship's Wake before they turn up the Glaſs: But then the Knots or Diviſions begin, and ought to be at leaſt 50 Foot from one another; tho' the common erroneous Practice at Sea, is to have them but at 7 Fathom, or 42 Foot Diſtance.

The Uſe of this *Log* and *Line* is to keep an Account, and make an Eſtimate of the Ship's Way; for as many Knots as run out in half a Minute of Time (which they meaſure by a Half-minute Glaſs) ſo many Miles do they account the Ship to ſail in an Hour; or ſo many Leagues and Miles doth ſhe run in a Watch: as, if there be veered out 4 Knots in half a Minute, the Ship runs 4 Miles an Hour, or 5 Leagues and 1 Mile in a Watch.

The Practice of heaving the *Log*, is firſt to let it down into the Water, and then to let it run away ſo far, as to be out of the Eddy of the Ship's Wake; and then one having an Half-minute Glaſs in his Hand, turns it up juſt when the firſt Knot runs off the Reel (tho' ſome turn up the Glaſs juſt when the Log touches the Water) and then the Line running eaſily off, when the Glaſs is out, he cries, *Stop!* The other ſtops the Reel; and then they count the Knots run out, and if they can be ſo exact, as to account the odd Feet, which the Line ſhall run out above any Knot, they ought to account 5 Feet for a Tenth part of a Mile more: And thus, if 3 Knots 45 Feet run out in an half Minute, the Ship goes at the rate of 3 Miles 9 Tenths in an Hour.

Now tho' this at beſt be but a precarious way, 'tis however the moſt exact of any in uſe, and much better than that of the *Spaniards* and *Portugueſe*, who gueſs at the Ship's Way by the running of the Froth or Water by the Ship's ſide; or than that of the *Dutch*, who uſe to heave over a Chip into the Sea, and ſo to number how many Paces they can walk on the Deck, while the Chip ſwims or paſſes between any two Marks or Bolt-heads on the ſide. And the Ground and Reaſon of this Practice of keeping an Account of a Ship's ſailing by the *Log*, is this:

1. That 5 of our *Engliſh* Feet make a Pace, and 1000 of ſuch Paces a Mile, and 60 of ſuch Miles a Degree, and conſequently a Degree would contain 300000 Feet. But this is erroneous on all Accounts; for there are both 1006 Paces in a Mile, and 72 ſuch Miles in a Degree.

2. But then this hath been corrected by Mr. *Norwood*, in his *Seaman's Practice*; who, by moſt exactly meaſuring the Diſtance of two Places under the ſame Meridian, and finding alſo the Latitudes of thoſe two Places by moſt accurate Inſtruments and Obſervations, he found, That to a Degree of a Great Circle on the Earth there muſt be 367200 *Engliſh* Feet: And this hath been in a good meaſure confirmed by the *French* Obſervations and Menſurations, who found a Degree to contain 365184 Feet. And yet Mr. *Norwood* conſidering that the

Ship's Way is really more than what is found by the *Log*, and alſo knowing that 'tis better and ſafer to have the Reckoning to be ſomething before the Ship, and probably alſo becauſe 'tis a round Number, caſt away the 7200 odd Feet, and ſuppoſe a Degree to contain juſt 360000 Feet. Then will a Minute of a Degree contain 6000 ſuch Feet; and that is to be reckoned for the true *Sea Mile*, 60 of which make a Degree: And ſince 5280 Feet are a Statute Mile, there will be 68 $\frac{2}{11}$ ſuch Miles in a Degree; and of the *Italian* Miles, of 5000 Feet, 72, or 24 Leagues in a Degree. And after this way of accounting, the whole Circumference of our Globe will be 8640 Leagues, or 25920 Miles; which is 120 Leagues, or 360 Miles leſs than the *French* make it: And yet this is probably leſs than the Truth, and in Fact leſs than Mr. *Norwood*'s Account.

Now to apply all this to the Eſtimation of a Ship's Way by the *Log*: If it be conſidered that an half Minute is the 120th part of an Hour, 'tis plain the Diſtance between Knot and Knot in the *Log-line*, muſt be alſo the 120th part of a Minute of a Degree of a great Circle on the Earth; or 120th part of a true Sea Mile or Minute, which is before ſhewed to contain 6000 Feet: And therefore the Diſtance between the Knots muſt be 50 Foot; (for 50 multiplied by 120, produces 6000) becauſe as 30 Seconds is to an Hour, or 3600 Seconds is to a Day; ſo is 50 Feet to 6000 Feet. Wherefore as many times 50 Feet as a Ship ſails in half a Minute, ſo many Miles muſt ſhe go in an Hour, ſuppoſing her to keep on at the ſame Rate. To try which, in long Voyages to the *Eaſt-Indies*, *&c.* the *Log* is heaved every Hour; but in ſhorter Voyages they content themſelves with doing it but every two Hours; tho' always the oftner 'tis done, the better.

And from hence plainly appears the groſs Error of having but 42 Feet or 7 Fathom between Knot and Knot, which is the common Diviſion of the *Log-line* at Sea. Indeed, being ſenſible their Diviſions are too ſhort, they leſſen their Half-minute Glaſs proportionably, as having that made of only 24 or 25 Seconds. But this is nothing but correcting one Blunder or Error by another; and ſhews plainly that the Common Sailors will not go out of their way, tho' they are ſure they are in the wrong.

Commonly in the Steerage, or ſome ſuch convenient Part of the Ship, hangs up a Board called the

LOG-BOARD; which is a Table divided into Five Columns, and ought to be of the following Form, or one like it.

This *Log-Board*'s Account ought daily at Noon (when if poſſible, let there be an Obſervation of the Latitude) to be entred into the *Log-Book* or *Traverſe-Book*, ruled and columned juſt as the *Log Board* is; from whence it may be tranſcribed into the Journals, and how much way the Ship hath gained in her Courſe, eſtimated daily.

To meaſure whether the Half-minute Glaſs be true, or to make one upon Occaſion, when you can get aſhore, you may uſe this Method:

Faſten a moderately heavy Plummet or Weight at the End of a ſmall String, which hang up againſt a Wall by a ſmall Pin or Wire, *&c.* and let its Length from the Pin where it hangs, to the Center of the Plummet or Weight, be juſt 39 Inches $\frac{1}{8}$. Then draw by the Lines hanging ſtill, a Perpendicular on the Wall behind, with a Pencil or ſome ſuch thing: And taking the Plummet in your Hand, move the Pendulum from the Perpendicular either way 6 or 7 Inches, and then let it ſwing freely by

Hour of the Day.	*Ships Courſe.*	*Log-lines run* Knots	Feet.	*Winds, Weather, Accidents, &c.*
1	S. W. b. S.	4	5	W.N.W. a mo-
2				derate Gale.
3				
4				
5				
6	S.	8	5	W.S.W. a ſtrong
7				Gale.
8				
9				
10				
11				W. b. S. Thick
12	N.W.b.N$\frac{1}{2}$W	7	0	hazy Weath.
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

the Wall; after which take your Half-minute Glaſs, and turn it up juſt when you ſee the String come right againſt the Perpendicular on the Wall, and then count the Swings of the Pendulum from its paſſing by the Perpendicular; and if your Glaſs is out, juſt when it hath made 30 Swings, it is right, elſe not; for this Pendulum ſwings exactly Seconds.

LOGARITHMS, which Captain *Halley* very well defines to be the Indexes of the *Ratio*'s of Numbers one to another, were firſt invented by my Lord *Neper*, a *Scotch* Baron; and afterwards compleated by Mr. *Henry Briggs*, Savilian Profeſſor of Geometry at *Oxford*.

1. *Logarithms* are a Series of Artificial Numbers (invented for the Eaſe and Expedition of Calculation) proceeding in an Arithmetical Proportion, as the Numbers they anſwer to do in a Geometrical one: As for Example,

1, 2, 4, 8, 16, 32, 64, 128, 256, are Numbers proceeding from Unity, in a Geometrical Proportion continued. Now if over theſe you place a Series of Numbers (beginning with 0) in an Arithmetical Proportion, they will ſtand thus:

0	1	2	3	4	5	6	7	8	9
1.	2.	4.	8.	16.	32.	64.	128.	256.	512, *&c.*

And the Numbers above, beginning with (0), and Arithmetically Proportional, are called *Logarithms*.

2. The Addition and Subtraction of *Logarithms* anſwers to the Multiplication and Diviſion of the Numbers they anſwer to. Thus the *Logarithm* 2 added to 4, makes the *Logarithm* of 6, whoſe correſponding Number is 64, (the Product of the Number 4 multiplied into 16). Alſo the *Logarithm* 5 ſubtracted from 9, leaves the *Logarithm* of 4, whoſe Number is 16, (equal to 512 divided by 32).

And the Caſe would be the ſame if any other Rank of Numbers in an Arithmetical Proportion were

were made to anſwer to the Numbers below. And therefore there may be many ſorts of *Logarithms*, as indeed there are.

And thus alſo will Extraction of Roots be performed by biſſecting the *Logarithms* of any Numbers for the Square Root, and triſecting them for the Cube: As for Inſtance,

To extract the Square Root of 256, divide its *Logarithm* 8 by 2, and it will quote 4; which *Logarithmick* Number 4, hath for its abſolute Number 16, and therefore 16 is the Square Root of 256.

To extract the Cube Root of 64, divide its *Logarithm* 6 by 3, and the Quote will be 2, which is the *Logarithm* of 4, the Cube Root of 64.

3. To apply this Matter for the making of a *Canon* or Table of *Logarithms*, that ſhould anſwer to Common Numbers in their natural Order, the Inventers proceeded in this Method:

They pitched on thoſe which are naturally Geometrically proportional; as

1, 10, 100, 1000, 10000, 100000, 1000000, 10000000, *&c.*

And to theſe they fitted not the ſingle *Logarithms*, 0, 1, 2, 3, *&c.* as in our Inſtance, Numb. 1. above, but *thoſe* augmented with many Cyphers, in order to fit proper *Logarithms* for all intermediate Numbers between 1 and 10, 10 and 100, 100 and 1000, *&c.* They made therefore 0000000 to be the *Logarithm* of 1, and 10000000 to be the *Logarithm* of 10; alſo 20000000 they put for the *Logarithm* of 100, and 30000000 for the *Logarithm* of 1000, making ſtill the *Index* or *Characteriſtick* of the *Logarithm* to be one leſs than the Number of Places in the Abſolute Number, becauſe they appointed 0000000 as the *Logarithm* of 1.

5. But then the greateſt Difficulty and Pains was yet to come, which was to find *Logarithms* for all the intermediate Numbers correſponding with thoſe appointed for 1, 10, 100, 10000, *&c.* which with moſt indefatigable Pains and Care they thus effected. In order (*e. g.*) to get the *Logarithm* of 9, they found a middle Proportional between the abſolute Numbers 1 and 10, encreaſed with ſeven Cyphers each: Then that Number not being exactly the abſolute Number 9, but bigger or leſſer than 9, (with ſeven Cyphers added to it) they accordingly found out new Geometrical mean Proportionals between that Number and 10, if it were leſs; and between *that* and the next leſs than it, as ſoon as it came to be bigger, *&c.* till at laſt, after a prodigious Number of Trials, *viz.* 25. they came to the abſolute Number 8, 9999998, which approacheth very near to 9, 0000000. And in order to find the *Logarithm* of this Number 8, 9999998, they found an Arithmetical mean Proportional between the *Logarithm* of 0 and 10 (*i. e.* between 0000000 and 10000000). And then another between *that ſo found*, and 10000000 again; and ſo on, 'till at laſt they came to 0, 9542450. the exact *Logarithm* of 9.

They were forced to proceed after the ſame manner alſo to gain the *Logarithm* of 5; but then their Work grew ſomething eaſier, and more expeditious.

1. For ſince by dividing 10 by 5, the Quotient is 2; therefore the *Logarithm* of 5, ſubtracted from the *Logarithm* of 10, muſt give the *Logarithm* of 2.

2. And as 10, multiplied by 2, gives 20; therefore the *Logarithm* of 9 being divided by 2, or halved, muſt give the *Logarithm* of 3.

3. Since the Square Root of 9 is 3; therefore the *Logarithm* of 9 being divided by 2, or halved, muſt give the *Logarithm* of 3.

4. By ſubtracting the *Logarithm* of any one known Number, from that of another; you have the *Logarithm* of the Quotient of the former Number dividing the latter.

And after this or the like manner they proceeded till they had compleated the Canon of *Logarithms* to Numbers reaching to 10000.

If you would ſee an eaſie and expeditious way of making ſeveral ſorts of *Logarithms* to a large Radius, conſult Capt. *Edm. Halley's Diſcourſe in Phil. Tranſ.* N. 216. Where from the pure Conſideration of Numbers, and withal by the Help of Sir *Iſ. Newton's* Method of finding the *Unciæ* of the Numbers of a Binominal Power, he ſhews how to find readily the *Logarithms* of all Numbers to above 30 Places; and he gives there ſeveral *Series* for this Purpoſe; ſome Univerſal, and ſome appropriated to peculiar ſorts of *Logarithms*.

Nicholas Mercator alſo did a good while ſince make ſome Improvements in this Affair, of which you have Dr. *Wallis's* Thoughts in *Phil. Tranſ.* N. 38.

And *John Gregory* hath alſo ſhew'd a way to make *Logarithms* to 25 Places, by means of the *Hyperbola*.

For the *Characteriſtick* of a *Logarithm*, ſee in *Index*.

The Uſe of the Table of *Logarithms*.

1. *To find a Logarithm.*

N. B. I here deſcribe only the Common Canon of *Logarithms* contrived by Mr. *Briggs*, and publiſhed in Sir *Jonas Moore's Mathematicks*, and in moſt Books of *Trigonometry*, *Navigation*, *&c.*

1. If the Number, whoſe *Logarithm* you would find, be under 100, you have it always in the firſt Page: Thus the *Logarithm* of 55 is 1.740363.

2. If the Number conſiſts of three Places, that is, a Number under 1000, look for it in the Table under *N.* and the *Logarithm* is found in the Column under 0. Thus the *Logarithm* of 216 is 2.334454.

3. If the Number be of four Places, and under 10000, ſeek the three firſt Figures under *N.* as before, and the laſt Figure on the Top; under which, in that Column lineally againſt the firſt three Figures, you have the *Logarithm* required: Thus the *Logarithm* of 3583 is 3.554247, find 358 under *N.* againſt which, in the Column under 3, ſtands your *Logarithm*.

4. If the Number be above 10000, and under 100000, you muſt find it by the *Difference* and Table of Parts Proportional: Thus, if the *Logarithm* of 35786 be required, firſt ſeek the *Logarithm* of the former four Figures 3578, which will be 3.553649; and the common Difference under *D.* is 121: With this Difference enter the Table of Parts proportional, and find 121 in the firſt Column under 3: and then lineally againſt that Number, and under 6, the laſt Figure of the Number 35786, found at the Head of the ſeventh Column, you will find 72; which being added to the *Logarithm* of 3578, *viz.* 553649, makes 4.553721, the *Logarithm* of 35786; and the Index muſt be 4, becauſe the Abſolute Number conſiſts of five Places.

5. If the Number be above 100000, and under 1000000, as ſuppoſe 357865; then find (as before) the *Logarithm* of the firſt five Figures, *viz.* 35786, and 'twill be found to be (omitting the Characteri-

ſtick

ſtick 5) 553721 : After this, multiply the remaining Figure (5) of the given Number, by the common Difference 70, (found under *D.*) and 'twill produce 350 ; then cut off (0) the laſt Figure of the Product, and add the remaining (35) to the *Logarithm* 553721 aforeſaid, the Sum is 553756 ; to which prefix the proper Characteriſtick (5) becauſe the Number given hath ſix Places, and 5.553756 is the *Logarithm* required for 357865.

If the Number be above 1000000, and under 10000000 ; find the *Logarithm* of the firſt five Figures (as before) and multiply the common Difference by the two remaining Figures ; from which Product cut off the two laſt Figures, and add the other (as before) prefixing 6 for a Characteriſtick, *&c.*

7. And ſo for any other greater Number proportionably ; only be ſure to cut off from the Sum ſo many Figures as you multiply the common Difference by ; and add the Remainder to the *Logarithm*, and prefix the Characteriſtick proper, that is, a Figure of one place leſs than the abſolute Number, whoſe *Logarithm* is required.

2. Next I will ſhew the *Way of finding the Number anſwering to a* Logarithm *given.*

Omitting the Characteriſtick, ſeek in the Table for that *Logarithm*, which is equal or next leſs to the *Logarithm* given, the Abſolute Number in the Column under *N*, with that on the Top over the *Logarithm*, is the Number deſired, which muſt be ordered according to the Characteriſtick.

Thus, to find what Number anſwers to the *Logarithm* 3.544821 ; omitting the Index 3, I find 544821 to anſwer to 3506, which the Index 3 ſhews to be all Integers ; but if the Index had been 1, then the Number would have been 35.06, that is, 35 Integers and .06 hundred Parts.

But if the *Logarithm* be not exactly to be found in the Tables, and five places be required, find the Number to four places (as before) noting the common Difference under *D*, then take the Difference betwixt the *Logarithm* given, and the *Logarithm* found in the Table leſs than it ; ſeek the common Difference in the Table of proportional Parts under *D*, and in that Line find out the Difference of the *Logarithms*, and at the Top juſt about it you have the fifth Figure : Thus, if the *Logarithm* required had been 2.543612, the *Logarithm* next leſs is 543571, anſwering to 3496 ; the common Difference is 124, the Difference of the *Logarithms* is 41, which, in the Table of proportional Parts againſt 124, gives 3 ; ſo that the Abſolute Number is 34963 : And becauſe the Index is 2, the Number will be 349 Integers, and $\frac{36}{100}$ Parts, or 349.63.

To find the Number of a Logarithm, *whoſe Index is* 5 *or more.*

Suppoſe 4 to be the Characteriſtick, and find (by the foregoing Directions) the *Logarithm* as near as you can (ſo it be but leſs) ; then ſubtract this *Logarithm* from the *Logarithm* given ; and to the Right Hand of the Remainder, if the Index be 5, ſet 0 ; if the Index be 6, ſet 00 ; if 7, ſet 000 ; and ſo on proportionally : This done, divide the Sum by the common Difference, and the Quote gives the Figure or Figures to be placed on the Right Hand of the Number anſwering to the firſt found *Logarithm*.

Example.

Let 6.64876 be the Logarithm given : Suppoſe 6 to be 4, the neareſt Logarithm leſs will be 4.648974, whoſe Abſolute Number is 44563. Subtract 4.648974 from the given Logarithm, the Remainder is 2 ; to the Right Hand of which ſet 00, (becauſe the Characteriſtick was 6) the Sum is 200 ; which divide by the common Difference 97, the Quotient is 2, (and an inconſiderable Fraction, which you may omit) which 2 ſet on the Right Hand of 44563, it makes 445632 ; but ſince the Index is 6, the Number muſt have 7 places ; therefore ſet 0 on the Right again, and it makes 4456320, which is the Number nearly correſponding to the Logarithm 6.648976.

Addition, Subtraction, Multiplication, and *Diviſion* in *Logarithms.*

3. In the Addition of two or more Logarithms together, obſerve theſe Rules :

1. If the Indices be Integers, add them as is uſual in common Arithmetick.

2. If the Indices be ſome Integers, and ſome the Indices of Parts or Fractions, they will be *unlike* ; and therefore if when added, their Sum be 10, or above, caſt away 10, the Remainder is the Index of Integers ; if under 10, Decimal Parts : Thus,

2.057821	2.237242
7.583210	9.875062
9.641031	8.698971
	0.811275

3. If the Indices be all Decimals, and when added, make a Sum under 10, then add 10 to the Sum ; if juſt 10, then add Unity ; as above 10, caſt 10 away, and the Index thus gotten is always Decimal Parts : Thus,

9.397941	8.698972
9.875062	9.875061
9.273002	8.574033

4. *Subtraction of* Logarithms.

1. If the Indices be Integers, then proceed as uſually.

2. If the Indices be either of them, or both, Decimal Parts, obſerve whether the Index of the upper Quantity be a ſmaller Number than that of the ſubtrahend or the lower ; if it be, add 10 to it : And if the upper be of a greater Value than the lower, (that is, a bigger Index by Place) then the Remainder will be Integers ; if not, Decimal Parts.

Examples.

2.033421	9.875062	9.875062	1.235781
9.875062	2.033421	8.574031	3.572141
2.158359	7.841641	1.301031	7.663640

5. *The* Logarithm *of a Fraction is thus found.*

Subtract the Logarithm of the Denominator from the Logarithm of the Numerator, the Remainder gives the Logarithm of the Fraction ; as of $\frac{3}{4}$, the Logarithm of 4 is 0.602060, out of the Logarithm of 3, 0.477121, the Difference 9.875061 is the Logarithm of $\frac{3}{4}$, or 75.

6. *To*

6. *To Multiply a* Logarithm.

If the Index be Negative, obſerve, That in multiplying the Figure next the Index, the Tens to be carried in Mind are Affirmative, and are to be deducted out of the Product of the Negative Indices: Thus,

2.543211	1.987214
3	5
5.629633	1.936070

7. *To Divide a* Logarithm, *having a Negative or Fractional Index.*

Obſerve whether the Diviſor will evenly divide the Index, then there is no Difficulty; but if it do not evenly divide the Index, add to the Index ſo many Units, till it may be evenly divided, ſetting the Quotient down for a new Index, augmenting the next Figure by ſo many times 10 as you added to the firſt.

3) 5.321412	2) 5.61228
2.440470	3.80614

8. *Multiplication of Numbers by the* Logarithms.

Add the *Logarithms* of the Numbers together, and the Sum is the *Logarithm* of the Product required.

Multiplicand,	32	1.505150	5.12	0.709265
Multiplier,	52	1.71003	1.55	0.899497
	1664	3.221153	7.936	0.899497

9. *Diviſion of Numbers by* Logarithms.

This is done only by ſubſtracting the *Logarithm* of the Diviſor from the *Logarithm* of the Dividend; and the Remainder will be the *Logarithm* of the Quotient.

Dividend	7286	3.862489	.5512	9.654369
Diviſor	32	1.505150	.0315	8.498311
Quotient	227.8	2.357359	1432	1.156058

10. *Extraction of Square, Cube,* &c. *Roots by* Logarithms.

To extract the Square Root of any Number, is to divide the *Logarithm* of that Number by 2, for the Cube Root by 3. *&c.* That is, in general, divide the *Logarithm* of the Number, by the Index of the Power.

Number	75832	Log. 4.879852	
Square Root,	275.37	2) 2.439926	for the Square R.
Cube Root,	42.327	3) 1.626614	for the Cube Root.

11. *To find a Mean Proportional betwixt two given Numbers by* Logarithms.

Half the Sum of their *Logarithms*, gives the *Logarithm* of the Mean Proportional betwixt them.

The Numbers are,	9	0.954242
	16	1.204120
Sum,		2.158362

Mean Proportional, 12 $S = 1.079181$.

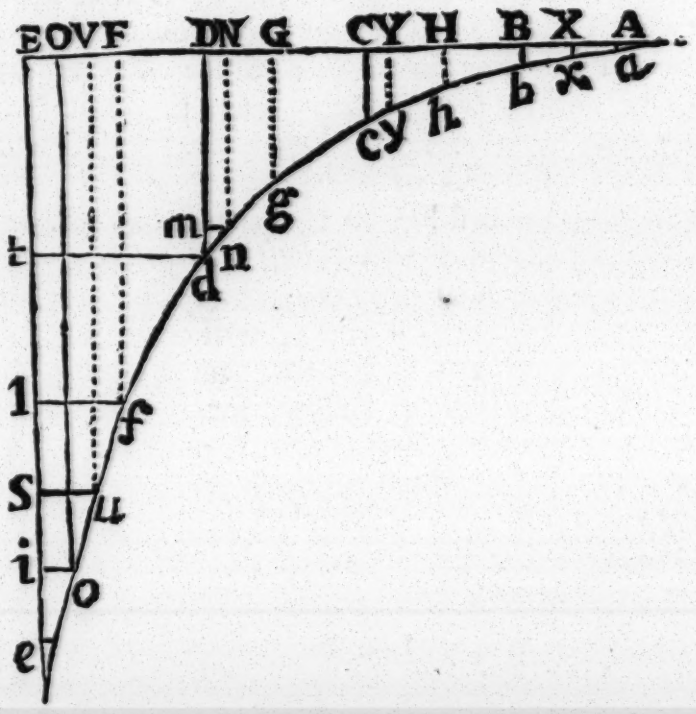
To find any Number of Mean Proportionals betwixt any two Numbers.

Take the Difference of the *Logarithms* of the two given Numbers, which divide by a Number more by one than the Number of Means deſired; and this Logarithmetick Quotient added to the *Logarithm* of the leaſt, gives the *Logarithm* of the *firſt Mean* next it; and then added to the *laſt* Sum, finds the next, *&c.*

As ſuppoſe it were required to find 3 Mean Proportionals between 4 and 64; the *Logarithm* of 4, is 0.602060; of 64, is 1.806180; their Difference, 1.204120 divided by 4, (*i. e.* 3 + 1) gives 0.301030; which added to the *Logarithm* of 4, makes 0.903090, the *Logarithm* of 8, the *firſt Mean*; and again, added to the laſt Sum, gives 1.204120, the *Logarithm* of 16; and again added, gives the *Logarithm* of 32; which are the three Means betwixt 4 and 64.

LOGARITHMICK-LINE *of Pardie*, is a Curve which diſcovers perfectly all the Myſteries of *Logarithms*, with ſeveral other very excellent Properties and Uſes; and is thus delineated.

Let the Right Line *AE* be divided into the equal Parts *AB*, *BC*, *CD*, *DE*, *&c.* from the Points *A*, *B*, *C*, *D*, *E*, *&c.* let the Lines *Aa*, *Bb*, *Cc*, *Dd*, and *Ee*, be drawn all perpendicular to *AE*, and conſequently parallel to one another.



And let them all be in a Geometrical Progreſſion; as let *Aa* be 1, *Bb* be 10, *Cc* 100, *Dd* 1003, *Ee* 10000, *&c.* Then ſhall we have two Progreſſions of Lines, Arithmetical and Geometrical: For the Lines *AB*, *AC*, *AD*, *AE*, are in Arithmetical Progreſſion, or as 1, 2, 3, 4, 5, *&c.* and ſo do repreſent the *Logarithms* to which the Geometrical Lines *Aa*, *Bb*, *Cc*, *&c.* do correſpond.

Let each of the equal Parts *ED*, *DC*, *CB*, *&c.* be divided equally again in *F*, *G*, *H*; and let the Parallels *Ff*, *Gg*, *&c.* be drawn, and be Mean Proportionals between the collateral ones; that is, *Ee* : *Ff* : : *Ff* : *Dd* : : *Dd* : *Gg*, *&c.*

Let there alſo be more Mean Proportionals drawn from the Middle of each Subdiviſion *E F*, *F D*, *D G*, *&c.* and ſo on, till theſe parallel Lines growing very numerous, have at laſt but a very ſmall Diſtance from each other: Then imagine a Curve Line drawn through all the Extremities of theſe parallel Lines, as *e o u d g h a*, and this is called the *Logarithmical Line*.

If this Figure were drawn on a very large Table, and with all requiſite Exactneſs, each Part, *A B*, *B C*, *&c.* might be divided not only into an 100 or 1000, but even into 10000, 100000 equal Parts, and more: So that *A B* being 100000, *A C* would be 200000, *A D* 300000, *&c.* as muſt always be in an Arithmetick Progreſſion.

The Line *E e* being ſuppoſed to contain 10000 Parts, let us imagine through each of thoſe Diviſions a Parallel to be drawn to the Line *A E*, cutting the Curve in ſo many Points, *v. gr.* let the Line *i o* be drawn through the Diviſion 9900 of the Line *E e*, and which cuts the Curve in the Point *o*. Let there be alſo ſuppoſed the Parallel *O o*, cutting the Line *A E* in the Diviſion 399.63; then any one may know that 399563 is the *Logarithm* of the Number 9900. In like manner, if *S u* paſſed through the Diviſion 9000 of the Line *E e*, the Line *V u* were drawn cutting *A E* in 395424, then would that Line *u V*, be the *Logarithm* of 9000, *&c.*

So that by this means a Table of *Logarithms* from 1 to 10000, may eaſily be made; and farther, by producing the Line *A E*.

Note, To obtain all the *Logarithms* from 1 to 10000, 'twill be enough to ſeek the *Logarithms* from 1000 to 10000; that is, (having drawn the Parallel *d t*) to take the *Logarithms* of all the Diviſions from *t* to *e*; which *Logarithms* are all contained between *E* and *D*: For by this you will have the *Logarithms* of all the Parts that are between *t* and *E*, and whoſe *Logarithms* lie between *D* and *A*. For Example; Since *O o* is 9900 Parts, and its *Logarithms* 399563, the ſame Number may be taken for the *Logarithm* of 990, which is *N n*: As alſo of the Number *Y y* 99, changing only the firſt Figure 3; becauſe, according to the Compoſition of this Line, *O N* or *N y*, ought to be equal to *E D* or *D C*; as any one may eaſily prove: So that *O N* or *N y*, will contain 100000. And becauſe *A O* is 399563, ſubſtracting *O N* 100000, there will reſt 199563 for *A y*. And after the ſame manner, having *A y* 395424 for the *Logarithm* of *V v*, which is 9000, you may have alſo 095424 for the *Logarithm* of *X x*, which is 9; or 195424 for the *Logarithm* of 90; or 295424 for the *Logarithm* of 900.

All this may be reduced to Practice for Calculation, without actually drawing theſe Figures, but only imagining them to be drawn: For by the Rules of Common Arithmetick, we may find out *F f*, the Mean Proportional between *d D* and *F f*, or between *F f* and *E e*, &c. But what we have here explain'd, is ſufficient to gain the Knowledge of the Nature and Compoſition of the *Logarithms*.

Though indeed there will not ariſe ſuch Advantage for making *Logarithms* by this Obſervation, as it may at firſt Sight ſeem to promiſe; becauſe there are 9000 Numbers between 1000 and 10000, whoſe *Logarithms* muſt be found alſo; and but 900 between 100 and 1000, and but 90 between 10 and 100, and but 9 between 1 10 and ſo in all 999, which is not the Ninth Part of the former.

In *Phil. Tranſ. N.* 245, is a Quadrature of that Part of the Space contained between any two Ordinates of the Curve and this *Abſciſſa*, by Mr. *John Craig*; and Dr. *Barrow*, in his *Lections*, hath carried the Matter farther: See in *Philoſophical Tranſactions*, *N.* 38. An Account of a very ſhort Way of making *Logarithms*, contrived by *Nicholas Mercator*, with Dr. *Wallis*'s Thoughts upon it, and Additions to it.

Mr. *James Gregory* alſo, in his *Vera Quadratura Circuli & Hyperbolæ*, Printed at *Padua*, *A. D.* 1667. applies the Quadrature of the Hyberbola to the making of *Logarithms*, and computes the *Logarithm* of 10 to 25 Places.

But our Learned Capt. *Halley*, in *Phil. Tranſ. N.* 216, gives a Way from the bare Conſideration of Numbers only; and withal, by the Help of Sir *Iſaac Newton*'s admirable Invention, to find the *Unciæ* of the Members of any Power, (which you have under the Word *Unciæ*) moſt compendiouſly to find the *Logarithms* of all Numbers to above 30 Places, with more Eaſe and Expedition than was ever done before: And he gives there ſeveral *Series* for this Purpoſe, ſome univerſal, ſome applicable to one ſort of *Logarithms*, and ſome to another.

LOGARITHMETICK *Curve*, is the ſame with *Pardie*'s *Logarithmetick Line* above deſcribed.

LOGICK, is the Art of right Thinking, or uſing our Rational Faculty aright: And the Power or Force of Reaſon, unaſſiſted by Art, is called *Natural Logick*.

Logick is derived from thoſe Reflections which Men have made on the Four Principal Operations of the Mind, *viz. Apprehenſion*, *Judgment*, *Diſcourſe*, and *Method* or *Diſpoſition*; which ſee.

The Buſineſs of *Logick* is chiefly to teach us how to make proper Animadverſions on the Operations of our Minds; and from its true Uſe we gain theſe Three Advantages.

Firſt, We are thereby aſſured that we make a right Uſe of our Reaſon: For the Conſideration of Rules, begets in us a more fervent Application and attentive Induſtry of the Mind.

Secondly, That thereby we more eaſily detect and explain the Errors and Defects which we meet with in the Operations of the Mind: For oftentimes it falls out, that we diſcover by the meer Light of Nature the Faults of Ratiocination; yet are not able to give a Reaſon why it is falſe: Thus they who know not what belongs to Painting, may take Exceptions at the Defects of a Picture, tho' they are not able to tell the Reaſon why they find fault.

Thirdly, That we are brought to a more accurate Knowledge of the Nature of our Underſtanding by theſe Reflections upon the Operations of the Mind, which, if we look no farther than meer Speculation, is to be preferr'd before the Knowledge of all Corporeal Things.

LOGISTICAL *Arithmetick*, was formerly the Arithmetick of Sexageſimal Fractions, and uſed by Aſtronomers in their Calculations. I ſuppoſe it was ſo called from a *Greek* Treatiſe of one *Barlaamus Monachus*, who wrote about Sexageſimal Multiplication very accurately, and entituled his Book, Λογιστική. This Author *Voſſius*, in his Book *de Scientiis Mathematicis*, places about the Year 1350, but miſtakes it for a Treatiſe of *Algebra*.

Thus alſo *Shakerly*, in *Tabulæ Britannicæ*, hath a Table of *Logarithms* adapted to Sexageſimal Fractions, which therefore he calls *Logiſtical Logarithms*; and the Expeditious Arithmetick of them, which is by this Means obtained, and by which all

the Trouble of Multiplication and Diviſion is ſaved, he calls *Logiſtical Arithmetick*; though ſome by

LOGISTICKS, will underſtand the firſt General Rules in *Algebra* of *Addition*, *Subſtraction*, *&c.*

LOHOCH, or *Loch*, the ſame with *Eclegma*.

LONCHITES, or *Haſtiformis*, a Species of Comets reſembling a Lance or Spear: Its Head is of an Elliptick Form, and its Tail or Stream of Rays very long, thin, and pointed at the End.

LONG *Accent*, in Grammar, ſhews that the Voice is to ſtop upon the Vowel that has that Mark, and it is expreſſed thus, (-).

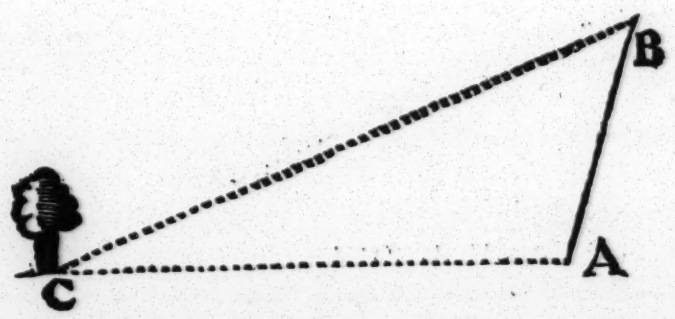
LONG-BOAT, is the largeſt and ſtrongeſt Boat belonging to a Ship, that can be hoiſed aboard of her: Its Uſe is to bring any Goods, Proviſion, *&c.* to or from the Ship; or, on Occaſion, to land Men any where; and particularly to weigh the Anchor; for which End ſhe hath a *David* to be ſet over her Head, with a *Shiver* in it, in which the *Buoy-rope* runs, to weigh the Anchor. She hath Maſt, Sail, and Oars, as other Boats, as alſo her *Tiller* to the Rudder, which anſwers to the *Helm* of a Ship.

LONGANON, the laſt Gut: See *Inteſtinum rectum*.

LONGIMETRY, is the Art of meaſuring Lengths or Diſtances: Or to take the Diſtances of *Trees*, *Steeples*, or *Towers*, &c. either one or many together; for which Purpoſe the *Theodolite* is reckoned to be the beſt Inſtrument, whereof we'll give the following Inſtances.

To Meaſure one ſingle Diſtance.

As ſuppoſe you ſtand at *A*, and would know the Diſtance to the Tree at *C*.



1. Set your Inſtrument at *A*, laying the *Index* with *Sights*, on the North and South Diameter, and turn it about till through the Sights you ſee the Tree at *C*, there fix your Inſtrument faſt.

2. Then from *A*, meaſure any Number of Feet, Yards, or the like, any way; as to *B* 100 Foot, and ſet up a Mark at *B*.

3. Take the Angle *B A C*, 120 deg. 10 min. which ſet down.

4. Set a Mark at *A*, and remove your Inſtrument to *B*, and take the Angle *A B C* 50 Degrees.

Now you have an *Oblique Angled Triangle*, wherein there is given the Angles *B A C* 120 deg. 10 min. *A B C* 50 deg. and the Diſtance *A B* 100 Foot, and conſequently the Angle *C* 9 deg. 50 min. (being the Complement of the other two, to 180 deg.)

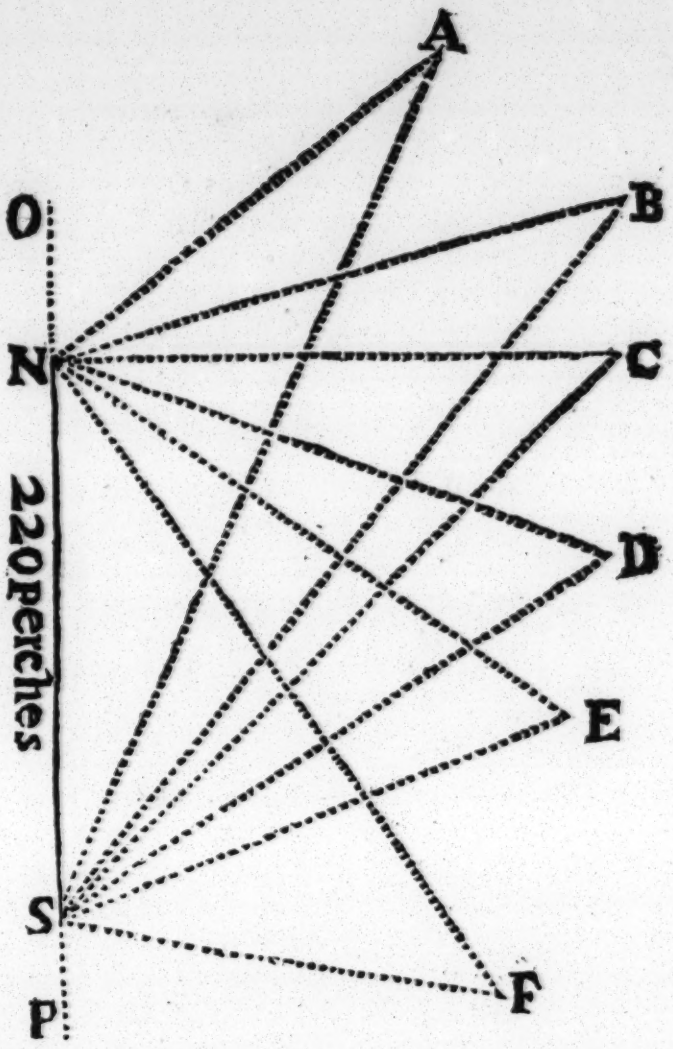
Then S. B C A : A B :: S. C B A : A C.
9° 50′ : 100 :: 50° 00′ 448, 6

And S. C B A : C A :: S, compl. C A B : C B
50° 00′ : 448, 6 :: 59° 50′ : 506, 2

So the Diſtance from C to A is 448, 6 Foot and from C to B 506, 2 Foot.

How to take the Diſtances *of divers Things remote from you; as*, Churches, Towers, Ships at Sea, *or ſuch like; and to make a* Map *of the ſame.*

Suppoſe that the Points A, B, C, D, E and F, were Houſes, Churches, Towers, or the like, and that it was required to make a Draught of them, repreſenting their Situation and true Diſtance one from another.



Let your Stations be *S* and *N*. Set your Inſtrument at *N*, and turn it about upon the Socket till the Needle hang directly over the *Meridian Line* of the *Chard* in the Bottom of the Box, the North end of the Needle over the *Flower-de-lis*; then ſkrew your Inſtrument faſt.

Then turn the *Index* about, till through the Sights you ſee *A*, and note what Degree the *Index* cuts, which ſuppoſe to be 60. Then turn the *Index* about till you ſee *B*, and mark what Degrees is cut by the *Index*; as 74 deg. 30 min. Do thus with all the reſt, be there never ſo many.

Alſo meaſure the Diſtance between *N* your firſt Station, and *S* the ſecond Station; which is 220 Perches: And bring your Inſtrument from *N* to *S*, where it muſt be ſet up, laying the Index upon the North and South Diameter: Turn it about till you ſee the firſt Station *N*, then fix it.

And turn the Index about, till thro' the Sights you ſee *A*, and note what Degrees the *Index* cutteth; as 31 deg. 30 min. Then turn the *Index* about to *B*, *C*, *D*, *&c.* noting the Degrees cut by the *Index* at every moving, and ſet them down in a Table ruled for that Purpoſe, thus,

		At the first Station the Index cut.		At the second Station the Index cut.	
		D.	M.	D.	M.
At	A	60	00	31	30
	B	74	30	38	40
	C	84	30	43	20
	D	104	50	54	00
	E	117	00	68	10
	F	145	10	97	00

Stationary Distance is 220 Perches.

How to Protract these Observations.

1. Draw a Line at Length, as O P; whereon take any Point, as N, for your first Station: Apply the Center of your Protractor to N, and its Diameter upon the Line O P.

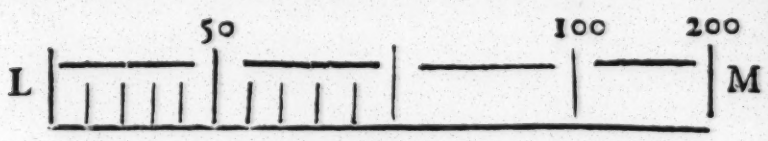
2. Having your *Table of Observations* before you, prick off the Degrees observed, along the Limb of your Protractor; and draw the obscure Lines N A, N B, N C, &c.

3. From some *Scale* of equal Parts (answerable to the Bigness you intend your Plot) take off 220 Perches, and set them from N to S.

4. Apply the Center of the Protractor to S, and its Diameter upon O P, and prick off your Observations at the second Station; and draw the obscure Lines S A, S B, S C, &c. (from S, through the several Marks made on the Paper) cutting the Lines drawn before, N A, N B, N C, &c. in the Points, A, B, C, D, &c. which Points shall represent the several Ships, as they lie at Anchor; or the several Towers, or remarkable Places to be plotted.

To make a Scale *to measure any Distance upon this Plot.*

Let a Line be so divided, that the Distance N S may be 220 Parts thereof, as the Line L M; for the Distance N S, set upon this *Scale*, will reach from 200 to 20 on the small Divisions.



And the *Scale* being thus Divided and Numbred, you may measure any Distance upon the Plot.

To measure any Distance, *thus laid down, by* Trigonometrical Calculation.

The Visual Lines made at both *Stations*, by their Intersections, do constitute several *Right-lined Triangles*; in either of which you will have enough given to find whatsoever Distance you shall require; as suppose the Distance N A were required.

In the *Right-lined Triangle* A N S, you have given; the Angle A N S, 120 deg. (being the Complement of 60 deg. the Angle observed at A, to 180 Degrees) The Angle N S A 31 deg. 30 min. being the Complement of the other two, to 180 Degrees.

Therefore, as S, N A S: N S :: S, N S A: N A.

To find A S, say,
As, S, N A S: N S :: S, A N S: A S.

By the same Method any other Distance may be found: And in this manner may the *Maps* or *Plots* of all eminent *Places* in Cities, Towns, &c. be taken.

LONGISSIMUS *Pollicis*: See *Flexor tertii Internodii.*

LONGISSIMUS *Femoris*; vid. *Sartorius.*

LONGITUDE *of a Place*, is an Ark of the *Equator* intercepted between the Meridian of that Place, and the *first Meridian*: Or 'tis more truly the Difference, either *East* or *West*, between the *Meridians* of any two Places, counted on the *Equator.*

LONGITUDE *in the Heavens*, is an Ark of the *Ecliptick*, counted from the beginning of *Aries*, to the place where the Stars Circle of Longitude crosses the *Ecliptick*: So that, 'tis much the same as the *Stars Place in the Ecliptick*, reckoned from the beginning of *Aries*; which how to find: See, *Place of the Sun or Star.*

LONGITUDE *of the Sun or Star from the next Equinoctial Point*, is the Number of Degrees and Minutes they are from the beginning of *Aries* or *Libra*, either before or after them; which can never be more than 180 Degrees.

LONGITUDE *in Navigation*, is also the Distance of a Ship or Place, East or West from another (counted in proper Degrees); but if in Leagues or Miles, or Degrees of the Meridian, and not in those proper to the *Parallel of Latitude*, it's commonly called *Departure.*

LONGITUDE *in Drolling.* The Ark of the Equinoctial, intercepted between the Substilar Line of the Dyal and the true Meridian, is called the *Planets Difference of Longitude.*

To find the Longitude *and* Latitude *of any Star by the Globe.*

Bring the Solstitial Colure to the Brass Meridian, and there fix the Globe; then will the Pole of the Ecliptick be just under 23 deg. 30 Min. accounted from the Pole above the Horizon, stand on the same Meridian: There skrew the Quadrant of Altitude, and then bring its graduated Edge to the Star, and there stay it; and so the Quadrant will cut the Ecliptick in the *Star's Longitude*, as also its *Latitude* on the Quadrant, reckoned from the Ecliptick.

LONGITUDE *of Motion*, is a Term used by Dr. *Wallis* in his *Mechanicks*, and others, for the Measure of Motion estimated according to the Line of Direction; so that 'tis the Distance or Length which the Center of any moving Body runs through, as it moves on in a Right Line.

And he calls the Measure of any Motion estimated according to the Right Line, or Line of Direction of the *Vis Motrix*, the *Altitude* of it.

LONGUS a Muscle of the *Cubit*, which helps to extend the Arm forwards.

LONGUS, a Muscle of the *Radius*, serving to turn the Palm of the Hand upwards.

LONGUS, a Muscle of the *Tarsus* so called: See *Peroneus Primus.*

LONGUS *Colli*, is a Muscle of the Neck which arises partly tendinous, but chiefly fleshy, from the fore-part of the Five *Vertebræ* of the *Thorax*; and being dilated in its Middle to a fleshy Belly, is inserted to the fore-part of all the *Vertebræ* of the Neck: This with its Partner acting, bends the Neck right forward. Between this and the *Scalenus* lies the *Rectus Internus Major.*

LOOF, or as they usually pronounce it, *Luff* is a Term used in *Cending* of a Ship: Thus *Luff up*,

is to bid the Steers-man keep nearer to the Wind. To *Loof into an Harbour*, is to Sail into it, close by the Wind. To *spring the Luff*, is when a Ship, that before was going *large* before the Wind, is brought close, or, as they say, *claps* close by the Wind. When a Ship sails upon a Wind, as they say, that is, on a Quarter-Wind, the Word of him that cons to the Steers-man, is, *Luff! Keep your Luff! Veer no more! Keep her to! Touch the Wind! Have a care of the Lee-latch*: All which Words signifie much the same thing, and bid the Man at Helm to keep the Ship near the Wind. But on the contrary, if the Ship is to go more *Large*, or Right before the Wind, the Word is, *Ease the Helm! No near! Bear up!*

Steady, is a Word common to both these ways of Sailing, either *on a Wind*, or *Large*, and signifies, that the Man at Helm should keep the Ship straight to her Course, and not let her go in and out, or make *Yawes*, as they call it.

LOOF-HOOK, is a Tackle aboard a Ship, with two Hooks to it, one of which is to hitch into the *Crengle* of the Main and Fore-sail, and the other is to hitch into a certain *Strap*, which is spliced into the *Chesse-tree*, and so down the Sail. Its Use is to succour the *Tackles* in a large Sail, that all the Stress may not bear upon the *Tack*. Sometimes also 'tis used when the *Tack* is to be seized the surer.

LOOF *of a Ship*, is that part of her *a-loft*, which lies just before the *Chesse-trees*; and hence the Guns that lie here are called her *Loof-Pieces*.

LOOF-TACKLE, or *Luff-Tackle*, is a small Tackle in a Ship, serving to lift all small Weights in or out of a Ship.

LOOME: If a Ship appears big at Sea, when seen at a Distance, they say, she *loomes*, or appears a great Sail.

LOOME-GALE, is a gentle, easie Gale or Wind, in which a Ship can carry her Top-sails *a-trip*: see *Trip*.

LOPIDOIDES, the same with *Lepoides*.

LORD, by the Writers of the Law, is divided into *Lord Paramount* and *Lord Mesne*.

Lord Mesne, is he that is Owner of a Mannor, and by Virtue thereof hath Tenants holding of him in Fee, and by a Copy of Court-Roll, and yet holdeth himself of a superior Lord, called *Lord Paramount*. Also he is called *Lord in Gross*, that is, a Lord having no Mannor, as the King in respect of his Crown: And there is a Case wherein a Private Man is *Lord in Gross*; as when a Man makes a Gift in Tail of all the Land he hath, to hold of him, and dieth, his Heir hath but a *Seigniory in Gross*.

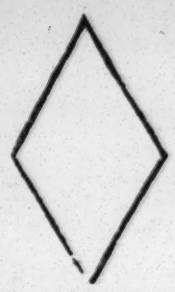
LORDOSIS, by some Writers, is the Term for the bending of the Back-bone forwards in Children, *&c.*

LOTION, a Term used by some Chymists and Pharmacal Writers, signifying only the washing of any Medicine in Water. Some also call Remedies which are between a *Fomentation* and a *Bath*, and which are used to wash the Head, or any Part affected, by this Name of *Lotion*.

LOWER *Flank*, or *Retir'd Flank*; see *Flank*. A Term in Fortification.

LOXODROMIQUES, is the Art or Way of oblique Sailing by the *Rhumb*, which always makes an equal Angle with every Meridian; *i. e.* when you sail, neither directly under the Equator, nor under one and the same Meridian, but obliquely or across them, Hence the Table of Rhumbs, or the Traverse-Table of Miles, with the Difference of Longitudes and Latitudes, by which the Sailor may practically find his Course, Distance, Latitude or Longitude, is by Sir *J. Moore*, and others, called by this Name of *Loxodromiques*; and such Tables as serve truly and expeditiously to find the several Requisites, or resolve the Cases of Sailing, are called *Loxodromical Tables*.

LOZENGE, is that Figure in Heraldry which the Geometers call a *Rhombus*, *i. e.* a Parallelogram, whose Angles are oblique, but Sides all equal; and the Distance between the two obtuse Angles always equal to the Length of one of the Sides. Thus,



In which it differs from the *Fusil*; which see.

In this Figure all unmarried Gentlewomen and Widows do bear their Coats of Arms; because, as some say, 'twas the Figure of the *Amazonian Shield*; or, as others, because 'tis the Ancient Figure of the *Spindle*.

LUCIDA *Coronæ*, a Fixed Star of the Second Magnitude, in the *Northern Garland*; whose Longitude is 217 deg. 38 min. Latitude 44 deg. 23 min. *Right Ascension* 230 deg. 12 min.

LUCIDA *Hydræ*: see *Cor Hydræ*.

LUCIDA *Lyræ*, a bright Star of the first Magnitude, in the Constellation *Lyra*; whose Longitude is 10 deg. 43 min. Latitude 61 deg. 47 min. *Right Ascension* 276 deg. 27 min. and *Declination* 38 deg. 30 min.

LUCIFEROUS, that which brings Light; a Word used by my Lord *Bacon*, and some other Naturalists, for such Experiments in Philosophy as do not so much inrich a Man, as inform and inlighten his Mind about some Physiological Truth, or Speculation in Physicks.

LUES *Venerea*, *Morbus Gallicus*, the *French Pox*, is a malignant and contagious Distemper, communicated from one to another by Coition, or other impure Contact; proceeding from virulent Matter, and accompanied with many ill Symptoms, such as *Gonorrhæa's*, with the Falling-off of the Hair, Spots, Swellings, Ulcers, Pains in the Bones, &c.

LUES *Deifica*: see *Caducus Morbus*.

LUFF, a Sea Term; the same with *Loof*: Which see.

LUMBAGO, is a Pain in the Muscles of the Loins, which *Blanchard* takes to be clogged with Scorbutick Matter; so that the Patient is forced to stand upright, being not able to sit down without great Pain.

LUMBALES *Musculi*: see *Psoas Magnus*.

LUMBARIS *Vena*, a Vein arising from the descending Trunk of the *Cava*, and is not always one, but often two or three on each side, which they divide into the *Lumbaris Superior* and *Inferior*; they are bestowed on Muscles of the Loins, and on the *Peritonæum*.

LUMBARIE *Arteries*, are by some said to come from the *Aorta*, unto all the Parts of the Loins, and to the Marrow of the Back-bone; sending as many Branches to its Joints, as there are Holes in it.

LUMBRICAL *Muscles*, are with some Anatomists, those Four Muscles which serve to move the Fingers or Toes, and are so called from their Worm-like Form.

LUMBRICALES, *seu Vermiculares*, are Muscles of the Fingers, so called from their Figure, being not much unlike the common Earth-Worms; they are also called *Flexores primi internodii digitorum*, from their Use. Those probably perform those minute Motions of the Fingers, when the second and third Internodes are curvated by the two last-treated

of

of Muſcles; and therefore uſed in playing on Muſical Inſtruments, and may be thence named *Muſculi Fidicinales*.

LUMBRICALIS *Pedis*, is a Muſcle of the leſſer Toes, ſpringing from the internal Part of the *Os Calcis*; and becoming tendinous, joyns with the Tendons of the *Perforans* in the middle of the Sole of the Foot; then dividing it ſelf into Four (as it were) diſtinct fleſhy Muſcles, they all become tendinous at their Inſertions to the internal Parts of each leſſer Toe, laterally, next the Great Toe.

LUMINARIES. The *Sun* and *Moon* are ſo called by way of Eminence, for their extraordinary Luſtre, and the great Proportion of Light that they afford us.

LUNA *Cornea*, is a tough inſipid Maſs, almoſt like Horn, made by pouring warily on Chryſtals of Silver (which Chryſtals were made by diſſolving that Metal in good Aqua-fortis or Spirit of Nitre) either Spirit of Salt, or a ſtrong Brine made of common Salt and Water. The Mixture is dried, and then brought to Fuſion in a Crucible, or a Glaſs Phial; where, after it hath been kept a little while ſo, it turns into this Shape, which the Chymiſts call *Cornea Lunæ*.

In which Proceſs, 'tis very remarkable, that tho' a Solution of Silver be commonly one of the worſt of Bitters, and Spirit of Salt have a very ſowre and acid Taſte, yet the Union of theſe together, produces a Body perfectly inſipid; which plainly ſhews that Taſtes depend on Mechanical Principles, and are various, according to the various Textures of Bodies.

LUNARY *Months*, are either *Periodical*, *Synodical*, or *Illuminative*; which ſee in their proper Places.

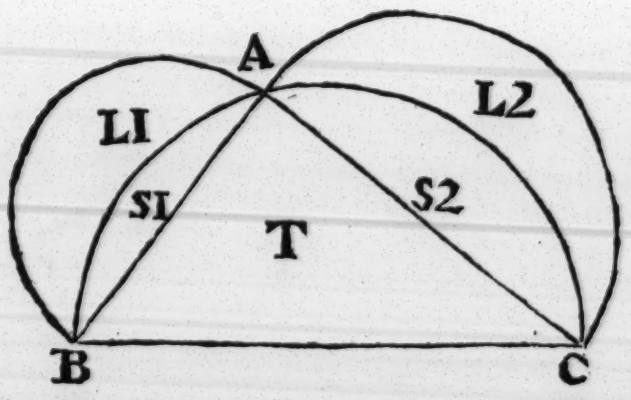
LUNAR *Cycle*: ſee *Cycle of the Moon*.

LUNATIONS *of the Moon*, are the Times between one New Moon and another: And this is greater than the Periodical Month by two Days and five Hours; and is called the *Synodical Month*, conſiſting of 29 Days, 12 Hours, and $\frac{3}{4}$ of an Hour.

LUNES, or *Lunulæ*, in Geometry, are Figures in the Form of a Creſcent or Half-moon, made by the Arks of two interſecting Circles; as in the following Figures the Space *L* is called a *Lune*.

PROPOSITION I.

1. *The Quadrature of* Hippocrates *his Lunes.*



I ſay, The Triangle *T*, is equal to the two *Lunes* *L* 1, and *L* 2.

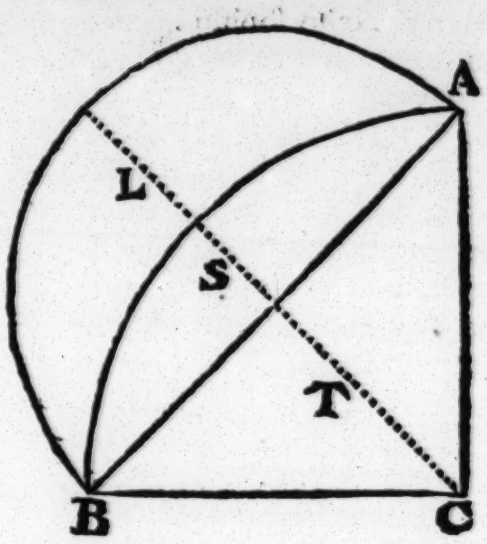
DEMONSTRATION.

The Semi-circle on *BC*, is equal to the Semi-circles on *BA* and *CA*.

And the Segments, *S* 1 and *S* 2, are common to all the three Semi-circles: Which being taken from the greater Semi-circle, they leave the Triangle *T*; and taken from the two leſſer Semi-circles, they leave the two *Lunes*, *L* 1 and *L* 2.

Therefore the Triangle T = to both the *Lunes*. *Q. E. D.*

2. Otherwiſe in a *Quadrant*,



I ſay, The Triangle *T*, is equal to the *Lune L*.

DEMONSTRATION.

The Triangle *T* being Quadrantal and Iſoſcelar, it muſt be that $AB\,q = 2\,BC\,q$.

But $2\,BC = \frac{1}{2}$ Square of $2\,BC = \frac{1}{2}$ the Square of the Diameter of the greater Circle; that is, the Square of the Diameter of the greater Circle, is double the Square of the Diameter of the leſſer Circle *AB*,

Therefore the Semi-circle on $2\,BC$ = twice the Semi-circle *BLA*; and conſequently the Quadrant *ABC* = Semi-circle *BLA*.

Take therefore from each the common Segment *S*, and there remains the *Lune L* = to the Triangle *T*. *Q. E. D.*

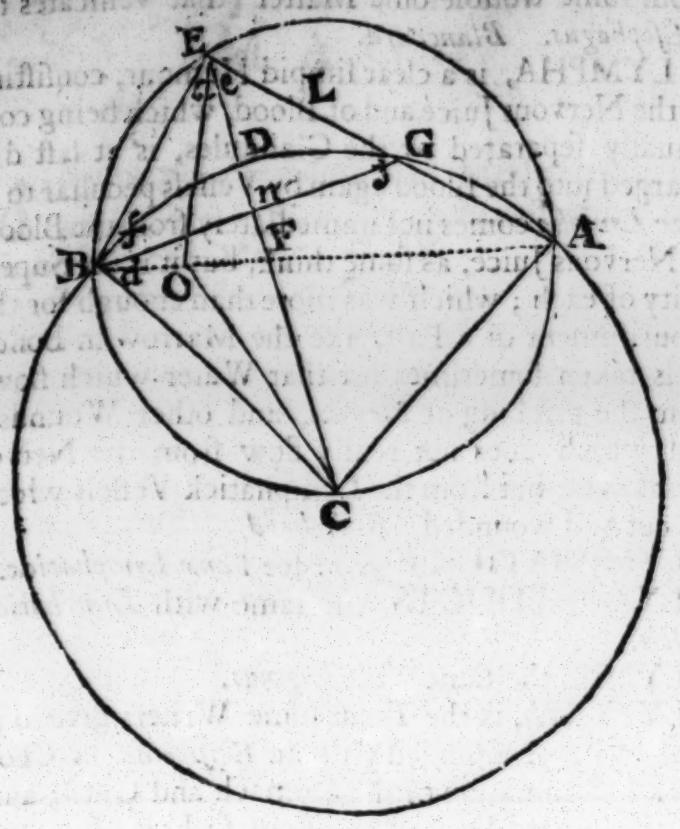
3. *To ſquare the Half of the* Lune *L*.

'Tis certain, that a Right Line drawn from *C* thro' *c* the Center of the leſſer Circle, muſt divide both Triangle, Segment and *Lune* into two equal Parts, and conſequently $\frac{1}{2}\,T = \frac{1}{2}\,L$: And thus the Half-Lune is ſquared.

4. *To ſquare any Part leſs or greater than Half the* Lune.

Let there be a Quadrant, as before, *BAC*, and a *Lune*, as *L*: 'Tis required to find the Segment of the *Lune BED*, made by the Line *EC* drawn to the Center of the greater Circle; which *Pardie* ſaith, is as difficult as ſquaring the Circle. *Lib.* 6. *Art.* 64.

CONSTRUC-



CONSTRUCTION.

Draw *E B* and *E A*, and *B G* at Right Angles with *E C*.

I ſay, the Triangle *B E F* is equal to the Part of the *Lune B E D*.

DEMONSTRATION.

1. The Angle at $G = \frac{1}{2}$ of a Right Angle, becauſe 'tis equal to $o + a + f$, as being external to the Triangle *G E B*: But the Angle at *E* (or $a + o$) = to a Right Angle, becauſe in *a* Semi-circle; and *f* muſt be half a Right Angle, becauſe *o* being in the ſame Segment, is equal to *d*, and conſequently is half a Right Angle; wherefore *g* alſo muſt be half a Right Angle (becauſe *n* is a Right Angle by Conſtruction) and conſequently *f* muſt be half a Right Angle: Wherefore the Right Angle at *E*, and the Right Line *B G*, and alſo the Segment *B D G*, are all biſſected.

2. Alſo the three Triangles, *G E B*, *E G F*, and *E F R*, are Iſoſceles and Rectangled; therefore each one muſt be the half of a Square.

3. Therefore *G B* : *E B* :: $\sqrt{2}$: $\sqrt{1}$. becauſe the Square of *G B* = twice the Square of *E B*.

4. Conſequently the Segment on *G B*, to that on *E B* :: 2 : 1, becauſe they are ſimilar Segments.

5. Therefore $\frac{1}{2}$ of one (*D B F*) = the whole other *E B*; which being taken from the Triangle, and added to the *Lune*, the whole muſt be equal.

And therefore the Triangle *B E F* is equal to the part of the *Lune*. *Q. E. D.*

The Ground of all which is this, That the Angle *BCE* being at the Center of one Circle, and at the Circumference of the other; the Line *E D C* muſt divide the Quadrantal Ark *A G B* in the ſame Proportion as it doth the Semi-circular one *B E A*: Whence follows the Equality of the Segments *B E* and *B D F*, on which all depends.

6. And ſince the $\triangle$ *B C A* = to the whole *Lune B E A G B* by *N.* 3. 'Tis eaſie to take thence a Part (as the Triangle *B O C*) equal to the aſſigned Portion of the *Lune*. For having let fall a Perpendicular from *E*, to find the Point *O*, draw *O C*, I ſay, the Triangle *BOC* = to $\triangle$ *BEF*, and conſequently to the Segment of the *Lune E B D*.

For the Triangle *B C A* and *B E F* are ſimilar, as being each the Half of a Square. Therefore the former is to the latter, as the Squares of their Homologous Sides, *i. e.* in a Duplicate *Ratio* of *B A* to *B E*. That is, as *B A* is to *B O*; by 8 *e.* 6 *Eucl.* The Triangle *A B C*, alſo having the ſame Height with *O B C* will be to it as the Baſe *B A* to the Baſe *A O*, by 1 *e.* 6 *Eucl.* Wherefore the Triangles *A E F* and *B O C* having the ſame Proportion to one and the ſame thing, are equal, by 9 *e.* 5 *Eucl. Q. E. D.*

Wherefore to divide the *Lune* according to any given *Ratio*, you need only divide the Diameter *A B*, according to that *Ratio* in the Point *O*: And from thence erecting a Perpendicular to find the Point *E*, draw *E C*, which ſhall cut off the Portion of the *Lune* deſired.

That Excellent Mathematician and Algebriſt, Mr. *Abr. de Moivre*, hath in *Philoſ. Tranſact.* N. 265. given an Account of the Dimenſion of the Solids generated by the Converſion of *Hippocrates* his *Lune*, and of its Parts about ſeveral Axes, with the Surfaces alſo generated by ſuch Converſion.

LUNETTES, in Fortification, are *Evolopes*, *Countergardes*, or Mounts of Earth caſt up before the Curtain, about five Fathom in Breath, whereof the Parapet takes up three. They are uſually made in Ditches full of Water, and ſerve to the ſame purpoſe as *Falſe Braies*. Theſe *Lunettes* are compos'd of two Faces, which form a Re-entring Angle; and their Platform being only Twelve Foot Wide, is a little raiſed above the Level of the Water, and hath a Parapet three Fathom thick.

LUNULÆ, the ſame with *Lunes*; which ſee.

LUPIA, is a Tumor, or Protuberance, about as big as a ſmall ſort of Bean; ſome take it for a *Meliceris*, others for a *Ganglio*. *Blanchard.*

LUPUS, a Southern Conſtellation, conſiſting of two Stars.

LUPUS, a ſort of Canker in the Thighs and Legs. *Blanchard.*

LUST, If a Ship *heel* either to *Starboard* or *Port*, the Seamen ſay that ſhe hath a *Luſt* that way; and they ſay ſo, tho' it be occaſional only by the *Shooting* of her Ballaſt, or by the unequal *ſtowing* of things in her *Hold*. Tho 'tis more properly ſaid of a Ship, when ſhe is inclined to *heel* any way, upon the Account of her *Mold* or *Make*.

LUTATION, is a cementing of Chymical Veſſels cloſe together.

LUTE (in Chymiſtry) is that wherewith the Chymiſts join together the Necks of the Retorts and Receivers, or wherewith they coat over the Bodies of Glaſs Retorts, to ſave them from being melted in very violent Fires.

The following Compoſition *Lemery* commends as good *Lute*. Take of Sand, Droſs of Iron and Potters Earth in Powder, of each five Pounds; Horſedung cut ſmall, a Pound; powdered Glaſs and Sea-ſalt, of each four Ounces. Temper all theſe well with Water, and then with the Paſt coat the Retorts as far as to half the Neck; or uſe it to *lute* together (as they call it) the Necks of the *Retorts* and *Receivers*. When 'tis dry, 'twill be exceeding hard; and therefore when you would ſeparate the Veſſels, you muſt wet it firſt well with exceeding wet Cloths.

The *Lute* which *Lemery* uſed himſelf, was only two parts of Sand, and one of Clay, tempered together in Water: Which will do very well to join the Noſes of Retorts, and their Receivers in the Diſtillation of Volatile Spirits, *&c.* When you diſtil by the Alembick, or *Veſica*, or Copper Body, with its Head and Serpentine, a wet Bladder will ſerve very well to *lute* the Junctures of the Veſſels. But when corroding Spirits are to be diſtilled, 'twill be better to uſe the following *Lute*. Take fine Flower

Slack'd

Slack'd-lime, of each an Ounce; Potters-Earth, or Powder of Pots, half an Ounce. Make a moiſt Paſte of theſe with Whites of Eggs, well beaten before with a little Water, and this will ſtop exceeding cloſe. *N. B.* This may be very well uſed to ſtop the Cracks that will often happen in Glaſs Veſſels; and there muſt be three Lays of the Paſte bound on with Paper.

Mr. *Boyle* recommends on Experience for this laſt Purpoſe, the following Compoſition, *viz.* Good Quick-lime and Scrapings of Cheeſe pounded in a Mortar, with as much Water as will juſt bring the Mixture to a ſoft Paſte; then ſpread it on a piece of Cloth, and apply it, as Occaſion requires.

LUXATION, a Term in Chyrurgery, is the Diſlocation, diſplacing, or putting any Bone or Joint out of its place.

LUXATOR *Externus*, a Muſcle ſo called: See *Externus Auris*.

LYCANTHROPIA, *Rabies Hydrophobica*, a Madneſs proceeding from the Bite of a mad Wolf, wherein Men imitate the howling of Wolves. *Blanchard*.

LYGMOS, the Hickets, is a convulſive Motion of the Nerves, which ſpread up and down the Gullet, returning after ſhort Intermiſſions: It proceeds from ſome troubleſome Matter [that vellicates the *OEſophagus*. *Blanchard*.

LYMPHA, is a clear limpid Humour, conſiſting of the Nervous Juice and of Blood, which being continually ſeparated by the Glandules, is at laſt diſcharged into the Blood again by Veſſels peculiar to it. The *Lympha* comes not immediately from the Blood, or Nervous Juice, as ſome think, but it is the Superfluity of each; which was more than enough for the Nouriſhment of a Part, like the Marrow in Bones. It is taken ſometimes for that Water which flows from the pricking of Nerves, and other Wounds; and which does not really flow from the Nerves themſelves, but from the Lymphatick Veſſels which are cut and wounded. *Blanchard*.

LYMPHATICK *Veſſels*: ſee *Venæ Lymphaticæ*.

LYMPHEDUCTS, the ſame with *Lymphatick Veſſels*.

LYNX, the ſame with *Lygmus*.

LYPYRIA, is the Term ſome Writers give to a kind of Fever attended with an *Eryſipelas*, or Cholerick Inflammation of the Stomach and Guts; and tho' the inward Parts of the Body feel very hot, yet the outward ones are very cold. *Blanchard*.

LYRA, the *Harp*, a Conſtellation in the Northern Hemiſphere, conſiſting of 13 Stars.

MACHINE, or *Engine*, in Mechanicks, is whatſoever hath Force ſufficient either to raiſe or ſtop the Motion of a Body. Theſe *Machines* are either *Simple* or *Compound*.

Simple Machines, are commonly reckoned to be Six in Number, *viz.* the *Balance*, *Leaver*, *Pulley*, *Wheel*, *Wedge* and *Screw*. To theſe might be added the *Inclined Plane*, ſince 'tis certain that the heavieſt Bodies may be lifted up by the means thereof, which otherwiſe could ſcarce be moved.

Compound Machines, or *Engines*, are innumerable, in regard that they may be made out of the *Simple*, almoſt after an infinite manner.

MACHINA *Boyliana*, Mr. *Boyle*'s Air-pump; which ſee. So called from that Noble Gentleman, being the firſt Inventor of that Engine.

MACROCOSM, is the whole Univerſe, in Contra-diſtinction to *Microcoſm*; which ſome will have to expreſs the Leſſer World, or the Body of Man.

MACULA *Epatica*, is a Spot of a brown or of a ſad yellow Colour, about an Hand's Breadth broad, chiefly ſeizing upon the Groins, the Breaſt and Back, nay, ſometimes it covers the whole Body; is attended with a certain ſlight Aſperity of the Skin, which lets fall Scales, or a ſort of Dendriff from it, which yet do not ſtick all together, but are diſſeminated here and there, and ſometimes diſappear, ſometimes break out again. *Blanchard*.

MACULÆ *Solares*; ſee *Spots in the Sun*.

MACULA *Volatica*, is a red or purple Spot here and there in the Skin; which, if it touch any Orifice in the Body, as the Mouth, Noſtrils, Eyes, Ears, &c. and pierce ſo far, it becomes mortal: It is often fatal to Children. *Blanchard*.

MADRIER, in Fortification, is a thick Plank arm'd with Plates of Iron, and having a Concavity ſufficient to receive the Mouth of the Petard when charged, with which it is applied againſt a Gate, or any thing elſe that you deſign to break down. This Term is alſo appropriated to certain flat Beams, which are fix'd at the Bottom of a Moat, to ſupport a Wall. There are alſo *Madriers* lined with Tin, which are cover'd with Earth, to ſerve as a Defence againſt artificial Fires.

MAGDALEONES, are Pieces of Plaiſter made up in Form of a Cylinder, or long Roll.

MAGICK *Square*, is when Numbers in Arithmetick Proportion are diſpoſed into ſuch parallel and equal Ranks, as that the Sums of each Row, as well diagonally, as laterally, ſhall be all equal.

5	10	3
4	6	8
9	2	7

Thus theſe Nine Numbers, 2, 3, 4, 5, 6, 7, 8, 9 and 10, being diſpoſed into this Square Form, they do every way, directly and diagonally, make Eighteen.

MAGICK-*Lantern*, a little Optick Machine; by the means of which are repreſented on a Wall, in the Dark, many Phantaſms and terrible Apparitions, which are taken for the Effect of *Magick*, by thoſe that are ignorant of the Secret. This Machine is compoſed of a Concave Speculum, reflecting the Light of a Candle, which paſſeth through the little Hole of a Tube, at whoſe End there is faſten'd another Glaſs: Between theſe two are ſucceſſively placed many ſmall Glaſſes, painted with different Figures, of which the moſt formidable are always choſen, and ſuch as are moſt capable of terrifying the Spectators; ſo that all theſe Figures may be repreſented at large on the oppoſite Wall.

A Convex Glaſs will do the Thing as well as a Concave one. See the Theory of it fully explained in M. *Molyneux* his Excellent *Dioptr. Nova*, Prop. 56. p. 183. They are ſold by all Perſpective-makers, and particularly by Mr. *John Marſhal*, at the *Archimedes* on *Ludgate-hill*, *London*; and Mr. *Yarwell* in the ſame Street.

MAGISTERY, a Word uſed by the Chymiſts, ſometimes for *very fine Powders*, made by Solution and Precipitation of the Matter; as *Magiſtery* of *Biſmuth*, *Lead*, &c. And ſometimes 'tis made to ſignifie *Reſins* and *Reſinous Extracts*. Thus the Reſins of Jalap, Scammony, &c. are called *Magiſteries*.

Mr. *Boyle* takes the true Notion of a *Magiſtery* to be a Preparation of Body (not an Analyſis of it, for the Principles are not ſeparated) whereby the whole, or very near the whole of it, by ſome Additament, is turned into a Body of a different kind; as when Iron or Copper is turned into Chryſtals of *Mars* or *Venus*, &c.

The Canting Alchymiſts talk alſo of the *Magiſtery* of the *Philoſopher's Stone*, which will be worth enquiring into, when they will tell us what the Stone it ſelf is. For an Inſtance how they are made, I will mention two or three.

Magiſtery of Biſmuth, is made by diſſolving the Biſmuth in Spirit of Nitre, and pouring upon it Salt-water, which will precipitate the *Magiſtery* to the bottom in a white Powder.

Magiſtery of Lead, is made by diſſolving *Saccharum Saturni* in diſtilled Vinegar; and then precipitating it with Oyl of Tartar, made *per deliquium*.

Magiſtery or *Reſine of Scammony*, *Jalap*, *Turbith*, &c. is made by a Diſſolution of the Matter in Spirit of Wine; and then precipitating it by common Water, or Water impregnated with a little Alum. And after theſe manners are moſt other *Magiſteries* made.

MAGISTERY *of Tartar*. See *Tartar Vitriolate*.

MAGMA, ſignifies the Dregs that are left after the ſtraining of Juices.

MAGNA *Aſſiſa eligenda*, is a Writ directed to the Sheriff, to ſummon four Lawful Knights before the Juſtices of *Aſſize*, there upon their Oath to chuſe twelve Knights of the Vicinage, &c. to paſs upon the Great *Aſſize* between *A.* Plaintiff, and *B* Defendant, &c.

MAGNA *Charta*, was granted the Ninth Year of *Henry* the Third, and confirmed by *Edward* the Firſt. The Reaſon why it is termed *Magna Charta*, was either for that it contain'd the Sum

of all the Liberties of *England*, or elſe becauſe there was another *Charter*, called *Charta de Foreſta*, eſtabliſh'd with it, which was the leſs of the two; or becauſe it contained more than many other *Charters*, or more than that of King *Henry* the Firſt, or of the great and remarkable Solemnity in the denouncing Excommunication, and direful *Anathema's* againſt the Infringers of it. *Holinſhed* tells us, That King *John*, to appeaſe his Barons, yielded to Laws or Articles of Government, much like to this *Great Charter*; but we have now no ancienter Law written than this, which was thought to be ſo beneficial to the Subject, and a Law of ſo great Equity, in compariſon of thoſe which were formerly in uſe, that King *Henry* for the granting of it, had the Fifteenth Peny of all the moveable Goods, of both *Temporality* and *Spirituality*.

MAGNESIA *Opalina*, is a kind of *Crocus Metallorum*, or Liver of *Antimony*, but of a redder or more *Opaline* Colour than the common one. 'Tis made after the common manner, with equal Parts of *Antimony*, *Salt-peter*, and *Sea Salt* decrepitated. 'Tis leſs Emetick than the common one, becauſe the *Sea Salt* fixes ſome of the active Sulphurs of the *Antimony*, and locks them up.

MAGNET, or *Loadſtone*, is a Foſſile approaching to the Nature of Iron-Oar, and endowed with the Property of attracting Iron, and of both pointing it ſelf, and alſo inabling a Needle touch'd upon it, and then poiſed, to point towards the Poles of the World.

MAGNET. *Sturmius* in his *Epiſtola Invitatoria Dat. Altorf.* 1682. obſerves, That the attractive Quality of the *Magnet* hath been taken Notice of beyond all Hiſtory: But that it was our Countryman *Roger Bacon*, who firſt diſcovered the *Verticity* of it, or its Property of pointing towards the Pole, and this about 400 Years ſince. The *Italians* firſt diſcovered, that it would communicate this Virtue to Steel or Iron. The various Declination of the Needle, under different Meridians, was firſt diſcovered by *Sebaſtian Cabott*; and its *Inclination* to the nearer Pole by our Countryman *Robert Norman*. The *Variation of the Declination*, ſo that 'tis not always the ſame in one and the ſame place, he obſerves, was taken Notice of but a few Years before, by *Hevelius*, *Auzout*, *Petit*, *Volckamer* and others.

The Properties, or Phænomena, *of this Wonderful Stone, as they have been diſcovered by* Gilbert, Kircher, Cabeus, Des Cartes, *and others, are theſe:*

1. That in every *Magnet* there are two Poles, one pointing North, the other South; and if a Stone be cut or broken into never ſo many pieces, there are theſe two Poles in each piece.

2. That theſe Poles in divers Parts of the Globe, are diverſely inclined towards the Earth's Centre.

3. That theſe Poles, tho' contrary to one another, do help mutually toward the *Magnet*'s Attraction and Suſpenſion of Iron.

4. If two *Magnets* are Spherical, one will turn or conform it ſelf to the other, ſo as either of them would do to the Earth; and that after they have ſo conformed or turned themſelves, they endeavour to approach to join each other; but if placed in a contrary Poſition, they avoid each other.

5. If a *Magnet* be cut thro' the Axis, the Parts or Segments of the Stone, which before were joined, will now avoid and fly each other.

6. If the *Magnet* be cut by a Section perpendicular to its Axis, the two Points which before were conjoined, will become contrary Poles, one in one, the other in the other Segment.

7. Iron receives Virtue from the *Magnet* by Application to it, or barely from an Approach near it, though it doth not touch it; and the Iron receives this Virtue variouſly, accçording to the Parts of the Stone 'tis made to touch, or made approach to.

8. If an Oblong piece of Iron be any how applied to the Stone, it receives Virtue from it only as to its Length.

9. The *Magnet* loſes none of its own Virtue by communicating any to the Iron, and this Virtue it can communicate to Iron very ſpeedily; tho' the longer the Iron touches or joins the Stone, the longer will its communicated Virtue hold; and a better *Magnet* will communicate more of it and ſooner, than one not ſo good.

10. That Steel receives Virtue from the *Magnet* better than Iron.

11. A Needle touch'd by a *Magnet*, will turn its Ends the ſame way towards the Poles of the World, as the *Magnet* will do it.

12. That neither Loadſtone nor Needles touch'd by it, do conform their Poles exactly to thoſe of the World, but have uſually ſome Variation from them: And this Variation is different in divers Places, and at divers Times, in the ſame Place.

13. That a Loadſtone will take up much more Iron when arm'd or cap'd, than it can alone: And that tho' an Iron Ring or Key be ſuſpended by the Loadſtone, yet the Magnetical Particles do not hinder that Ring or Key from turning round any way either to the Right or Left.

14. That the Force of a Loadſtone may be variouſly increaſed or leſſened, by the various Application of Iron, or another Loadſtone to it.

15. That a ſtrong *Magnet*, at the leaſt Diſtance from a leſſer or a weaker, cannot draw to it a piece of Iron adhering actually to ſuch leſſer or weaker Stone; but if it come to touch it, it can draw it from the other: But a weaker *Magnet*, or even a little piece of Iron, can draw away or ſeparate a piece of Iron contiguous to a greater or ſtronger Loadſtone.

16. That in our North Parts of the World, the South Pole of a Loadſtone will raiſe up more Iron than the North Pole.

17. That a Plate of Iron only, but no other Body interpoſed, can impede the Operation of the Loadſtone, either as to its Attractive or Directive Quality. Mr. *Boyle* found it true in Glaſſes ſealed Hermetically; and Glaſs is a Body as impervious as moſt are, to any Effluvia.

18. That the Power or Virtue of a Loadſtone may be impaired by lying long in a wrong Poſture, as alſo by Ruſt, Wet, *&c.* and may be quite deſtroyed by Fire.

EXPERIMENTS of the Nature and Properties of the MAGNET.

1. Mr. *Boyle* found, that by heating a *Magnet* red hot, it could be ſpeedily deprived of its *Attractive Quality*.

2. If

2. If a Loadſtone be heated red hot, and then cooled either with its South Pole to the North, in a Horizontal Poſition, or with its South Pole downwards in a Perpendicular one, it will change its Polarity, the South Pole becoming the Northern one, and *vice verſa*.

3. By applying the Poles of a very ſmall Fragment of a Loadſtone, to the oppoſite vigorous ones of a good larger *Magnet*, Mr. *Boyle* found he could ſpeedily change the Poles of the Fragment; but he could not effect it in a Fragment that was conſiderably bigger, tho' he tried many Hours.

4. He obſerved, That well-temper'd and harden'd Iron Tools, when heated by Attrition, Turning, Filing, *&c.* they would, while warm, attract thin Filings, or Chips of Iron and Steel, but not when cold Yet I remember once to have ſeen my ſelf, and tried, that a Piece of a File, which was in the Hands of Mr. *Yarwell* the Spectacle-maker, did retain ſuch an Attractive Quality, that it would take up, and keep ſuſpended, the Key of a Cabinet, or *Eſcritoire*, and needed no Attrition to excite this Magnetical Virtue.

5. The Iron Bars of Windows, which have long ſtood in an erect Poſition, do grow permanently Magnetical, the lower Ends of ſuch Bars being the North Poles, and the upper the Southern: For according to the Laws of *Magnetiſm*, we find the lower Ends of ſuch Bars will drive away the North End of a poiſed Needle, and will attract the Southern; which ſhews, that by the continual Paſſage of the Subtile Magnetical Particles thro' them, they are turned into a kind of *Magnet* themſelves.

6. If a Bar of Iron that hath not long ſtood in an erected Poſture, be only held Perpendicularly, its lower End will be the North Pole, and attract the South Point of a Touch'd Needle: But then this Virtue is tranſient, and will ſhift as you invert the Bar, for the other End when held lowermoſt, will preſently become the North Pole; wherefore, in order to render the Quality of Verticity permanent in an Iron Bar, it muſt remain a long time in a proper Poſition. But the Fire will produce this Effect in a very ſhort time; for as it will immediately deprive a Loadſtone of its Attractive Power, or change its Poles, (as in *Exper.* 1. 2.) ſo it will as ſoon give a Verticity to a Bar of Iron, if being heated red hot, it be cooled in an erect Poſition, or directly North and South. Nay, it hath been obſerved often, that even Tongs and Fire-forks, by being often heated, and then ſet to cool in a Poſition near to erect, have gained this Magnetical Property.

The Reaſon of which very different Effects of the Fire on a *Magnet*, and on Iron, Mr. *Boyle*, with his uſual Modeſty, ſuggeſts to be this: That the peculiar Texture or Conſtitution by which a *Magnet* differs from common Iron Ore, being accurate and fine, is ſpoiled by the rude and violent Attacks of the Fire: But this mighty Agent, by working upon Iron, ſoftens and opens the Pores of the Metal (which is harder than Iron Ore); ſo that it becomes capable of being pervaded by the Magnetical Particles, and by that means gains a *Vertical Quality*.

7. Mr. *Boyle* found that by heating a Piece of *Engliſh Oker* red hot, and placing it to cool in a proper Poſture, it plainly gained a Magnetick Power.

8. The ſame Noble Gentleman found, that an excellent Loadſtone of his own, having lain almoſt a Year in an inconvenient Poſture, had its Virtue ſo impaired, that he at firſt thought ſome Body had got at it, and ſpoiled it by Fire.

9. If a Needle be well touch'd on a good Loadſtone, 'tis known it will, when duly poiſed, point North and South; but if it have one contrary Touch of the ſame Stone, it will immediately be deprived of that Faculty; and by another ſuch Touch, it will have its Poles quite changed; ſo that the End which before pointed North, ſhall now point Southward.

10. Dr. *Power* and Mr. *Boyle* both tried, that after a red-hot Iron had gain'd a *Verticity*, by being well heated and cooled North and South; and then alſo hammer'd at the Ends, this Virtue would immediately be deſtroyed by two or three Blows of a ſtrong Hammer ſmartly given about the middle of it.

11. Mr. *Boyle* found by drawing the Back of a Knife, or long Piece of Steel Wire, *&c.* over the Pole of a Loadſtone leiſurely, once or divers times, beginning the Motion from the Equator or middle of the Stone, towards the Pole, the Knife or Wire will accordingly attract one End of a poiſed Magnetical Needle; but if you take another Knife or Wire, and thruſt it leiſurely over the Pole, from the Pole towards the Equator or middle of the Equator, this Knife ſhall expel or drive away the ſame End of the Needle, which the former Knife would attract: Which Experiment makes it very probable, that the Operation of the *Magnet* depends on the Flux of ſome fine Particles, which go out at one Pole, then round about, and in again at the other.

12. Becauſe it is one of the Univerſal Laws of Nature, That *Action and Reaction are always equal*: Therefore 'tis plain, the Iron muſt attract the *Magnet*, as much as that doth the Iron: And ſo you may eaſily experiment it to be in Fact, if you place a *Magnet* or Piece of Iron on a Piece of Cork, ſo as that it may ſwim freely in the Water; for then you will ſee, that which ſoever you hold in your Hand, will draw the other towards it.

From all which Experiments, 'tis plain (as Mr. *Boyle* concludes) *That Magnetiſm doth much depend upon Mechanical Principles.* As alſo, That there is ſuch a Thing as the *Magnetiſm of the Earth*; or that there are *Magnetical Particles*, which continually are paſſing from Pole to Pole; but Sir *Iſaac Newton* demonſtrates, that *Gravity* is a very different Thing from *Magnetiſm*; ſince the former is always as the Quantity of Matter attracted, but *Magnetiſm* by no means ſo.

Mr. *Joblot*, Profeſſor of the Mathematicks in the *French* Academy of Painting, *&c.* hath found out (as it is ſaid) a Method of making *Artificial Magnets*.

MAGNETISM, or *Magnetical Attraction*, or, as ſome are pleaſed to call it, *Coition*; is effected (ſay they) by the *Effluvia* of each Body, which drive away the Air between the Iron and the Stone; ſo that an Union of the Stone and the Iron is occaſion'd by the joint Protruſion or Pulſion of the Air behind each.

But this Opinion is plainly refuted by Mr. *Boyle*'s Experiment of a Loadſtone's being equally Vigorous and Attractive in the exhauſted Receiver, as in the open Air.

MAGNETICAL *Amplitude*, is an Arch of the Horizon, contain'd between the Sun at his Riſing or Setting, and the Eaſt and Weſt Point of the Compaſs: Or it is the different Riſing or Setting of the Sun from the Eaſt or Weſt Points of the Compaſs; and is found by obſerving the Sun at his Riſing or Setting, by an *Amplitude Compaſs*.

MAGNETICAL *Azimuth*, is an Arch of the Horizon, contained between the Sun's *Azimuth Circle*, and the *Magnetical Meridian*: Or it is the apparent Diſtance of the Sun from the North or South Point of the Compaſs; and may be found by obſerving the Sun with an *Azimuth Compaſs*, when he is about 10 or 15 Degrees high, either in the Forenoon or Afternoon.

MAGNETICAL *Meridian*; See *Meridian*.

MAGNIFIE, is a Word uſed chiefly in reference to *Microſcopes*; which are uſually ſaid to *magnifie* Objects, or to make them appear bigger than they really are.

But in reality, *Microſcopes* do not, nor can at all *magnifie* any Object, but only ſhew more of it to the Eye than before was taken Notice of; as will be apparent from the following Conſiderations.

For, Firſt, 'Tis clear that the Images of all Objects which are repreſented or pictured on the *Retina* in the Bottom of our Eyes, (and by which way all Viſion is made) thoſe Images, I ſay, muſt of neceſſity be very ſmall, in Proportion to the Objects themſelves; as is demonſtrable to any one's Reaſon, that will conſider the Smallneſs of the *Fundus Oculi*; and to his Senſes, that will but take the Pains to try the *Carteſian* Experiment, of putting a Bullock's Eye in the Hole of a darkned Room. (Vid. *Cart. Diopt.* cap. 5.) Now there being no Reaſon to ſuppoſe, that the bare Communication of that Picture to the Brain by the Optick Nerve, or Animal Spirits, can magnifie it again, ſo as to equal it with the Objects themſelves; it muſt and doth follow, that we always have Things repreſented to us leſs than they are, in the common way of Viſion.

2. At any conſiderable Diſtance we ſee but very little of the Object we behold, in Compariſon of what evades our Sight; and the nearer we come to it, the more ſtill we diſcover of it; and whenever we look in groſs upon an Object, our Eye cannot take Notice of many minute Differences, which, when we come to obſerve them ſingly, do yet very plainly appear; and after the neareſt View we can make with our bare Eye, very many Parts will yet remain undiſcoverable to us: So that all that the *Microſcope* doth, is (by taking off the Circular Radiation of Light) to direct our Eye to contemplate theſe minute Parts diſtinctly, ſingly, or by themſelves, which before we could either but confuſedly, or not at all, diſcern; and which now appearing (our Eyes thus armed with a Glaſs) very plain to us, make us attribute a new Magnitude to the Body we look on, becauſe we cannot imagine it can have thoſe Parts (which we now ſo diſtinctly ſee, and which before we could not ſee) unleſs its viſible Parts lie farther aſunder from each other than they did before, to make Room for theſe new to come between them.

3. But 'tis yet farther plain, that 'tis impoſſible any Glaſs can *magnifie* an Object, or make it bigger to us than it really is in it ſelf: For to do this, muſt be to give it new Parts, and to remove the viſible Parts it hath already to a greater Diſtance from each other; both which are utterly impoſſible.

4. If you make a very ſmall Hole in a Piece of Tin or Braſs, and look thro' it on any Object, it will make it appear much bigger than before, and ſo much bigger as the Hole is leſſer; which plainly proves, that the Reaſon of any Object's appearing bigger thro' a *Microſcope* is, as before, only bringing the Object nearer to the Eye, and letting ſome Parts of it be ſeen, which before were not diſceverable by the bare Eye.

MAIM, or *Mayhim*, in Common Law, ſignifies a Corporeal Hurt, by which a Man loſeth the Uſe of any Member that is or might be of any Defence to him in Battel. But the cutting off an Ear, or Noſe, the breaking of the hinder Teeth, or ſuch like, is no *Maim*; and rather a Deformity of the Body, than diminiſhing of Strength: Yet cutting off a Noſe, or cutting or diſabling any Limb or Member, is Felony without Benefit of the Clergy.

Maim is commonly tryed by the Juſtices inſpecting the Party; and if they doubt whether it be a *Maim*, or not, they uſe to take the Opinion of ſome able Surgeon.

MAIN-*Maſt* of a Ship, is a long, large, and round Piece of Timber, ſtanding upright in her Middle or Waſt, on which is born her *Main-Yard*, and *Main-Sail*. Its Length is uſually 2 ½ of the Length of the Mid-ſhip Beam.

MAIN-TOP-*Maſt*, is one half of the Length of the *Main-maſt*; and the *Top-gallant-maſt* half the Length of the *Main-top-maſt*.

MAINOUR, *Manour*, or *Meinour*, in a Legal Senſe, ſignifieth a Thing that a Thief taketh away, or ſtealeth: As to be taken with the *Mainour*, is to be taken with the Thing ſtollen about him.

MAINPERNABLE, is he that may be let to Bail. See the Statute of *Weſtm.* 1. *cap.* 15. made *Anno* 3 *E.* 1. what Perſons be *mainpernable*, and what not.

MAINPERNORS, are thoſe Perſons to whom a Perſon is delivered out of Cuſtody or Priſon, and they become Security for him, either for Appearance, or Satisfaction. They are called *Manucaptores*, becauſe they do as it were *manu capere & ducere captivum è cuſtodia vel priſona*: And the Priſoner is ſaid to be delivered to *Bail*, from the Words of the *Bail-piece*, viz. *A. B. &c. traditur in Ballium* J. D. & R. R. *&c.*

MAINPRISE, in our Law, ſignifies the taking or receiving a Man into Friendly Cuſtody, that otherwiſe is or might be committed to Priſon, upon Security given for his Forth-coming at a Day aſſigned: And they that thus undertake for any, are called *Mainpernors*, (which ſee) becauſe they receive him into their Hands; whence alſo comes the Word *Mainpernable*, denoting him that may be thus bail'd: For in many Caſes a Man is not *mainpernable*; whereof ſee *Bro. Tit. mainpriſe per totum*; and *F. N. B.* fol. 249. When *Mainpriſes* may be granted, and when not, ſee *Cromp. Juſtic. of Peace*, fol. 136, and 141. And the *Mirror of Juſtices* ſays, That *Pledges* be thoſe that Bail or Redeem any Thing but the Body of the Man; but *Mainpernors* are thoſe that free the Body of a Man; and therefore that *Pledges* belong properly

to

to real and mix'd Actions, and *Mainpernors* to perſonal.

MAINTAINOR, is he that ſupports or ſeconds a Cauſe depending in Suit between others, either by disburſing Money, or making Friends for either Party, towards his Help.

MAINTENANCE, is a Law-Term, ſignifying the Act of a *Maintainer*, when he ſeconds a Cauſe depending between others: And when it is accounted *Maintenance*, and when not, ſee *Broke Tit. Maintenance.* The Writ that lies againſt a Man for this Offence, is alſo called *Maintenance.*

MAJOR-*General*, is an Officer in an Army, that receives the General's Orders, and delivers them out to the Majors of the Brigades, with whom he concerts what Troops are to mount the Guard, what to go out upon Parties, what to form Detachments, or to be ſent on Convoys, *&c.* 'Tis his Buſineſs alſo to view the Ground to incamp on, and he is next ſubordinate to the General and Lieutenant-General.

MAJOR *of a Brigade*, either of Horſe or Foot, is he that receives Orders, and *the Word*, from the Major-General, and gives them to the particular Majors of each Regiment. And the

MAJOR *of a Regiment*, is an Officer whoſe Buſineſs it is to convey all Orders to the Regiment; to draw it up, and to exerciſe it; to ſee it march in good Order, to look to its Quarters, and to rally it, if it happen to be broken in an Ingagement, *&c.* He is the only Officer in a Regiment of Foot, that is allowed to be on Horſeback in Time of Service; but he is mounted, that he may ſpeedily get from Place to Place, as Occaſion ſerves. There is alſo in a Garriſon an Officer next to the Deputy-Governor, which is called the *Town-*

MAJOR; He ought to underſtand Fortification, and hath Charge of the Guards, Rounds, Patroilles and Sentinels.

MAJUS-*Jus*, is a Writ or Proceeding in ſome Cuſtomary Manors, in order to a Tryal of Right of Land.

MAKE; a Word frequently uſed by Lawyers, ſignifying, to Perform or Execute: As, to *make his Law*, is to perform that Law which he hath formerly bound himſelf to; that is, to clear himſelf of an Action commenced againſt him by his Oath, and the Oaths of his Neighbours. To *make Services* or *Cuſtoms*, is nothing elſe but to perform them; and to *make Oath*, is to take Oath.

MALACIA, is a depraved Appetite, which covets thoſe Things which are not fit to be eaten; alſo a Tenderneſs of Body. *Blanchard.*

MALACTICA, or *Emollientia*, are Things which ſoften the Parts by a moderate Heat and Moiſture, by diſſolving ſome of them, and diſſipating others. *Blanchard.*

MALAGMA, the ſame with *Cataplaſm*; alſo 'tis uſed in the ſame Senſe as *Malactica.*

MALIGNUS *Morbus*, a malignant Diſeaſe, is that which rages more vehemently and continues longer than its Nature uſually permits it to do; as a Peſtilential Fever, *&c.*

MALLEABLE, that which will bear being hammered, and ſpread, being beaten. This Quality belongs in the higheſt Degree to Gold, which is the moſt *ductile* or *malleable* of any Metal whatever. Mr. *Boyle* reckons the Qualifications requiſite to Malleableneſs, to be, Having the Corpuſcles, or Particles of ſuch an adapted Size, Shape, and Figure, whether hooked, branched, *&c.* that they can take faſt hold of one another, and ſtick ſo cloſe, as to make the Body ſpread eaſily under the Hammer, and not break nor crack.

MALLEUS, is one of the Four little Bones in the Ear.

MALLEOLUS, or *Malleus Pedis*, is Twofold: *External*, which is the lower Proceſs at the Foot of the Bone of the Leg, called *Fibula*; or *Internal*, which is the lower Proceſs of the Bone of the Leg, called *Tibia*: Theſe make up or form the Ancle.

Malleolus is alſo uſed as a Term in Botany, for a Sprout that grows out of a Branch which grew out its ſelf but the Year before. *Columella.*

MALTHACODE, is a Medicine ſoftened with Wax. *Blanchard.*

MALUM *Mortuum*, the Dead Diſeaſe, is a ſort of Scab; ſo called, becauſe it makes the Body appear black and mortified. It is in Colour black, and inclining to blue, and appears with a Cruſty ſort of Pimples, unſeemly, and filthy, but without ſending out Matter, or giving the Patient Pain. It infects the Hips and Legs eſpecially. *Blanchard.*

MAMILLARY *Artery*, or the *Mammaria*, is a Branch of the Arteries which ſupplies the Breaſts, and iſſues out of the adjoyning Trunk of the *Aorta*, as ſome ſay; but more properly it ought to be ſaid to come from the ſuperior Part of the Subclavian Branch of the Aſcending Trunk of the *Aorta.*

MAMMA, *Mammilla*, *Uber*, the Breaſts, Dugs, *&c.* The *Grammarians* call the inner Part *Ubera*, and the outward Protuberances *Mammæ.* The Subſtance of the Breaſts is a white and ſoft Body, conſiſting internally of a Congeries of Conglomerated Glandules, by the means whereof the Milk is ſeparated from the Arterious Blood, and is conveyed out by very little Pipes, which paſs thro' the Nipples.

MAMMARY *Veſſels*, are the Arteries and Veins that run through the Muſcles and Glands of the Breaſts.

MAMMIFORMES *Proceſſus*, are the two Apophyſes of the Bone of the back-part of the Skull.

MANDAMUS, is a Writ that lieth after the Year and Day; whereas in the mean Time the Writ called *Diem clauſit extremum* hath not been ſent out to the Eſcheator for the ſame Purpoſe to which it ſhould have been ſent forth. See *Diem clauſit extremum.*

Mandamus is alſo a Charge to the Sheriff, to take into the King's Hands all the Lands and Tenements of the King's Widow, that againſt her Oath formerly given, marryeth without the King's Conſent.

MANDATE, is a Commandment of the King, or his Juſtices, to have any thing done for Diſpatch of Juſtice; whereof you ſhall ſee Diverſity in the Table of the *Regiſter Judicial verbo Mandatum.*

MANDATARY, in Law, is he to whom a Charge or Commandment is given: Alſo he that obtains a Benefice by *Mandamus.*

MANDIBULA, or rather *Maxilla*, the Jaw; is either *Upper* or *Lower.* The *Upper* Mandible conſiſts of Twelve Bones, on each Side Six. The Firſt is at the external Corner of the Eye, which joyned with the Fore-proceſs of the Bone of the Temples, produces the *Jugal Bone.* The Second conſtitutes

conſtitutes the inner Corner of the Eye, has a large Paſſage in it, by which the ſuper-abundant Moiſture of the Eye deſcends to the Noſtrils. The Third is within the Circle of the Eye, interpoſed betwixt the other two. The Fourth, the greateſt of all, forms the greateſt Part of the Cheeks and the Palate, and is elaborately contrived with proper Cavities for the Reception of the Teeth. The Fifth helps to make the Noſe. The Sixth, with another Bone along with it, terminates the Extremity of the Palate. And all thoſe are joyned rather by a plain Line, than by Sutures. The *Lower* Jaw, at riper Years, grows into one continued Bone, extreme hard and thick, and conſequently very ſtrong: It has two Proceſſes, one Acute, called *Corone*; the other in the Form of a little Head, called *Condylus*. It has two Holes within, and as many without, which make way for the Nerves: The Under Teeth are implanted in it, and is joynted with the inner ſide of the Bone of the Temples, called *Os petroſum*. To theſe Twelve Bones, *Columbus* and *Laurentius* are for adding a Thirteenth, which, they ſay, lies between the innermoſt Space and the *Os ſphæroides*, dividing the moſt inward Part of the Noſtrils into two Parts, like a *Septum*; and therefore they call it *Vomer*. To theſe *B. Veſalius* would have the *Oſſa ſpongioſa*, which are in the innermoſt Cavity of the Noſe, to be added alſo.

MANGER in a Ship, is a Circular Place made with Planks faſtened on the Deck, right under the *Hawſes*, being about a Foot and half in Height: The Uſe of which is to catch and receive the Sea-water, beating in at the *Hawſes* in a Streſs of Weather.

MANIA, a ſort of Madneſs, is a Deprivation of Imagination and Judgment, with great Rage and Anger, but without a Fever; altho' a Fever may be joyned with a *Mania* proceeding from ſome other Cauſe.

MANICA *Hypocratis*, or *Hypocrates his Sleeve*, is a Woollen Sack or Bag, in Form of a Pyramid; wherewith *Aromatick* Wines, Medicines, and many other Liquors are ſtreined. 'Tis ſo called by the Chymiſts.

MANIPULUS, is a Dry Meaſure, uſual with Phyſicians in their Preſcriptions: For it is a determinate Quantity, to wit, as much as can be held in one Hand, meant for the moſt part of Herbs.

Faſciculus is a different Quantity from *Manipulus*, an Handful; for it properly ſignifies an Armful.

MANNER, a Word now much in Uſe, which we have borrowed from the French *Maniere*. In Painting, it ſignifies the Uſage, Way, *Mode*, or *Manner* any Painter hath acquired, not only in the Management of his Hand or Pencil, but alſo as to his Obſervance of the Three principal Parts of Painting, *Invention*, *Deſign*, and *Colour*: And according as any one hath gotten a Habit or peculiar Way of Painting, we ſay, He has ſuch a *Manner*. If it be agreeable to the Rules of this Art, Natural, Strong, Eaſie, and Duly Proportioned, we ſay, 'Tis a *Good manner*; and if the contrary, A *Bad manner*. If he imitate any famous Ancient Painter, as *Mich. Angelo*, *Raphael*, &c. we ſay, *He paints after their manner*. So 'tis alſo in Sculpture; and now adays in *Singing*, or *Playing* on any Inſtrument: When we would expreſs our Approbation of any one's Way of *Singing* or *Playing*, we ſay, *He hath a very Good manner*,

MANNOPUS, a Term in the Common Law, ſignifying Goods taken in the Hand of an apprehended Thief.

MANOR, was a Noble ſort of Fee granted partly to Tenants for certain Services to be performed, and partly reſerved to the Uſe of the Family, with Juriſdiction over his Tenants for their Farms: The whole Fee was termed a *Lordſhip*, of Old a *Barony*; from whence the Court, that is always an Appendant to the *Manor*, is called, The *Court-Baron*. Now a *Manor* rather ſignifies the Juriſdiction and Royalty incorporeal, than the Land or Site: For a Man may have a *Manor in groſs*, that is, the Right and Intereſt of a Court-Baron, with the Perquiſites thereunto belonging; and another, or others, have every Foot of the Land. But at this Day a *Manor* cannot be made, becauſe a *Court-Baron* cannot now be made, and a *Manor* cannot be without a *Court-Baron*.

MAN-SLAUGHTER, is the unlawful Killing of a Man, without prepenſed Malice: As when Two, that formerly meant no Harm one to another, meet together, and upon ſome ſudden Occaſion falling out, the one killeth the other. It differeth from *Murther*, becauſe it is not done with foregoing Malice; and from *Chance-medley*, becauſe it hath a preſent Inrent to kill. And this is Felony, but admitted to the Benefit of the Clergy for the firſt Time.

MANTELETS, in Fortification, are a kind of movable Pent-houſes, and are made of Pieces of Timber ſaw'd into Planks; which being about three Inches thick, are nail'd one over another to the Height of almoſt ſix Foot. They are generally caſed with Tin, and ſet upon little Wheels, ſo that in a Siege they may be driven before the Pioneers, and ſerve as Blinds, to ſhelter them from the Enemies Small-ſhot. There are alſo other Sorts of *Mantelets*, cover'd on the Top, whereof the Miners make uſe to approach the Walls of a Town or Caſtle.

MANTLE, in *Heraldry*, is that Appearance of the Foldings of Cloth, Flouriſhing or Drapery, that is, in any Atchievement, drawn about a Coat of Arms; 'Tis ſuppoſed to have formerly been the Repreſentation of a Mantle of State in Blazon; 'tis always ſaid to be doubled, *i. e.* Lined throughout with one of the Furs, as Ermin, Pean, Verry, *&c.*

MANUCAPTIO, is a Writ that lies for a Man, who taken upon Suſpicion of Felony, and offering ſufficient Bail for his Appearance, cannot be admitted thereto by the Sheriff, or other having Power to let to *Mainprize*.

MANUS *Chriſti*, is a ſort of Refined Sugar, ſo called, becauſe it is put into Cordials for very weak People. *Blanchard*.

MANUTENENTIA, is a Writ uſed in caſe of Maintenance. See *Maintenance*.

MAP, is a Deſcription of the Earth, or ſome particular Part thereof, projected upon a plain Superficies; deſcribing the Form of Countries, Rivers, Situation of Cities, Hills, Woods, and other Remarks.

MARASMODES, is the Term for a Fever, which at laſt ends in a Conſumption.

MARCHASITE, is the General Term for a *Mineral Body*, having in it ſome Metalline Parts; tho' many of them hold but a very little Quantity of Metal. See *Foſſils*.

MARINE *Barometer*. See *Barometer*.

MARISCA, the ſame that *Ficus*.

MARITAGIO *amiſſo per defaltam*, is a Writ for the Tenant in *Frank-marriage*, to recover Lands, *&c.* whereof he is divorced by another.

MARITAGIO *Forisfacto.* See *Forfeiture of Marriage.*

MARLINE, is a ſmall Line made of Hemp untwiſted, that it may be the more gentle and pliable; its uſe is to *ſeize* the ends of Ropes from *farcing out*: They uſe it alſo to ſeize the Straps at the Arſe (as they call it) or lower end of the Block. *Marling a Sail*; is, when being ſo ript out of the *Bolt Rope*, that it cannot be ſewed in again, the Sail is faſten'd by *Marline*, put thro' the Eye-let Holes made in it for that Purpoſe unto the *Bolt Rope.*

MARLINE *Spikes*, are ſmall Spikes of Iron made for the Splicing together of ſmall Ropes; and alſo to open the Bolt Ropes when the Sails are ſewed into them. They are only a kind of ſmall *Fidd*; which ſee.

MARMORATA *Aurium*, Ear-wax, is a certain Excrement of the Ear, laid there in the Auditory Paſſage from the Openings of the Arteries, or Sweat out from the Cartilages.

MARROW. See *Medulla.*

MARSHAL: There be with us divers Officers of this Name; as *Lord* or *Earl Marſhal of England*, whoſe Office conſiſts chiefly in Matters of War and Arms, as well with us as in other Countries. Alſo, the *Marſhal* of the King's Houſe, whoſe ſpecial Authority is in the King's Palace to hear and determine all Pleas of the Crown, and to puniſh Faults committed within the Verge, and to hear and judge of Suits between thoſe of the King's Houſhold, *&c.* There be ſeveral other Officers of this Name, as *Marſhal of the Juſtices in Eyre*; *Marſhal of the King's-Bench*, who hath the Cuſtody of the *King's-Bench* Priſon in *Southwark*: *Marſhal* of the King's-Hall, whoſe Office is, when the Tables are prepared, to call out both thoſe of the Houſhold, and Strangers, according to their Worth, and decently to place them, *&c.* Alſo *Marſhal* of the Exchequer, to whom the Court committeth the Cuſtody of the King's Debtors during the Term-time, for ſecuring the Debts: He alſo aſſigneth Sheriffs, Eſcheators, Cuſtomers, and Collectors their Auditors, before whom they ſhall account.

MARSHALSEA, is the Court or Seat of the *Marſhal* of the King's Houſhold, who formerly perhaps uſed to ſit there in Judgment, or keep his Priſon; and is now allowed for the Priſon in *Southwark.*

MARSUPIALIS *ſeu Burſalis*, is a Muſcle of the Thigh, ſo called from its Tendons running through (as it were) a ſecond fleſhy Beginning of it ſelf, which Duplication repreſents a Purſe: It is alſo called *Obturator Internus*; it ariſeth broad and fleſhy, from that part of the *Os Ilium*, *Iſchium*, *Pubis*, and Ligament that is extended in the Great *Foramen* of the two laſt named Bones internally, and marches tranſverſly in the *Sinus* of the *Iſchium*, (fenced on each ſide by two Proceſſes, the one Acute and the other Obtuſe) where it is externally fleſhy, but internally it hath three, ſometimes four Tendons paſſing in ſo many diſtinct Furrows in the ſaid *Sinus*, like ſo many Cords in a Quadruple Pulley, where it meets with the other fleſhy beginning, commonly called its *Marſupium*, ariſing from the above-mentioned Acute and Obtuſe Proceſſes, which joyning with the ſaid Tendons at their united Inſertion to the Superior part of the Root of the great *Trochanter*, near the Implantation of the *Pyriformis*: When this Muſcle acteth, its Inſertion is directed towards that part of the *Iſchium*, over which its Tendons run after the manner of a Pulley, and the *Os Femoris* is thereby turned outwards.

MARTIAL *Regulus* of *Antimony.* See *Regulus.* When any Particles are ſaid to be of a *Martial Nature* in Chymiſtry or Natural Philoſophy, 'tis meant, that they partake of the Nature of Iron or Steel. The Chymiſts calling Iron, *Mars.*

MARTIAL *Law*, is the Law of War, depending upon the King's Pleaſure, or his Lieutenant: For the King in time of Peace, never makes any Laws, but by common Conſent in Parliament, yet in War he uſeth abſolute Power, inſomuch, that his Word is a Law; but even this Power hath of late Years been inveſted in the King, or his Generals of the Army by Act of Parliament, and under particular Reſtrictions too. Read the new Acts of Parliament for puniſhing Mutineers and Deſerters, *&c.*

MARTLET, the Term in Heraldry for a Pidgeon, with its Feet eraſed or torn off; 'tis alſo the Difference, or mark of Diſtinction in an Eſcutcheon for the fourth Brother or Family.

MARTNETS in a Ship, are ſmall Lines faſtened to the *Leetch* of the Sail, being *Reeved* thro' a Block on the Topmaſt-head, and ſo they come down by the Maſt to the Deck. Thoſe *Martnets* which belong to the Top-ſails are faſtened (after the ſame way) to the Heads of the Top-gallant Maſts, but their *Fall* comes down no farther than the Top, when it is haled: The Word is *Top the Martnets*; *i. e.* Hale them up. Their deſign is, in furling the Sail, to bring that part of the *Leetch* which is next the *Yard Arm*, cloſe up to the Yard, that ſo the Sail may furle up the Cloſer.

MARS, the Name of one of the Planets which moves round the Sun in an Orbit between that of the Earth and *Jupiter.*

To view this Planet, there requires a good Teleſcope, with ſmall Apertures on the Object-glaſs, or elſe his Glairy Light makes but a confuſed Appearance.

This Planet as (well as the reſt) borrows its Light from the *Sun*; and has its Increaſe and Decreaſe of Light like the *Moon*; and it may be ſeen almoſt biſſected when in his Quadratures with the *Sun*, or in his *Perigæon*, but never corniculated or falcated as the other Inferiors.

March 10. 1665. Dr. *Hook* obſerved this Planet, with a 36 Foot Tube, and ſaw its Body as large very near as the *Moon* at Full; and in it he obſerved ſeveral Spots, and particularly a Triangular one; which having a Motion, he concluded the Planet to have a turbinated Motion round its Centre.

In the Year 1666, *February* the 6th in the Morning, Mr. *Caſſini* with a 16 Foot Teleſcope, obſerved two dark Spots in the firſt Face of *Mars*, moving from 11 at Night until break of Day.

February the 24th in the Evening, he ſaw two other Spots in the other Face of this Planet, like thoſe of the firſt, but much bigger: And continuing the Obſervations, he found the Spots of theſe two Faces to turn by little and little from Eaſt to Weſt, and to return at the Space of 24 Hours, 40 Minutes, to the ſame ſituation, wherein they were ſeen at firſt.

Whence he concluded, That the Revolution of this Planet round its Axis, is perform'd in the

ſpace

ſpace of 24 Hours, 40 Minutes, or thereabouts.

The Diſtance of *Mars* from the Sun, is about one and an half of that of the Earth from the Sun; and therefore to an Eye placed in *Mars*, the Diameter of the Sun would appear by one and an half leſs than it doth to us, and conſequently his Light and Heat will be but half of what it is here on our Earth; but this admits of a ſenſible Variation, becauſe of the great Eccentricity of *Mars* his Orbit, yet not ſo great as in *Mercury*.

Mars his Year is almoſt twice as long as ours, and his *Natural Day* a little greater than ours; but his *Artificial Day*, or the Time in which the Sun appears above his Horizon (beſides the Twilight before Sun-riſe, and after Sun-ſet, according to the daily Height of the Atmoſphere) is almoſt every where equal to his Night; and conſequently, in one and the ſame place on his Surface, there can be but little Variety of Seaſons as to Summer and Winter, *&c.* the Reaſon of which is, That the Axis of the Diurnal Revolution of this Planet, is nearly at Right Angles with the Plane of the Orbit. But Places ſituate in divers Latitudes, or at divers Diſtances from his Equator, will have very different Degrees of Heat, by reaſon of the different Inclination of the Sun's Rays to the Horizon; as is the Caſe of our Earth when the Sun is in the Equinoxes.

And from hence the Learned Dr. *Gregory*, in his *Aſtronom. Phyſ. & Geometr.* p. 473. conjectures very probably, That the *Faſciæ* of this Planet do ariſe: which are certain *Swathes* or *Fillets* which appear in *Mars*, and are poſited parallel to his Equator. For ſince there is always in the ſame Climate (*here*) nearly the ſame Degree of Heat, 'tis likely, that theſe Spots in *Mars* owing their Original to Heat and Cold, (as in our Earth Clouds and Snow do) may be extended in the ſaid Climates in Parallels to the Equator, or to the Circle of *Mars* his Diurnal Revolution, and ſo form the *Faſciæ*. And the ſame is true of *Jupiter*, which, as well as *Mars*, hath a perpetual Equinox.

That *Mars* hath an Atmoſphere, like ours, is argued from the Phænomena of the Fixed Star's appearing obſcur'd, and, as it were, extinct. when they are ſeen juſt by the Body of *Mars*: And if ſo, a Spectator in *Mars* will hardly ever ſee *Mercury*, unleſs it may be in the *Sun*, when that Planet paſſes over his Disk like a Spot, as he doth ſometimes to us.

To an Eye in *Mars*, *Venus* will appear about as far from the *Sun*, as *Mercury* doth from him with us; and the Earth, as far as *Venus* appears to us, to be from the *Sun*. And when the Earth, being ſeen from *Mars*, appears in Conjunction with, and very near to the Sun, the *Martial* Spectator will ſee that which *Caſſini* once or twice ſaw in *Venus*, *viz.* the lower Planet (or the Earth) appear horned or falcated; and its Satellite, the *Moon* of the ſame Figure, and at its greateſt Diſtance, not above 15 minutes of a Degree from the Earth. *Greg. Aſtronom.*

MARSHALLING a Coat of Arms (in Heraldry) ſignifies the due and proper joining of ſeveral Coats of Arms in one and the ſame Shield or Eſcutcheon, together with their Ornaments, Parts and Appurtenances.

MASCLE, a Term in Heraldry for a Bearing of this Figure: Gules a Chevron Ermin between three *Maſcles* Argent, by the Name of Bellgrave. *Guillim* ſaith, the *Maſcle* repreſents the Maſh of a Net, and is an honourable Bearing. A *Maſcle* differs from a *Lozenge*, only by being *voided*.

MASSE: This Word is uſed by the Natural Philoſophers to expreſs the Quantity of Matter in any Body, and this Sir *Iſaac Newton* ſaith, he found by moſt accurate Experiments on *Pendulums*, to be always proportionable to the Weight of Bodies, which is a good Argument to prove the Neceſſity of allowing a Diſſeminate Vacuum.

MASSETERS, in Anatomy, are ſhort, thick Tendinous Muſcles of the Lower Jaw, produced forwards from the *Os Primum* of the Upper Jaw, and backwards from the *Jugal Bone*; they are connected to the Lower Jaw. They aſſiſt the *Temporales* to move it to the Right-ſide, Left-ſide, and forward, according to the various Diſpoſition of the *Fibres*.

MASTER *of the Rolls*, is an Aſſiſtant to the *Lord Chancellor*, or *Lord Keeper* of the Great Seal of *England*, in the High Court of *Chancery*, and in his Abſence, hears the Cauſes there, and giveth Orders. He is by ſome called *Clerk of the Rolls*. And he has the diſpoſing of the Offices of the Six Clerks, Clerks of the Petty Bag, Examiners of the Court, and Clerks of the Chapel.

MASTERS *of the Chancery*, are Aſſiſtants in *Chancery* to the *Lord Chancellor*, or *Lord Keeper* of the Great Seal, in Matters of Judgment. Of theſe there are ſome Ordinary, ſome Extraordinary; of Ordinary there are Twelve, (whereof the *Maſter of the Rolls* is accounted one) whereof ſome ſit in Court every Day in each Term, and have referred to them (at the Lord Chancellor, Lord Keeper, or Maſter of the Rolls Diſcretion) Interlocutory Orders for ſtating Accounts, computing Damages, and the like; taking of Oaths, Affidavits, and Acknowledgments of Deeds and Recognizances. The Extraordinary do act in all the Country Ten Miles from *London*, by taking Recognizances and Affidavits, Acknowledgment of Deeds, *&c.* for the Eaſe of the Subject.

MASTICATION, or Chewing, is an Action, whereby we break and divide the Meat into ſmall Pieces with our Teeth, and mix it with the Spittle or *Saliva*, in order to its being the more eaſily fermented, digeſted, and turned into Chyle in the Stomach.

MASTICATORIES, are Medicines which are deſigned to provoke Spitting. By ſome they are called *Apophlegmations*.

MASTOIDEI, in Anatomy, is the ſame with *Mammillares*, and are ſuch Proceſſes any where, as are like Breaſts or Dugs, which from a broad Baſis, end in an obtuſe Top, and are ſhaped like the Tears in a Cows-Udder.

This Name is given by ſome Writers to thoſe *Muſcles* which bend the Head proceeding from the Neck-bone and the Breaſt-bone, terminating in the Proceſs *Mammiformis*. Theſe *Muſcles* ariſe partly tendinous, and partly fleſhy, from the Upper Part of the *Os Pectoris*, near half the Clavicle;

vicle; with two ſeemingly diſtinct Originations. Mr. *Cowper* ſaith, When either of theſe Muſcles act, they turn the Face to the contrary ſide. The *Proceſs*, or *Apophyſis* of the *Os Temporale*, which is in Shape ſomething like the Teats of a Cow, is called by this Name; and ſo are the Proceſſes of the *Olfactory Nerves*.

MASTS of a Ship, are the Main-maſt, Main-top-maſt, Main-top-gallant-maſt, Fore-maſt, Fore-top-maſt, Fore-top-gallant-maſt, Mizen-maſt, and Mizen-top-maſt; amongſt which, may alſo be reckoned her Boltſprit; all which ſee.

For the Proportion of Maſts, Sir *H. Manwaring* gives theſe Rules. Whatever the Breadth of a Ship be in Feet, multiply $\frac{4}{5}$ of that Breadth by 30, the Product is the Length of her *Main-maſt* in Yards. Thus if a Ship be 30 Foot at the *Midſhip-Beam*, $\frac{4}{5}$ of 30 is 24: Therefore that Ship's *Main-maſt* muſt be 24 Yards, or 72 Feet in Length. Then for its Bigneſs, he allows an Inch to every Yard in Length; and therefore this *Main-maſt* muſt be 24 Inches thro' or thick.

The *Fore-maſt* of a Ship muſt be $\frac{4}{5}$ of the Length of the *Main-maſt*, that is in this caſe, 19 Yards $\frac{1}{5}$, or 57 Feet $\frac{3}{5}$. Thick or through, it muſt be near 20 Inches.

The *Boltſprit* or *Bowſprit*, is always the ſame Length and Bigneſs with the *Fore-maſt*. And the *Mizen-maſt* muſt be juſt half the Length of the *Main-maſt*, and half as thick.

MATER *Dura*, called alſo *Dura Meninx*, is a Membrane which ſticks cloſe to the Skull within, in ſome places, and mediately covers both the Brain and *Cerebellum*; it has four Cavities, which ſupply the Place of the Veins, and come together betwixt the Brain and *Cerebellum*, which Conjunction is called *Torcular*.

MATER *Tenuis*, or *Pia Meninx*, is a Membrane which immediately cloaths the Brain and *Cerebellum*; is extremely full of Sanguinary Veſſels, and is deſign'd, as ſome think, to keep in the Spirits generated in the Brain and *Cerebellum*, that they fly not away.

MATERIA *Medica*, is whatever is uſed in the Art of Medicine for the Prevention or Cure of Diſeaſes, whether collected or prepared from Plants, Animals, Minerals, *&c.* by Chymiſtry or Pharmacy.

MATHEMATICKS, originally ſignifies any Diſcipline or Learning (μαθησις) but now, 'tis properly that Science which teaches or contemplates whatever is capable of being numbered or meaſured, as it is computable or meaſurable.

And that Part of *Mathematicks* which relates to Number only, is call'd *Arithmetick*: That which relates to Meaſure in general, whether Length, Breadth, Motion, Force, *&c.* is called *Geometry*.

Mathematicks may be reckon'd either,

1. *Pure, Simple*, or *Abſtracted*, which conſiders abſtracted Quantity, without any relation to Matter, or Senſible Objects. Or,

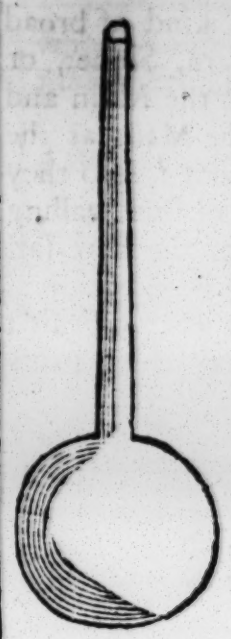
2. *Mixt Mathematicks*, which is interwoven every where with Phyſical Conſiderations.

Mathematicks alſo are divided into

Speculative, which propoſes only the ſimple Knowledge of the Thing propoſed, and the bare Contemplation of Truth or Falſhood: And

Practical, which teaches how to demonſtrate ſomething uſeful, or to perform ſomething that ſhall be propoſed for the Benefit and Advantage of Mankind.

MATHEMATICAL *Horizon*, is the ſame with *True Horizon*. See *Horizon*.



MATRASS, or *Bolt-head*, is a long ſtrait-necked Veſſel of Glaſs, frequently uſed by the Chymiſts in Diſtillations; and when they are fitted to the Noſe of an Alembick, they are called *Receivers*, becauſe they Receive the Matter which the Fire forces over the Helm or Head of the Still. They are of this Figure. And when one of theſe is by its Neck luted well into the Neck of another, they call it a Double Veſſel, which is uſed for the Circulation of Spirits, and for the Opening or Subtilizing of any Body by a long Digeſtion.

MATRIX, the ſame that *Uterus*.

MATRIX of a Tree or Plant, is the ſame with what the Botaniſts call *Cor*; which ſee.

MATTER, or *Body*, is an impenetrable, diviſible, and paſſive Subſtance, extending into Length, Breadth and Thickneſs. This, when conſider'd in general, remains the ſame in all the various Motions, Configurations and Changes of Natural Bodies, being capable of putting on all manner of Forms, and of moving according to all manner of Directions and Degrees of Velocity.

The Quantity of Matter in any Body, is its Meaſure, ariſing from the joint Conſideration of the *Magnitude* and *Denſity* of that Body: As if any Body be twice as *denſe* as another, and take up *twice the Space*, 'twill be four times as great. This Quantity of Matter is beſt diſcoverable by *Weight*, to which 'tis always proportionable; as the Excellent Sir *Iſaac Newton*, by moſt accurate Obſervations on Pendulums, found true by Experience.

Dr. *Woodward*, in his *Eſſay towards a Natural Hiſtory of the Earth*, Part 5. aſſerts *Matter* to be originally and really very different; being at its firſt Creation divided into ſeveral *Ranks*, *Sets* or *Kinds* of *Corpuſcles*: That all the *Corpuſcles* which are of the ſame *Kind* or *Set*, agree in every thing, and are moſt exactly like unto one another in all reſpects. But thoſe that are of *different Kinds*, differ from one another every way, as well in *Matter* or *Subſtance*, in *Specifick Gravity*, in *Hardneſs*, in *Flexibility*, and in ſeveral other ways, as in *Bigneſs* and *Figure*. And he ſuppoſes, that from the various *Compoſures* and *Combinations* of theſe Corpuſcles together, happen all the Varieties of the Bodies formed out of them; and all their Differences in Colour and outward Appearance, in Taſte, in Smell, in Hardneſs, in Specifick Gravity, and in all other reſpects.

MATTER *in Deed*, and *Matter of Record*, are Terms in Law, which are ſaid to differ thus: *Matter in Deed*, ſeems to be nothing elſe but a Truth to be proved, tho' not by any Record; and *Matter of Record* is that which may be proved by ſome Record. For Example: If a Man be ſued to an *Exigent*, during the Time he was in the King's Wars; this is *Matter in Deed*, and not *Matter of Record*: And therefore he that will alledge this for himſelf, muſt come before the *ſcire facias*, before Execution be awarded againſt him; for after that, nothing will ſerve but *Matter of Record*; that is, ſome Error in the Proceſs appearing upon Record.

MATTS *on Board a Ship*, are a kind of broad thick Clouts, wove out of ſpun Yarn, Sinner, or Thrums; and are uſed to preſerve the Main and Fore-Yards from galling againſt the Maſts at the Tyes, and at the Gunnel of the Loof: Alſo they ſerve to keep the Clew of the Sail from galling there; as alſo to ſave the Clews of the Fore-ſail from doing ſo at the Beak-head and Boltſprit.

MATURITY, the juſt Ripeneſs of any Fruit; and by Analogy, the Arrival of any thing to its juſt Degree of Perfection.

MATURATION, is the Action of growing Ripe, or the Tendency of any Fruits towards Maturity or Ripeneſs.

MAUNCH: The Figure of an Ancient Sleeve of a Coat, is ſo called by the Heralds, and is born in many Gentlemens Eſcutcheons; as in the Earl of *Huntington*'s, in thoſe of the *Coniers*, &c.

MAXILLA *Superior*, the Upper Jaw-bone: This conſtitutes the inferior and lateral Parts of the Orbit of the Eye, and comprehends alſo the Bones of the Noſtrils, Palate, and Upper Row of Teeth. It hath, according to *Diemerbrook*, Twelve Bones belonging to it, Six on each ſide. The Firſt is called the *Os Jugale*, and is of a Triangular Form, and poſited at the External Angle of the Eye. The Second is called the *Foramen lacrymale*, and is a thin pellucid ſmall Bone, placed in the Internal Angle of the Eye, and gives a Paſſage to that Liquor which makes the Tears. 'Tis near this *Foramen* that the *Abſceſſe*, which the *Greeks* call *Ægilops*, and we *Fiſtula lacrymalis*, uſually happens. The Third is a thin pellucid Bone, placed between the two former, and within the Orbit of the Eye, and which is continued with the fungous Bones of the Noſtrils. The Fourth is a large Bone, conſtituting the greateſt Part of the Cheek and Palate, and receiving into it the Upper Teeth by their proper Caverns: It hath an eminent conſpicuous *Foramen*, or Hole, placed under the Orbit of the Eye, and tranſmitting to the Face a Branch of the Third Pair of Nerves. It hath alſo another *Foramen* at the hinder part of the *Dentes inciſorii*; and then there go up two *Foramina*, with a Bony Partition between them, one to each Noſtril. The Fifth is a thin, hard, ſmall, oblong Bone, approaching to a ſquare Figure; and this, with its Partner on the other ſide, conſtitutes the Bridge, or protuberant Bone of the Noſe. The Sixth Bone forms, with its Fellow, the Bony Part of the Palate, or Roof of the Mouth. *Fallopius*, *Columbus*, and ſome others, add to theſe a Thirteenth Bone, which they call *Vomer*, and place it between the Palate and *Os ſphæroides*; and will have it like a kind of *Septum*, to divide the Lower Parts of the Noſtrils. And *Veſalius* reckons the Two *Oſſa ſpongioſa* among theſe Bones of the *Superior Maxilla*.

MAXILLA *Inferior*, is the Lower or Moveable Jaw: This contains all the Lower Teeth. It hath two Proceſſes on each ſide; of which, the Foremoſt is thin and large, and ends in a kind of Point, to which the Tendon of the Temporal Muſcle is firmly knit, and this is called *Corona*: The other is obtuſe, and lies more backwards, and is join'd by a Cartilage to the Neck; and its Part, by which it adheres, they call *Condylus*: It hath Four *Foramina* deſign'd to tranſmit the aforeſaid Proceſſes.

MAXIMIS and *Minimis*. The Mathematicians call that Method whereby a Problem is reſolved, which requires the greateſt or leaſt Quantity attainable in that Caſe, *Methodus de Maximis & Minimis*.

Of this ſee *Hon. Faber*. at the End of his *Synopſis Geometrica*, where you have a great Variety of Problems of this kind. See alſo *Ozanam*'s Preface to his *Dictionaire Mathematique*; the Marqueſs *d' Hoſpital* his *Analyſe des Infiniment Petits*, Sect. 3, *&c.* In the *Acta Erud. Lipſ. A. D.* 1683. p. 122. there is alſo a Method of determining *Maxima & Minima*, by one *D. T.* chiefly applicable to the Drawing of Tangents to Curves: And in the ſame Book, and for the Year 1684. p. 467. you have a Method of the famous Mr. *Leibnitz*, for the ſame Purpoſe, according to his *Calculus Differentialis*. See alſo the Seventh Book of M. *De La Hire*'s *Conick Sections*, in Latin; and Chap. 7. of *Niewentiit*'s *Analyſis Infinitorum*. There is alſo printed in the Firſt Volume of *Des Cartes*'s *Geometry*, a Method of *Huddes*, for finding the *Maxima & Minima*, p. 137.

The following Account of this Method, was communicated to me by Mr. *Humphrey Ditton*, a Perſon very Skilful in theſe Matters; and now Maſter of the New Mathematical School in *Chriſt's Hoſpital*.

PROBLEM.

To determine any Flowing Quantity in an Equation propos'd, to an Extreme Value.

Tho' there are various excellent Methods for the doing of this, yet there is nothing that ſeems ſo clear and natural, and is really ſo general, ſo quick and eaſie, as that which the Doctrine of *Fluxions* furniſhes us withal.

To ſolve the Problem in any Caſe that can be propos'd, is only to make a juſt Application of this General Rule, *viz.*

Having put the Equation into Fluxions, *let the* Fluxion *of that Quantity (whoſe Extreme Value is ſought) be ſuppos'd* $= o$; *by which means all thoſe Members of the Equation in which it is found, will vaniſh, and the remaining ones will give the Determination of the* Maximum *or* Minimum *deſired.*

DEMONSTRATION.

Every *Maximum* or *Minimum* is in its own Nature a *Stable Quantity*: To determine therefore any Flowing Quantity to a *Maximum* or *Minimum*, is to make it (inſtead of a Flowing) a Permanent one; but the *Fluxion* of a Permanent Quantity is equal to Nothing. From whence the Reaſon of the Rule is ſufficiently clear.

Let us illuſtrate this by ſome Examples. *Ex. gr.*

Suppoſe $b\,b\,x - y\,y\,x + c\,y\,x - d^3 = o$, where y and x are Flowing Quantities, and y is to be determined to an Extreme Value. Then

$$b\,b\,\dot{x} - 2\,y\,\dot{y}\,x - y\,y\,\dot{x} + c\,\dot{y}\,x + c\,x\,\dot{y} = o,$$

and making $\dot{y} = o$, $b\,b\,\dot{x} - y\,y\,\dot{x} + c\,y\,\dot{x} = o$, and $y\,y - c\,y = b\,b$, from which Quadratick Equation y may be determin'd.

Let

Let $r\,x - \frac{r\,x\,x}{q} - y\,y = 0$, which is the Equation of an Ellipſe, where the *Latus Rectum* $= r$, the *Latus Tranſverſum* $= q$; the Abſciſſe $= x$, and the Ordinate $= y$; then we have

$\dot{r}\,\dot{x} - \frac{2\,r\,x\,\dot{x}}{q} = 2\,y\,\dot{y} = 0$, from whence $q\,r = 2\,r\,x$, and $x = \frac{q}{2}$; which Value of x ſubſtituted in the Equation of the Curve, gives $\frac{r\,q}{4} = y\,y$, and ſo $y = \sqrt{:\frac{r\,q}{4}}$ = the *Semi-Conjugate.*

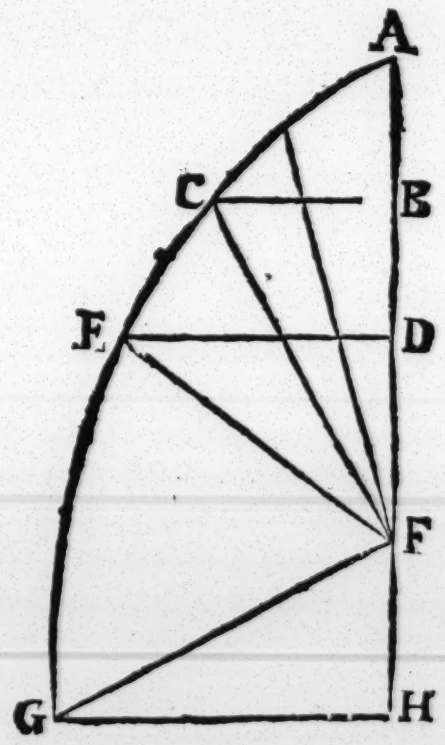
Again, Suppoſe $y\,y\,u - d\,y\,z - c\,c\,d = 0$, where y, z, u, are all Flowing Quantities; and y is to be determin'd to an *Extremum.* Now in all ſuch Caſes, where the Equation will involve the Fluxions of ſo many different Flowing Quantities, we muſt endeavour by convenient Subſtitutions to expunge ſome of them, that we may have no more than one ſort of Fluxions left to deal with; of which the Equation may be clear'd by ordinary Diviſion. And I think this Method, which I'll propoſe in the firſt place, to be a very eaſie and general one in order to this End. The Equation is $y\,y\,u - d\,y\,z - c\,c\,d = 0$, from whence $2\,y\,\dot{y}\,u + y\,y\,\dot{u} - d\,\dot{y}\,z - d\,\dot{z}\,y = 0$, and putting $\dot{y} = 0$, $y\,y\,\dot{u} - d\,y\,\dot{z} = 0$. Now to throw out theſe Fluxions in the laſt Equation, we need only ſubſtitute the Value of either of them from the Second Equation, where we find $\dot{u}$ (*ex gr.*) $= \frac{d\,\dot{y}\,z + d\,\dot{z}\,y - 2\,y\,\dot{y}\,u}{y\,y}$ wherefore $y\,y\,\dot{u} - d\,y\,\dot{z} = d\,\dot{y}\,z + d\,\dot{z}\,y - 2\,y\,\dot{y}\,u - d\,y\,\dot{z} = d\,\dot{y}\,z - 2\,y\,\dot{y}\,v = 0$, wheref. $d\,z - 2\,y\,u = 0$, which is the Equation deſired.

Suppoſe $y\,y\,x - z\,y\,x - m = 0$, and y to be determined to an *Extremum.* Then $2\,y\,\dot{y}\,x + y\,y\,\dot{x} - \dot{z}\,y\,x - z\,\dot{y}\,x - z\,y\,\dot{x} = 0$, and making $\dot{y} = 0$, $y\,y\,\dot{x} - x\,y\,\dot{z} - z\,y\,\dot{x} = 0$, but $\dot{z} = \frac{2\,y\,\dot{y}\,x + y\,y\,\dot{x} - z\,\dot{y}\,x - z\,y\,\dot{x}}{y\,x}$, wherefore ſubſtituting this in the Room of $\dot{z}$ in the former Equation, we have $y\,y\,\dot{x} - 2\,y\,\dot{y}\,x - y\,y\,\dot{x} + z\,\dot{y}\,x + z\,y\,\dot{x} - z\,y\,\dot{x} = 0$; that is, $z\,\dot{y}\,x - 2\,y\,\dot{y}\,x = 0$, and $z\,x - 2\,y\,x = 0$.

But Mr. *Niewentiit* furniſhes an Expedient for this Purpoſe alſo in the 7th Chap. of his *Analyſis Infinitorum*: He conſiders the Flowing Quantities in the Equation, as the Ordinates of ſo many ſeveral Curves, which have one common *Abſciſſa*; then ſubſtituting the Values of the Fluxions of theſe Ordinates (gotten by the general Property of all Curves) he brings all the Fluxions to one Expreſſion. *Ex. gr.* In the Equation above, $y\,y\,u - d\,y\,z - c\,c\,d = 0$, where we had $y\,y\,\dot{u} - d\,y\,\dot{z} = 0$, let y, u, z be conceiv'd to be the Ordinates of three ſeveral Curves, whoſe common *Abſciſſe* let $= x$, and let the *Subtangent* belonging to u be $= n$, and that for z be $= l$; then $\dot{v} = \frac{v\,\dot{x}}{n}$ and $\dot{z} = \frac{z\,\dot{x}}{l}$, wherefore $\frac{y\,y\,u\,\dot{x}}{n} - \frac{d\,y\,z\,\dot{x}}{l} = 0$, that is $l\,y\,u - d\,z\,n = 0$, the Equation for y determined to an *Extremum.* 'Tis true, this Equation appears ſomething different from that which was deduced by the former Proceſs: There the Equation was $d\,z - 2\,y\,u = 0$, and here 'tis $l\,y\,u - d\,z\,n = 0$; but that theſe Equations are exactly the ſame, is thus eaſily diſcovered. Becauſe $\dot{u} = \frac{v\,\dot{x}}{n}$, and $\dot{z} = \frac{z\,\dot{x}}{l}$ theref. $\dot{u} : \dot{z} :: \frac{u}{n} : \frac{z}{l}$; from whence $l : n :: z\,\dot{u} : u\,\dot{z}$, but (by what went before) $\dot{u} = \frac{d\,\dot{y}\,z + d\,\dot{z}\,y - 2\,y\,\dot{y}\,u}{y\,y}$, wheref. $l : n :: \frac{d\,\dot{y}\,z\,z + d\,\dot{z}\,z\,y - 2\,y\,\dot{y}\,z\,v}{y\,y} : v\,\dot{z}$; from hence in Mr. *Neiwentiit*'s Equation, *viz.* $l\,y\,u - d\,z\,n = 0$, ſubſtituting theſe Quantities in the Room of l and n, to which they are proportional, we have $\frac{y\,u\,z\,z\,d\,\dot{y} + u\,z\,y\,y\,\dot{z} - u\,u\,z\,2\,y\,\dot{y}}{y\,y}\,y - d\,u\,z\,\dot{z} = 0$, or dividing all by $u\,z$, and multiplying by $y\,y$, and rejecting Contradictories, we have $d\,z\,y\,\dot{y} - 2\,y\,y\,\dot{y}\,u = 0$, that is, $d\,z - 2\,y\,u = 0$. *Q. E. D.*

Theſe Examples may ſerve to illuſtrate a Rule which is in it ſelf very plain and obvious.

As for the Uſe and Application of the Doctrine *de Maximis & Minimis*, perhaps it may be as Uſeful and Noble a one as any, to ſhew how from hence all ſorts of Curves may be cut at Right Angles, and conſequently the Invention of the Tangents is to be performed.



Let A C G be any Curve whoſe Vertex is A, Axe A H, its Ordinates E D, C B, G H: Let any Point, as F, be taken in the Axe at Liberty, and

from thence the Lines F C, F E, F G be drawn to the Curve.

Let A F $= n$, A B, A D, A H $= x$, H F $= n + x$, B F, F D $= n - x$, E D, B C, G H $= y$, F C, F E, F G $= z$. The Point F being taken any where at liberty, 'tis evident, that when any Line, as F C, F G, *&c.* is coincident with F E, which I imagine to be a *Normal* to the Curve in the Point E, from the same Point F; that then the intercepted Line, F B, F H, *&c.* is coincident with the *Subnormal* F D, and consequently upon the determining of an *Extremum*, the Invention of a Tangent naturally follows.

To form the General Equation that is to serve in this Business, we have, from the Rectangular Triangle F B C, $z z = n n - 2 n x + x x + y y$; or on the other side F, from the Triangle G H F, $z z = x x - 2 n x + n n + y y$; or for an *Extremum*, $2 x x - 2 n x + 2 y y = 0$:

In which Equation, if in the room of $2 y y$ we substitute its Value from the Equation of the Curve, the *Subnormal* will be discovered.

Ex. gr. Suppose the Curve were an *Hyperbola*, then $2 y y = r \dot{x} + \frac{2 r x \dot{x}}{q}$: Therefore $2 x \dot{x} - 2 n \dot{x} + r \dot{x} + \frac{2 r x \dot{x}}{q} = 0$, and $2 n \dot{x} = 2 x \dot{x} + r \dot{x} + \frac{2 r x \dot{x}}{q}$ and $n = x + \frac{r}{2} \frac{r x}{q} =$ F A, wherefore F D (the *Subnormal*) $= \frac{r}{2} \frac{r x}{q}$ Q. E. I.

Suppose the Curve a Circle, in which Case $2 y \dot{y} = 2 r \dot{x} - 2 x \dot{x}$; then proceeding as before, we have $2 n \dot{x} = 2 r \dot{x}$, and $n = r$, and therefore F D $= r - x$; which shews that F is ever in this Curve, the Centre it self. In the Common *Parabola*, $r \dot{x} = 2 y \dot{y}$, and therefore $n = \frac{r}{2} + x$, and so F D $= \frac{r}{2}$. But 'tis not only in these Conick Sections, but in any other Curve whatsoever, that from this general Equation by a due Substitution of the Value of $2 y \dot{y}$, the Tangent, or (which is all one in effect) the Subnormal will be discover'd.

MEAN *Axis*, in *Opticks*. See *Axis*.

MEAN *Diameter*, in *Gauging*, is a *Geometrical Mean* between the Diameters at Head and Bung in any close Cask.

MEAN *and Extream Proportion*. See *Extream and Mean Proportion*.

MEAN in *Law*, signifies the Middle between two Extreams, and that either in Time or in Dignity. As in the First, His Action was *Mean* betwixt the Disseisin made to him and his Recovery, that is in the *Interim*, (or, as we say, in the *mean* time.) Of the Second, there is *Lord-mean* or *mesne*, and *Tenant-mean*. See *Mesne*.

MEAN *Motion*, or *mean Longitude of the Sun*, in the *Ptolemaick Hypothesis*, is an Ark of the Ecliptick, reckon'd from the Beginning of *Aries* to the Line of the Sun's Mean Motion, accounting according to the Order of the Signs. And 'tis also not unusual to call the

MEAN *Motion of the Sun*, in the Old Astronomy, the Distance (accounted on in the Ecliptick, from the Beginning of *Aries*) of the *Sun* from the Line of his *Mean Motion*. See *Line of the Sun's Mean Motion*.

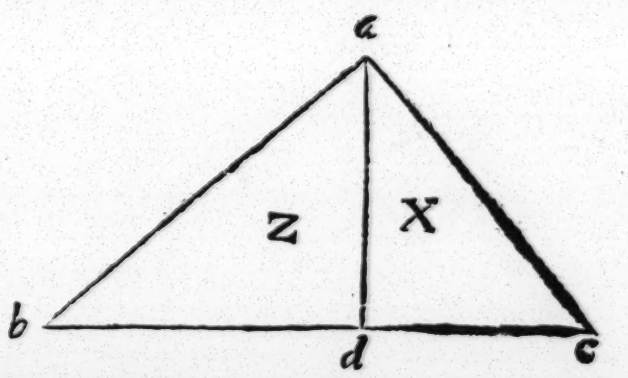
MEAN or *middle Proportional*, between any two Lines or Numbers, is that which hath the same *Proportion* to a third Term that the first bears to it.

Thus 8 is a *mean Proportional*, between 2 and 32, because 2 : 8 :: 8 32. And the three Numbers in this Case are thus expressed 2. 8. 32 :: That is, Two, Eight, and Thirty two, are in *Continual Proportion*; for the same *Proportion* is continued from the Middle or Second Term to the Third, as was between the First and Second: Therefore 'tis the very same thing as if the middle Term had been put down twice. Now, because when Four Numbers are *Proportional*, the Rectangle of the middle Terms is equal to that of the Extreams, it must be so here: But here the two middle Terms being the same Number, they will make a Square; so that when Three Numbers are in *continual Proportion*, the Square of the middle Term is equal to the Rectangle of the Extreams; and that middle Term is call'd a *mean Proportional* between the other two.

PROPOSITION.

In a Right angled Triangle

The Perpendicular (*a d*) is a *mean Proportional* between the Segments of the Hypothenuse (*b d* and *c d.*)

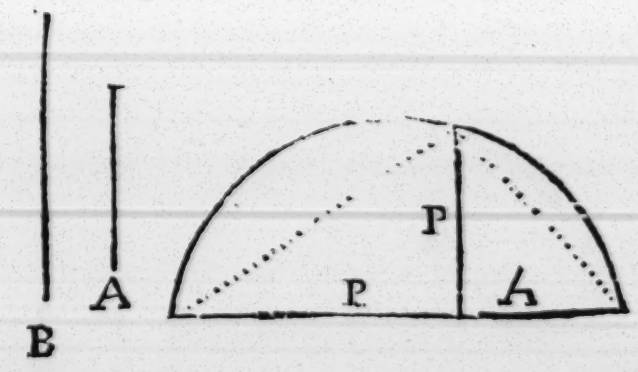


That is, as *b d* : *a d* :: *a d* : *d c*; and therefore the Square of *a d* is equal to the Rectangle between *b d* and *d c*.

For the Triangles *c d a* and *a d b*, being similar, 'twill be as *c d* : *d a* :: *d a* : *d b*; and consequently $\square\, d\, a = \square\, b\, d\, c$.

PROBLEM.

To find a Mean Proportional *to Two Given Lines*, A *and* B.



Put A and B both into one Line, then bisect the whole Line; make the Point of Bisection the Centre of a Semi-circle, and then erect the Line P perpendicular to the Two given Lines, at their Point

Point of Union: I ſay, the Line P is the *Mean Proportional* ſought.

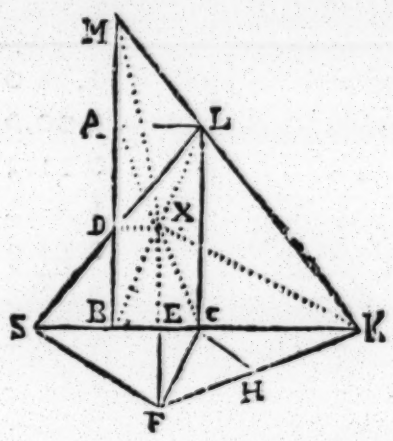
For B: P :: P: A, by the laſt Propoſition.

To find a Mean Proportional, *between any Two Numbers,*

Multiply the Numbers into one another, and extract the Square Root of the Product: Of which ſee more under *Logarithms*, and the *Uſe of Logarithms*, Numb, 11. and 12.

To find Two Mean Proportionals *between Two Given Lines,* A B *and* B C.

This famous Problem (which is the ſame as the *Duplication of the Cube*) may be reſolved and demonſtrated by means of the Conchoid of *Nicomedes*; and would be Geometrical, if that were a Geometrical Curve.



Join the given Lines A B and B C together at Right Angles, and biſſect each in the Points D and E: Compleat the Rectangle ALBC, and draw L D till it meet with C B produced to S. Then will S B. = A L or to B C. From E let fall a Perpendicular, which produce till C F be equal to A D, which will cut off the Part E F. Draw then F S, and parallel to it C H. Then (by *Cor.* 1. *Prop.* 2. of the *Conchoid*) through the Legs of the Angle K C H draw the Right Line F H K, ſo that H K be equal to C F. Draw alſo the Right Line K L M, producing it till it meet with B A alſo produced in M. So will C K and A M be the Two *Mean Proportionals* ſought.

DEMONSTRATION.

Let M A be called b. L C or A B = eb and B C = c. Then becauſe of the Similar Triangles M A L and L C K,

A M. L C or A B :: A L or A C. C K

$b \;.\; eb \quad :: \quad c. \quad \frac{ebc}{b}$ or ec

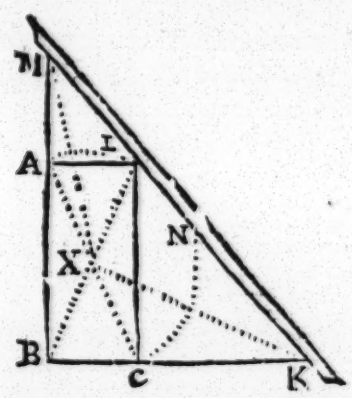
Wherefore ec = CK. Alſo MA. A D :: S C. CK

$b.\frac{cb}{2} :: 2c.ec.$

(Becauſe if you halve one Conſequent, you muſt double the other Antecedent.) And S C. C K :: F H. H K (becauſe C H is parallel to S F) Wherefore M A. A D :: F H. H K. H K is equal to A D or $\frac{1}{2}eb$ (as was taken above) wherefore F H muſt be equal to M A or b. And conſequently M D = F K (for both in this Notation are $b + \frac{1}{2}eb$.) And the Square of each will be $bb + ebb + \frac{1}{4}eebb$, that is = F E + □ E K, (by 47 *e* 1. *Eucl.*) And to theſe Equal Quantities adding the Squares of D X and E C, each of which is $\frac{1}{4}cc$. Their Sum, *viz.* □ M D + □ D X (*i. e.* □ M X) will be $bb + ebb + \frac{1}{4}eebb + \frac{1}{4}cc$; which alſo is equal to the Sum of theſe □ E F + □ E C (*i. e.* □ F C, which was = to A D = X E by the Conſtruction + □ E K = $\frac{1}{4}eebb + \frac{1}{4}cc + ecc + eecc$; that is equal to □ X K. Wherefore ſince the Squares are equal, the Roots or Line M X and X K muſt be equal to each other.

Now if from thoſe equal Sums $bb + ebb + \frac{1}{4}eebb + \frac{1}{4}cc$, and $\frac{1}{4}eebb + \frac{1}{4}cc + ecc + eecc$, you take away what is common to both, *viz.* $\frac{1}{4}eebb + \frac{1}{4}cc$, there will remain $bb + ebb = ecc + eecc$: Which will be found to be alſo, ſingly taken, equal to each other; becauſe the Part taken away bb, will be to the other Part taken away ecc:: as the Remainder ebb, is to the Remainder $eecc$; and both muſt be as their Wholes were, *i. e.* equal: Wherefore $bb = ecc$, and $ebb = eecc$. Which latter Equation reſolved into Proportionals will ſtand thus, as $cb.ec::ec.b$; or as A B. C K :: C K. M A. And if you reſolve the former Equation, it will be as $ec.b::b.c$. That is C K. M A :: M A. B C. Which is in plain Words the Propoſition, *viz.* that C K and M A are Two Mean Proportionals between A B and B C, *Q. E. D.*

On which *Demonſtration* is founded the Mechanical Way of *Eutocius*, *Lib.* 2. *De Sph.* and *Cylind.* for finding Two Mean Proportionals; which is thus:



Join the Given Lines A B and B C in a Right Angle, as before, and compleat the Rectangle, drawing the Diagonal to find the Point X, and producing B A and B C both ways towards M and K; for then fix a Ruler on the Centre L, and then return it forward and backward, till you find by the Compaſſes M X and X K are equal; and then A M and C K are the Lines ſought.

Another Method for which, *Eutecius* alſo mentions, which ſeems more practical; which is, To make a Semi-circle on A C the Diagonal of the Rectangle, then the Moveable Ruler is placed forwards and backwards till L M (by the Compaſſes) be found equal to N K, and that will give the Points M and K, and conſequently the Lines A M and C K required.

How to find Two *Mean Proportionals* by help of the *Ciſſoid* of *Diocles*, and by Two Parabola's, (which was *Menechmus* his way) ſee *Sturmius Matheſis Enucleata*, Book 2. Prop. 21. *Conſect. & Scholium.* *Des Cartes* doth the ſame Thing by help of One Parabola only, ſee his *Geometry*, p. 91. and as many as you pleaſe by help of a Curve Line generated after a peculiar way, which ſee in *p* 67, 68. of his *Geometry*. Much more of this Nature you have in *Sluſius's Meſolabium*.

MEASURE, in Muſick, is a Quantity of the Length and Shortneſs of Time, either with reſpect to Natural Sounds, pronounced by the Voice; or Artificial, drawn out of Muſical Inſtruments: Which

Which Measure is adjusted in Variety of Notes, by a constant Motion of the Hand or Foot, *down* or *up*, successively and equally divided; so that every *Down* and *Up* is called a *Time* or *Measure*, whereby the Length of a *Semi-breve* is measured, which is therefore termed, The *Measure-Note*, or *Time-Note*.

MEASURES. I thought it would be a very Acceptable Thing to the Reader, to see in one View, an Account of the Ancient and Present Measures of several Parts of the World: Which therefore I have here given him, as I occasionally collected them from the Best Authors.

A TABLE of the *Foreign Measures*, Carefully Compared with the *English*.

	Suppose an *English* Foot divided into 1000 Equal Parts, those here mentioned are in Proportion to it, as follows.	The *English* Foot divided into Inches and Decimal Parts of an Inch.
London —— Foot	1000	0.12.0
Paris —— the Royal Foot	1.068	1.00.8
Amsterdam —— Foot	.942	0.11.3
Brill —— Foot	1.103	1.01.2
Antwerp —— Foot	.946	0.11.3
Dort —— Foot	1.184	0.02.2
Rynland or *Leyden* —— Foot	1.033	1.00.4
Lorain —— Foot	.958	0.11.4
Mechlin —— Foot	.919	0.11.0
Middleburg —— Foot	.991	0 11.9
Stratsbourg —— Foot	.920	0.11.0
Bremen —— Foot	.964	0.11.6
Cologn —— Foot	.954	0.11.4
Frankford ad Manam —— Foot	.948	0.11.4
Spanish —— Foot	1.001	1.00.0
Toledo —— Foot	.899	0.10.7
Roman —— Foot	.967	0.11.6
On the Monument of { *Cestucius* / *Statilius* } ——	.972	0.11.7
Bononia —— Foot	1.204	1.02.4
Mantua —— Foot	1.569	1.06.8
Venice —— Foot	1.162	1.01.9
Dantzick —— Foot	.944	0.11.3
Copenhagen —— Foot	.965	0.11.6
Prague —— Foot	1.026	1.00.3
Riga —— Foot	1.831	1.09.9
Turin —— Foot	1.062	1.00.7
The *Greek* —— Foot	1.007	1.00.1
Paris Foot, according to Dr. *Bernard* ——	1.066	
Universal —— Foot	1.089	
Old *Roman* —— Foot	.970	
Bononian Foot of M. *Auzout* ——	1.140	
Lyon —— Ell	3.976	3.11.7
Bologn —— Ell	2.056	2.00.8
Amsterdam —— Ell	2.269	2.03.2
Antwerp —— Ell	2.273	2.00.2
Rynland or *Leyden* —— Ell	2.260	2.03.1
Frankford —— Ell	1.826	1.09.9
Hambourg —— Ell	1.905	1.10.8
Leiping —— Ell	2.260	2.03.1

Lubeck

The TABLE Continued.

Lubeck	Ell	1.908	1.09.8
Noremburg	Ell	2.227	2.03.3
Bavaria	Ell	.954	0.11.4
Vienna	Ell	1.053	1.00.6
Bosnia	Ell	2.147	2.01.7
Dantzick	Ell	1.903	1.10.8
Florence	Brace or Ell	1.913	1.11.0
Spaniſh or *Caſtile*	Palm	0.751	0.09.0
Spaniſh Vare or Rod, which is Four Palms		3.001	1.00.0
Lisbon	Vare	2.750	2.09.0
Gibraltar	Vare	2.760	2.09.1
Toledo	Vare	2.685	2.08.2
Naples	Palm	0.861	0.09.6
	Brace	2.100	2.01.2
	Canna	6.880	6.10.5
Genoa	Palm	0.830	0.09.6
Milan	Calamus	6.544	6.06.5
Parma	Cubit	1.866	1.10.4
China	Cubit	1.016	1.00.2
Cairo	Cubit	1.824	1.09.9
Old *Babylonian*	Cubit		1. 6.$\frac{24}{100}$
Old *Greek*	Cubit		1. 6.$\frac{11}{100}$
Old *Roman*	Cubit		1. 5.$\frac{426}{1000}$
Turkiſh	Pike	2.200	2.02.4
Perſian	Araſh	3.197	3.02.3

The *Hebrew* or *Jewiſh Long-Meaſures.*

	Feet	*Inches*	*Parts*
Cubit	1	09	888
Span, or Half-Cubit	0	10	944
Palm	0	03	648
Digit	0	00	912
Fathom, 4 Cubits, or	7	03	552
Ezekiel's Reed, 6 Cubits, or	10	11	328
Pole or *Canna*, 8 Cubits, or	14	7	104
Schænus, Chain or Line	145	$\frac{92}{100}$	

Sabbath-Day's Journey, 2000 Cubits, or 3648 Feet.
Eaſtern Mile, 4000 Cubits, or 7296 Feet.
Par ſang, 12000 Cubits, or 24888 Feet, or $4\frac{144}{1000}$ Miles.
Stadium, $\frac{1}{30}$ of a *Paraſang*, or 400 Cubits.
A *Day's Journey*, 8 *Paraſangs*, or 96000 Cubits, or 33,16 Miles.

The *Hebrew Measure* of *Capacity*.

	Solid Inches	*W. Gal.*	*Pints*	*Solid Inches*
Epha, or *Bath*	1747.7	7	4	15.2
Corus, or *Choner*, is	17477	75	5	7.0
Seah, $\frac{1}{3}$ of an *Epha*	582.5	2	4	3
Hinn, $\frac{1}{6}$ of an *Epha*	291.25	1	2	1.5
Homer, $\frac{1}{10}$ of an *Epha*	174.77	0	6	0.5
Cab, $\frac{1}{18}$ of an *Epha*	97.03	0	3	10
Log, $\frac{1}{72}$ of an *Epha*	24.25	0	0	24.2
To which add the *Syrian Metretes*, or *Congius Romanus*	207.06		7	$\frac{1}{8}$

The *Grecian Long Measures*.

Schoenes. This ſome will have to contain 60, ſome 30, others 32, and others 40 Furlongs.

Paraſang, is the ſame with the Hebrew Paraſang.

Dolich. This ſome will have to contain 24 Furlongs; but the common Account is 12.

Hippicon, containing 4 Furlongs.

Diaulus, Two Furlongs.

Plethron. This ſome make an Acre, as *Plutarch*; others $\frac{1}{4}$ of a Furlong, or 100 Feet, as *Suidas*; others 10000 Feet, as *Heſychius*; and ſome make it 100 Furlongs. But *Suidas* ſeems righteſt in ſtating it 100 Foot.

Pygon. This *Heſychius* ſuppoſes the Length from the Elbow to the Fingers Bent, which ſome call *Palmipes*; that is, a Foot and a Palm, or 20 Fingers Breadth.

Pygme, is the Length from the Elbow to the End of the Hand, when the Fiſt is cloſed, and is two Inches ſhorter than the Pygon.

Orthodoron. Some make this a Palm, others a Span; but 'tis ſhorter by a Finger's Breadth than the Span, or Greater Palm.

Lichas, is uſually reckon'd the Length or Span between the End of the Thumb and of the Fore-finger, when both are ſeparated and extended; and therefore is leſs than the Orthodoron by a Finger's Breadth. Some will have it the ſame with *Dichas*, which *Cowper*, in his Dictionary, ſays, is but 8 Fingers Breadth; but the former Account ſeems trueſt.

Paleſt, the ſame with *Doron*, is the Leſſer Palm; being 4 Fingers Breadth, or 3 Inches *Engliſh*.

But there is great Uncertainty in theſe Accounts.

The *Meaſures* of *Capacity*, were,

1. The *Kypſele.* This *Scapula* reckons a Corn-meaſure, and is ſuppoſed to contain 6 Attick Medimnoi.

2. *Medimnos*, both Attick and Georgick, contained 48 Chænices, or 72 Sextaries. But becauſe the Georgick Chænix was larger than the Attick, there muſt be ſome Difference between them.

3. *Metretes.* Some render this by *Cadus*, and ſome by *Amphora*; the latter is wrong, for the *Amphora* is another Meaſure. This *Legat*, and ſome others, will have equal to the Attick Medimnos. This was not the Syrian Metretes, mentioned *John* 2. 6. for that was the ſame with the *Congius Romanus*.

4. *Amphora*, or *Amphoreus.* This was a Georgick Meaſure, and was half the Medimnos or *Metretes Georgicus*, as ſay ſome; others (as *Schrevelius*) will have it an Attick Meaſure, and to contain 3 Urns.

5. *Modion* was not what we call a Buſhel, but a Meaſure much leſs. *Alſted* computes it to contain 8 Attick Chænices, or 12 Sextaries: Others make it hold 16 Sextaries; and others a Pint leſs than our Peck.

6. *Chous*, *Chus* and *Choas*, was of two ſorts: the Attick held 6 Attick Sextaries, and the Georgick Chous 9 Georgick Sextaries.

7. *Chænix.* This ſome take for the Meaſure of Servants Food for one Day. The Attick Chænix, 'tis probable, held about one Attick Sextary and an half; and the Georgick 2 and $\frac{1}{4}$ of ſuch. Others ſay, that the latter held but barely 2 Attick Sextaries. Some alſo mention a *Bilibral*, *Quadrilibral*, and *Quinquelibral Chænix*. So that 'tis hard to determine any thing certain, as to theſe Matters.

8. *Sextarius*, or *Xeſta.* This ſome make 2 Kotyles, or $\frac{1}{2}$ of the Attick Chous. This Meaſure, ſay ſome Authors, would hold 20 Ounces of Water, others 24: Others are ſo exact as to tell you, that it held exactly 13 Ounces 7 Pennyweights and 18 Grains, *Troy*: Some ſay it held a Pint and an half of our Meaſure; and others will have it but half a Pint.

9. *Kotyle Attick*, is the Half Sextary. Some make this equal to the Roman *Hemina*; and then the Roman and the Attick Sextaries will be the ſame. This the *Romans* wrote *Cotyle*.

10. *Tetaction.*

10. *Tetacton.* This was a Liquid Measure, being a fourth Part of the Attick Sextary, and therefore called also *Quartarius.* But the Georgick Sextary contained 2 $\frac{1}{3}$ of the Georgick Tetacton.

11. *Oxybaph.* This in the Attick Measure was the Twelfth Part of the *Chœnix*; but in the Georgick the Eighth.

12. *Kyath*, in Latin *Cyathus*: One and half of this was an *Oxybaph.*

13. *Coucha* was the Half of a Kyath.

14. *Myſtrum*, the Half of the Coucha.

15. *Cheme.* One *Myſtrum* contained 2 $\frac{1}{2}$ of the Cheme.

A TABLE of *Grecian Exotick Meaſures*, compared with the *Attick.*

1. *Achana Perſica.* This, according to *Heſychius*, was a Corn-meaſure, and contained 7 Kypſeles, and 3 *Medimni.*

2. The *Syrian Metretes*: Which our very learned Dr. *Cumberland*, Biſhop of *Peterburgh*, hath proved to be the ſame with the *Congius Romanus*, and holds of our Meaſure 7 Pints, and $\frac{1}{8}$ or 207.06 ſolid Inches. This is what we tranſlate (but wrongly) a Firkin, *John* 2. 6.

3. *Artaba Perſica.* This, from the Authority of *Herodotus*, *Lib.* 1. *Pag.* 49, may be concluded to hold 3 Chœnices more than the Attick Medimnus. St. *Jerom*, on *Iſaiah*, *Chap.* 5. ſaith, that this Meaſure held 20 *Modii.*

4. *Kyprus*, or *Cyprus*, was the ſame with the Attick Medimnus.

5. *Artaba Ægyptica.* This *Epiphanius* makes the ſame with the Attick Medimnus; as alſo was, ſaith he, the Median Artaba: But *Fannius* and *Legat* make it but 3 $\frac{1}{3}$ *Modii.*

Medimnus Kyprius, { *Salaminca*, *Papho*, } contained { 5 *Modii.* 4 *Modii*, and 1 *Chous.*

7. *Collathum Syrium*, was the ſame Meaſure with the Pontick Modius, and was double to the Common Modius. And the like Quantity did the

8. *Ponticus Cyprus* contain alſo, as *Epiphanius* ſaith.

9. *Subitha Syria*, held 22 Attick Sextaries.

10. *Mares Ponticus*, held (according to *Epiphanius*) 20 Alexandrian Sextaries; which how much different from the Attick I know not.

11. *Kophinus.* This was a Boetick, both Liquid and Dry; and *Legat* ſaith it held 3 *Congii.*

12. *Modius Cyprius*, is a Meaſure containing 17 Attick Sextaries.

13. { *Kamſaces*, *Tetarpe Laconices*, } each a Meaſure of twelve Sextaries.

14. *Dadix*, a Boetick Meaſure, containing ſix Chœnices.

15. *Aphin*, an Ægyptian Meaſure of 4 Chœnices: And of the ſame Meaſure doth *Heſychius* make the *Topium* to be; but he tells us not where the *Topium* was uſed.

16. *Caphita*, a Perſian Meaſure of two Attick Chœnices. To this was the *Mares* equal; and ſome ſay was a Meaſure uſed in *Boetia.*

17. *Irion.* This with the *Ægyptians*, ſaith *Legat*, was the Word for the Sextary; and, according to *Epiphanius*, held juſt two Pound of Oyl.

18. *Elenius*, the ſame with the *Tetarton*, or one Quarter of a Sextary.

19. *Gabenon*, the ſame with the *Oxybath* or *Aretabule.*

20. *Alabaſtron* was a Meaſure containing a Pound of Oyl.

A TABLE of *Engliſh Long Meaſures.*

Inch	*Palm*	*Span*	*Foot*	*Cubit*	*Yard*	*Ell*	*Pace*	*Fath*	*Pole*	*Furl.*	*Mile.*
3	1										
9	3	1									
12	4	1 $\frac{1}{3}$	1								
18	6	2	1 $\frac{1}{2}$	1							
36	12	4	3	2	1						
45	15	5	3 $\frac{3}{4}$	2 $\frac{1}{2}$	1 $\frac{1}{4}$	1					
60	20	6 $\frac{2}{3}$	5	3 $\frac{1}{3}$	1 $\frac{2}{3}$	1 $\frac{1}{4}$	1				
72	24	8	6	4	2	1 $\frac{3}{4}$	1 $\frac{1}{5}$	1			
198	66	22	16 $\frac{1}{2}$	11	5 $\frac{1}{2}$	4 $\frac{2}{5}$	3 $\frac{1}{10}$	2 $\frac{3}{4}$	1		
7920	2640	880	660	440	220	176	132	110	40	1	
633 0	21120	7040	5280	3520	1760	1408	1056	880	320	8	1

A TABLE of *Square Meaſures.*

Inches ſq.	*Feet ſq.*	*Yards ſq.*	*Paces ſq.*	*Poles ſq.*	*Roods ſq.*	*Acres ſq.*	
144							
1296	9						
3600	25	2,77					
39204	272. 25	30,25	10,89				
1568160	10890	1210	435,6	40			
	43560	4840	1742,4	160	4		
		3097600	1115136	102400	2560	640	*Mile.*

Dry Meaſures of Capacity, are raiſed from the Gallon containing 8 Pints, which ſhould be contained in $272\frac{1}{4}$ Cubick Inches, and ſhould hold of pure Running or Rain-Water, 9 Pound, 13 Ounces, 12 Drams and $\frac{1}{2}$, *Averdupois* Weight: ſo that to have a true Gallon for *Dry Meaſure*, you muſt make a Cubick Veſſel that ſhall have all the Sides 6 Inches, and $1\frac{48}{100}$ Parts of an Inch ſquare. Or if you would weigh with *Averdupois* Weight, 9 Pound, 13 Ounces, and 12 $\frac{1}{2}$ Drams of clean Running Water.

A TABLE of *Dry Meaſures.*

Pints	*Gallons*	*Pecks*	*Buſhels*	*Strikes*	*Carnock or Coom*	*Seem or Quarter*	*Way*	*Laſt*	
8									
16	2								
64	8	4							
128	16	8	2						
256	32	16	4	2					
512	64	32	8	4	2				
3072	384	102	48	24	12	6			
5120	640	320	80	40	20	10	12		
1 ℔	8 ℔	16	64	128	256	512	3072	5120	Troy
14 ℥	7 ℔	14	56	1 C.	2 C.	4 C.	24C.	40C.	Averd.

Liquid Meaſure, is either of *Wine, Ale,* or *Beer.*

The *Wine Gallon* contains 231 Cubical Inches, and ſhould hold of pure Running Water 8 Pound, 1 Ounce, 11 Drams *Averdupois*; or 9 Pound, 10 Ounces, $1\frac{1}{4}$ Peny-weight, *Troy*; or a Cubick Veſſel of 6 Inches, and 1300 Parts every way.

A TABLE for *Wine-Meaſure, Honey, Oyl,* &c.

								Pints
							Galls.	8
						Rundl.	18	144
					Barrels	$1\frac{3}{4}$	$31\frac{1}{2}$	252
				Terces.	$1\frac{1}{3}$	$2\frac{1}{3}$	42	336
			Hogſh.	$1\frac{1}{2}$	2	$2\frac{1}{2}$	63	504
		Punch.	$1\frac{1}{3}$	2	$2\frac{2}{3}$	$4\frac{2}{5}$	84	672
Butt	*or Pipe*	$1\frac{1}{2}$	2	3	4	7	726	1008
Tun.	2	3	4	6	8	14	252	2016

The

The *Beer* or *Ale Gallon* holds 282 ſolid Inches, and weighs of pure Water 13 Pound, 3 Ounces $1\frac{426}{1000}$ parts, *Averdupois*; therefore the Cubick Veſſel ought to be 6 Inches, and 5500 parts of an Inch each way, to find this *Gallon*.

A ſolid Foot contains 1728 ſolid Inches; that is, 6.128 Gallons; and a *Hogſhead* contains 10.287 ſolid Feet; or if in round Numbers you allow 10 Feet to be in a *Hogſhead*, then the *Butt* will contain 20, and the *Tun* 40 Feet.

A TABLE for *Beer Meaſure*.

			Gallons.	*Pints.*
		Firkins.	9	72
	Kilderkins.	2	18	144
Barrels.	2	4	36	288
Hogſheads. 2	4	8	72	576

A TABLE for *Ale Meaſure*.

			Gallons.	*Pints.*
		Firkins.	9	64
	Kilderkins.	2	18	128
Barrels.	2	4	36	256
Hogſheads. 2	4	8	72	512

A *Degree*, or $\frac{1}{360}$ part of the Circuit of the Earth, according to

Dr. *Bernard*, is { $73\frac{14}{10}$ *Engliſh* Miles, of 5000 Foot in a Mile. / $67\frac{4}{10}$ *Catholick* Miles. / $66\frac{2}{3}$ *Arabick* Miles.

Mr. *Norwood*, $69\frac{1}{2}$ *Engliſh* Miles, or 367200 Feet.

Mr. *Picard*, ——————— 365184 Feet.

MEATUS *Auditorius*, the Auditory Paſſage, begins from the *Concha* and winds towards the inward part of the Ear, and is cloathed with a thin Skin as far as the brim of the *Tympanum*, or Drum of the Ear: Its uſe is to receive the Sound, and to convey it eaſily, but yet truly and ſo effectually to the *Tympanum*; within this Cavity is the *Ear-wax*, or *Cerumen*.

MEATUS *Urinarius*. See *Urethra*.

MECHANICKS, Dr. *Wallis* defines to be the Geometry of Motion; and is a Mathematical Science which ſhews the Effects of *Powers*, or moving Forces, ſo far as they are applied to Engines; and demonſtrates the Laws of Motion, *&c.* 'Tis alſo commonly taken for thoſe *Handy-crafts*, which require as well the Labour of the Hands, as the Study of the Brain.

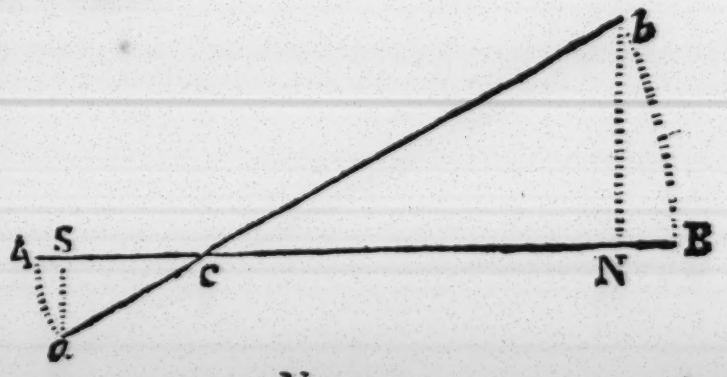
The Principle on which all Mechanick Power depends, will be eaſily underſtood by the Reſolution of this Problem.

Any Body as A, *with its Celerity* C, *being given; and alſo another Body as* B: *'Tis required to find the Velocity neceſſary, to make the* Moment, *or quantity of Motion in* B, *to be equal to the Moment of* A, *the given Body.*

Now ſince the *Moment of any Body is equal to the Rectangle under the Celerity and the Quantity of Matter*; as you will find in the *Laws of Motion*, (ſee the Word *Motion*:) You need only make as B to A : : ſo is C to a fourth Term, which will be *c*, the Celerity proper to B, ſo that its Moment ſhall be equal to that of A.

And from hence it follows, That any Body, though never ſo ſmall, may have a *Moment* equal to that of any other Body, tho' never ſo great, which ſhall be moved with any given Celerity.

Wherefore in any *Machine* or *Engine*, if the Velocity of the *Power*, be made to the Velocity of the *Weight* : : reciprocally as the *Weight* is to the *Power*; then ſhall the Power always ſuſtain or move the weight.



Let A B be a *Vectis*, or *Leaver*, whoſe *Fulcrum* is at *c*, and let it be moved into the Poſition *a c b*.

I ſay, that the Velocity of any Point in the Leaver is as its Diſtance from the Centre. Let the Point A deſcribe the Ark A *a* ; and the Point B, the Ark B *b* : Then theſe Arks will be the Spaces deſcribed by the two Motions : But ſince the Motions are both made in the ſame Time, the Spaces will be as the Velocities. (See Mr. *Keil*'s Laws of Motion, under the Word *Motion*, *Theorem* 6.) But 'tis plain, the Arks A *a*, and B *b*, will be to one another as their *Radii* A C, and A B, becauſe the Sectors A C *a*, and B *c b*, are Similar: Wherefore the Velocities of the Points A and B are as their Diſtances from the Centre C. *Q. E. D.*

Now if any Powers are applied to the Ends of the Leaver A and B, in order to raiſe its Arms up and down, their force will be expounded by the Perpendiculars S *a* and *b* N ; which being as the Right Sines of the former Arks *b* B and *a* A, will be to one another alſo as the *Radii* A *c* and *c* B: Wherefore the *Velocities of the Powers are alſo as the Diſtances from the Centre.*

And ſince the Moment of any Body is as its Weight, or gravitating Force and its Velocity conjunctly ; if different Powers or Weights are applied to the Leaver, their Moments will always be, as the Weights (or Powers) and their Diſtances from the Centre conjunctly.

Wherefore if to the ſame Leaver there be two Powers or Weights applied reciprocally proportional to their Diſtances from the Centre, their Moments will be equal ; and if they act contrarily, as in the Caſe of the *Statera* or *Stilliard*, the Leaver will remain in an Horizontal Poſition, or the Balance will hang in *Æquilibrio.*

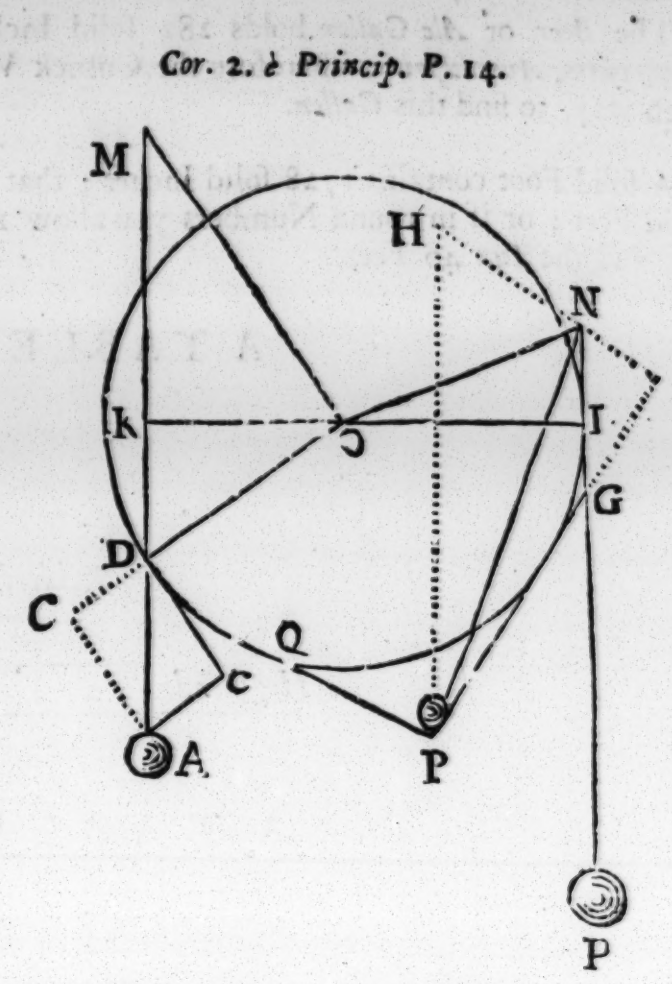
And thus 'tis eaſie to conceive how the Weight of one Pound may be made to Equi-balance a thouſand, *&c.*

And from hence 'tis plain, That the Force of the Power is not at all encreaſed by Engines, but only the Velocity of the Weight in either Lifting or Drawing, is ſo diminiſhed by the Application of the Inſtrument, that the Moment of the Weight may not be greater than the Force of the Power.

Thus for Inſtance : If any Force can elevate a Pound weight with a given Velocity ; 'tis impoſſible, by any Engine, to effect that the ſame Power ſhall raiſe two Pound weight with the ſame Velocity : But you may by an Engine raiſe two Pound weight with half the Velocity ; or 10000 times the weight with one 10000th part of the former Velocity.

The Admirable Sir *Iſaac Newton* accounts for all the Mechanick Powers by this following Diagram.

Cor. 2. *è Princip. P.* 14.



From O the Centre of any Wheel, let there be drawn the unequal *Radii* M O and O N, by the Threads M A, and N P ſuſtaining the Weights A and P ; and let the Forces of the Weights for the moving of the Wheel be required.

Thro' the Centre O, draw K O L Perpendicular to the Threads, then with the longer Radius O L, deſcribe a Circle cutting the Threads in D and L : Draw D O, and Parallel to it A c ; draw alſo the Perpendicular D C : Becauſe it matters not whether the Points of the Threads K, L, D, be fixed or not to the Plane of the Wheel, ſince the Weight, will weigh the ſame as if they were ſuſpended by the Points K and L, or D and L : For the whole Power of the Weight A is expreſſed by the Line D A : And this Diagonal is reſolvable into the two Forces, D C and A C, (by *Cor.* 2.) Now A C being Parallel to D O, and drawing the Radius D O directly from the Centre ſignifies nothing towards turning the Wheel. But the other Force D C drawing the Radius D O Perpendicularly, doth the ſame as if it drew the Radius O L Perpendicularly downwards, for O D = O L: That is, it doth what the Weight P doth. Now, let the Weight P, be in the ſame Proportion to A : : as D C is to D A: That is, by Reaſon of the Similar Triangles A D C and D O K :: as O K is to O D, or to O L. Then I ſay the Wheel cannot move at all, becauſe the Weights A and P, are reciprocally as their *Radii* O K and O L placed in the ſame Right Line ; and therefore there will be an *Æquilibrium.* Which is the known Property of the *Balance*, *Lever*, *Wheel*, *Windlace*, &c. But if the Weights be in any other *Ratio* but this, of K O to O L, the Wheel will turn that way, in which the Proportion exceeds.

Let there be another Weight *p* = to the former Weight P, which let be partly ſuſpended by the Thread N P, and partly ſuſtained by the Inclined Plane *p* G : To which Plane draw H N Perpendicular, and H *p*, Perpendicular to the Horizon. Now, 'tis plain, by *Cor.* 1. That if the Tendency of the Weight downwards be expounded by the Line H *p*, it is then Reſolvable into the Forces *p* N. and H N. If

If Q *p* be drawn Perpendicular to the Thread N *p*, ſo as to cut the Plane *p* G, in a Line Parallel to the Horizon: And if the Weight *p* be ſuppoſed to lie only on the two Planes *p* Q, and *p* G, the Weight will preſs theſe Planes Perpendicularly with the Forces *p* H, and H N: That is, it will preſs the Plane *p* Q, with N *p*; and the Plane *p* G, with H N.

Wherefore, if Q *p* be ſuppoſed to be taken away, ſo that the Weight *p* may ſtretch the Thread N *p*; then, becauſe the Thread now ſuſtaining the Weight, ſupplies the Place of the Plane Q *p*, the Thread will be ſtretch'd by the Force N *p*, which before preſſed on the Plane *p* Q.

Wherefore the Tenſion of this Oblique String, to the Tenſion of the other Perpendicular one N *p*:: is as *p* N is to *p* H.

And conſequently, if the Weight *p*, be to the Weight A:: in a *Ratio*, compounded of the reciprocal *Ratio* of the leaſt Diſtances of the Threads A M, and *p* N, from the Centre of the Wheel, and of the direct *Ratio* of *p* H, to *p* N, the Weight will be in *Æquilibrio*, as any one may ſoon try.

Hence 'tis plain, that the Weight *p* lying on thoſe two Oblique Planes, is in the Nature of a Wedge within the Parts of a Cloven Body; and conſequently the Forces of the Wedge and Beetle may from hence alſo be known.

For the Force with which the Weight *p* preſſes the Plane *p* Q, is to the force with which either by its own Gravity, or by the ſtroak of the Beetle it is impelled according to the Line H *p* in that Plane, :: as *p* N, is to *p* H, and to the Force with which it preſſes the other Plane *p* G:: as *p* N. N H.

And ſince the Screw is nothing but a Wedge forced by a Leaver, its Power or Force may by this Method be eaſily calculated.

Wherefore (adds the Excellent Author:) This Corollary is of moſt Extenſive Uſe, ſince all Mechanicks depend upon it.

MECHANICK *Powers*, (as they call them) are Six, viz. The *Balance*, *the Leaver*, the *Wheel*, the *Pulley*, the *Wedge*, and the *Screw*; to ſome or other of which, the force of all *Mechanical* Inventions, muſt neceſſarily be reduced. See thoſe words.

MECHANICAL *Philoſophy*, is the ſame with the *Corpuſcular*, which endeavours to explicate the *Phænomena* of Nature from *Mechanical Principles*; *i. e.* from the *Motion*, *Reſt*, *Figure*, *Poſition*, *Magnitude*, &c. of the Minute Particles of Matter. And theſe Principles are frequently called

MECHANICAL *Cauſes*: And alſo the

MECHANICAL *Affections* of Matter.

MECHANICAL *Solution* of a Problem in Mathematicks, is either when the Thing is done by repeated Tryals, or when the Lines made uſe of to ſolve it are not truly Geometrical. Thus the Method of *Nicomedes*, *Eratoſthenes*, *Pappus* and *Vieta*, for finding two mean Proportionals; and that of *Nicodemus* and *Dinoſtratus*, for dividing an Angle into any Parts aſſigned, by means of the *Quadratrix*, is *Mechanical*: Becauſe the former is done by repeated Tryals, and the latter by the means of a Curve that is not truly Geometrical.

MECONIUM, properly is an Opiate, or the condenſed Juice of Poppies. Alſo the Excrements of a *Fœtus*, which ſtick to the Inteſtines after the Birth, are improperly ſo called, from the Blackneſs of their Colour, like to that of Poppy Juice.

The *Opium* which we have in *England*, *France*, &c. is only a *Meconium* made by expreſſing the Juice of the Oriental Poppies, which is thickened a little by Evaporation, and then wraps up in Leaves to be ſold here: But the *Turks*, &c. keep the Tears of their Poppies, or the true *Opium* to themſelves, and will not vend them abroad.

MEDALLIONS, are large Medals Coined, not as Current Money, but on ſome ſpecial extraordinary Occaſion.

MEDALS, are Pieces of Metal like Money, Stamp'd or Coined upon ſome Extraordinary Occaſion, to perpetuate the Memory of ſome great and Eminent Perſon, or of ſome conſiderable Victory, or other Publick Benefit to a Nation, or People.

They divide *Medals* into *Ancient* and *Modern*; and they account Ancient, all ſuch as were Coined between the Third and Ninth Age of Chriſt. The Modern are ſuch as have been made within theſe laſt 3 or 400 Years.

Of the Ancient Medals, the moſt Ancient are the *Greek*; and the *Conſular Medals*, are the moſt Ancient of the *Latin* ones.

MEDIANA *Vena*, is the Middle Vein in the bending of the Cubit, betwixt the Cephalick and Baſilick; it is ſafely opened, becauſe there's neither Nerve nor Artery under it.

MEDIAL *Alligation*. See *Alligation Medial*.

MEDIASTINUM, is a doubling of the *Pleura*, or Membrane clothing the internal Parts of the *Thorax*, Ribs, *&c.* and it divides the Lungs and other *Viſcera* of the Breaſt, into two parts. It proceeds from the *Vertebres* of the Back, and going on forward, reaches the Breaſt-bone, and there makes an eminent Partition in the very middle of the *Thorax*.

MEDIASTINA, is a Branch of the *Subclavial* Veins, which ordinarily comes from the Trunk of the *Cava*; it goes to the *Mediaſtinum* and *Thymus*.

MEDIATION, according to ſome Writers of Arithmetick, is Diviſion by 2, or taking the half of any Number or Quantity. This is called alſo *Bipartition*; and in Reference to Lines, uſually *Biſſection*.

MEDIATUS *Linguæ*, or *Party-Jury*, is a Jury Impanelled upon any Cauſe, wherein a Stranger is Party, whereof the one half conſiſts of Denizens, the other of Strangers, and is uſed in Pleas, where one Party is a Denizen, and the other a Stranger.

MEDICINE, or as 'tis commonly called *Phyſick*, is an Art aſſiſtant to Nature, and deſigned for the preſerving of Health in Humane Bodies, as much as is poſſible, by the Uſe of convenient Remedies. *Sennertus* and others, divide it into five parts.

1. *Phyſiologia*, which treats of an Human Conſtitution, as it is ſound and well; to which belongs *Anatomy* too.

2. *Pathologia*, which treats of the Preternatural Conſtitution of our Bodies.

3. *Semiotica*, which treats of the Signs of Health and Diſeaſes.

4. *Hygicina*, which delivers Rules for the *Regimen* to be obſerved in the Preſervation of Health.

5. *Therapeutica*, which teaches the Management of

of *Diet*; and comprehends *Chirurgery*, and the Art of *Medicine*, properly ſo called.

The general Diviſion of Phyſick is only into two Parts; the *Theory* and the *Practick*: An accurate Skill in both which, are neceſſary to make a Man a good Phyſician.

MEDIO *Acquittando*, is a Writ Judicial, to diſtrain a Lord for the *acquitting* a *Mean* Lord from a Rent which he formerly acknowledged in Court, not to belong to him.

MEDIUM in Natural Philoſophy, ſignifies that peculiar Conſtitution of any Space or Region through which Bodies move. Thus the *Æther* is ſuppoſed by ſome to be the *Medium* in which the Planets and Heavenly Bodies move. The *Air* is the *Medium* in which all *Meteors* are generated and move; and by the means of which it is that all Land Animals, as Inſects, Birds, Beaſts, and Men, can Breath and Live. But water is the *Medium* in which Fiſhes Live and Move. And whatever Denſity, or Tenacity there is in the Parts of this *Fluid Medium*, whereby Bodies moving in it are hindred or ſtopped, ſo that the Motion becomes ſlower, or is made in part to ceaſe, is called the *Reſiſtance of the Medium*. And Sir *Iſaac Newton* hath proved, That this Reſiſtance of the *Medium* to the Motion of Bodies, is always as the Square of the Velocity of the moving Body. *Princip. Philoſ. Math.* p. 245. See *Reſiſtance of the Medium*.

MEDIUS *Venter*. See *Thorax*.

MEDULLA *Cerebri* is the white ſoft part of the Brain, covered on the outſide with the Cortical Subſtance, which is of a more dark or aſhy-colour: It is called alſo the *Corpus calloſum*, and is an Union or Conjunction of both ſides of the Brain into one. *Willis* obſerved, That this Part conſiſted of an Innumerable Number of *Striæ*, or *Fibræ*, tending length-wiſe: And *Malpighius* aſſerts, That by the help of a Microſcope they appear ſo viſible as to look ſomething like the Teeth of an Ivory Comb.

MEDULA *oblongata*, is that part of the Brain within the Skull, which is the beginning of the Spinal Marrow; it is about 3 or 4 Inches in length within the Scull, and then it deſcends to the *Os Sacrum*, thro' the Hole of the hinder part of the Head and the Vertebræ: It ſends out ten pair of Nerves to the Cheſt, the Abdomen, and the Limbs. It is call'd alſo the *Common Senſory*, becauſe the Original of the Nerves being there, it is the common Place or Receptacle of all that comes to the Brain by the external Senſes.

MEDULLA *Oſſium*, Marrow in the Bones, is a ſoft fat ſubſtance plac'd in the Cavities, or Poroſities of the Bones; it is kept in a Membrane, and is quite deſtitute of all Senſe; it is red in the greater Cavities, white in the leſs, and ſoft and ſucculent in ſpungy Bones.

MEDULLA *Spinalis*, or the Spinal Marrow, is the Continuation of the *Medulla Oblongata* without the Scull; and which paſſing thro' all the *Vertebræ* of the Back, ends at laſt at the *Os Sacrum*; it is a kind of Coagmentation of Nerves, ſending out thirty pair of Nerves on each ſide, to the Limbs, to the great Cavities, and other parts of the Body. If it be waſh'd with a convenient Liquor, it will ſever into a great many little Fibres, which alſo are very conſpicuous in its Original, the *Medulla Oblongata*.

MEDULLA of a Plant, or rather Tree, is the ſame with *Cor*; which ſee.

MEDULLARY *Oil*, is the finer and more ſubtile part of the Marrow of the Bones; which paſſes into them not by Ducts (ſaith Dr. *Havers*) but by ſmall Pores formed into the Veſicles or Glandules (which are conglomerated into diſtinct Lobules contained in ſeveral Membranes, or Bags, and theſe Bags are contained in one common Membrane Inveſting the whole Marrow: And all theſe Veſicles, Bags, and Coat or Membrane are propagated from the outward Coat of the Arteries) by which it paſſes from one to another, till it arrives at the ſides or extream parts of the Bone.

That part of it which is ſupplied to the Interſtices of the Joints, paſſes into them by Paſſages, penetrating thro' the Bone into thoſe Cavities, and formed for this end.

The Uſe of this Oil is either common to all the Bones, whoſe Temper it preſerves and keeps them from being too brittle: Or more peculiar for the Joints; where it is very ſerviceable,

1. To lubricate the Extremities of the Bones, that they may move the more eaſily and freely.

2. To keep the ends of the Articulated Bones from too great an Incaleſcence or Heat.

3. It preſerves the Joints alſo from wearing by Attrition, or grating one againſt another. And

4. It preſerves the Ligaments of the Joints from Drineſs and Rigidity; and lubricates thoſe parts of them alſo that ſlide upon the Bones, and it keeps the Cartilages which are join'd to any of the Bones in a flexible Condition.

MELA is a Chirurgeons Inſtrument, called alſo *Speculum*, the Vulgar call it *Tenta*, a *Tent*, from trying. It is made for the moſt part of Silver, or Ivory, and its Uſe is to probe Ulcers, or to draw a Stone out of the Yard, *&c.* It is of different Shapes, according as it is differently deſigned to be uſed.

MELANAGOGUES are Medicines that expel black Choler, or Melancholy, as the Ancients us'd to expreſs themſelves.

MELANCHOLY, is a Doating, without a Fever or Raving; or a *Delirium* proceeding from a kind of Sadneſs of the Patient, whereby the Animal Spirits ſeem to be moved more ſlowly than they were wont. *Blanchard.*

MELICERIA, called alſo *Hydarthrus*, and *Ichor*, and ſometimes *Hydrops Articularis*, is a Tumor ſhut up within a Tunick, proceeding from Matter like Honey, without Pain, round, yielding if preſſed, but quickly returning again. It ſeems to proceed from the Lymphatick Particles which do not circulate right; and which, when the Moiſture is evaporated, leave a honeyiſh kind of Subſtance. *Blanchard.*

MELICRATUM, is a Drink made one part of Honey, and eight parts of Rain Water.

MELIUS *inquirendo*, is a Writ that lieth for a ſecond Inquiry of what Lands and Tenements a Man died ſeized, where Partiality was ſuſpected upon the Writ of *Diem clauſit extremum*.

MELOPES, *Vibices*, *Enchymoma*, *Sugillationes*, all ſignifie the ſame thing; and are red Spots (like thoſe which remain in the Skin after beating) in Malignant and Peſtilential Fevers. *Blanchard.*

MELOS, a Diſeaſe of the Eye, when there is ſo great an Irruption of the *Uvea* Tunicle; that it ſeems like an Apple. *Blanchard.*

MEMBRANA, is a nervous, fibrous, broad, plain, white, and dilatable Subſtance, which covers

vers the Bowels, the great Cavities of the Body, the Muſcles, &c. and is endowed with an exquiſite Senſe.

MEMBRANA *Muſculorum Communis*, the Common Membrane, or Covering of the Muſcles, is ſpread over all the Body, except the Skull, and is knit by Fibres ſomething looſely to the *Membrana Carnoſa*, lying above it; and to the proper Membrane of each Muſcle which lies under it; it is very thin, but ſtrong, of a whitiſh Colour, and almoſt tranſparent. It ſerves not only as a common Bag to the Muſcles, and helps to keep them in their proper Places; but alſo to moiſten them, and to beſmear their Tendons with a Mucilaginous Liquor, which lubricates them, and forwards their Motion and Action.

MEMBRANA *Adipoſa*. See *Adipoſa Membrana*.

MEMBRANA *Carnoſa*, the ſame that *Panniculus Carnoſus*.

MEMBRANA *Nictitans*. See *Nictitans*.

MEMBRANA *Urinaria*, the ſame with *Allantois*.

MEMBRANOSUS, is a Muſcle of the Leg, ſo called from the large Membranous Expanſion it is Continuous with, incloſing all the Muſcles of the *Tibia* and *Tarſus*; whence it is alſo called *Faſcia lata*: It hath an acute fleſhy Beginning from the Fore-part of the Spine of the *Os Ilium*, between the Origination of the *Sartorius* and Tendinous Beginning of the *Glutæus Magnus*; and being dilated to a fleſhy Belly, which fills the Interſtice made by the firſt of the two laſt-named Muſcles and Upper part of the *Rectus* and Fore-part of the *Glutæus Medius*, in its Oblique Deſcent becomes Tendinous, four Fingers Breadth below the great *Trochanter*, whence it paſſes directly over the *Vaſtus Externus* to its proper Termination, at the ſuperior *Appendix* of the *Fibula*; but in its Progreſs thither, it is conjoined with the Tendinous Expanſion of the *Glutæus Magnus*, which ariſeth from the Spine of the *Ilium*, covering the external Part of the *Glutæus Medius*, and all the external Muſcles of the *Tibia*, as well as thoſe of the Thigh-bone; and deſcending over the *Patella*, comprehends the Muſcles of the *Tarſus*, and joins with the *Ligamentum Annulare*, which retains the Tendons of the Toes and Feet: When this Muſcle acteth, the Leg and Thigh are drawn outwards.

MEMBRED: In Heraldry thoſe Birds which are either whole-footed, or which have no Tallons, are termed by this Word *Membred*.

MEMORY, is that Faculty of the Soul, which repeats Things perceived by former Senſations; or is the calling to mind of known and paſt Things; as when we conceive Heat or Light, Yellow or Sweet, &c. the Object being removed; and is as it were the Store houſe of our *Idæa's*.

MENDOSA *Sutura*, or *Squammea*, is a ſcaly Connexion of the Bones of the Skull; as may be ſeen in the Bone of the Temples, and the Bone of the Fore-part of the Head.

MENINGES, are the thin Skins that inwrap the Brain, and which are called *Matres* by the *Arabians*; as if all the Membranes of the Body were propagated by and from them. They lie immediately within the Skull, and are Two in Number; *viz.* the *Dura mater*, or *Craſſa meninx*; and the *Pia mater*, or *Tenuis meninx*; which ſee.

MENINGOPHYLAX, is that which preſerves the Meninx or Membrane of the Head, as thin Gold or Silver Plates, which are applied when the Skull is opened. *Blanchard.*

MENINX, ſee *Mater dura & tenuis*.

MENISCUS *Glaſſes*, are thoſe which are Convex on one ſide, and Concave on the other.

For finding the *Focus* of a *Meniſcus*, the Rule is this:

As the Difference of the Semi-diameters of the Convexity and Concavity, to the Semi-diameter of the Concavity; ſo is the Diameter of the Convexity to the Focal Length.

MENOPEGIA, is a ſharp Pain in the Head, affecting one ſingle Place.

MENSTRUUM, the Chymical Word for a Diſſolving Liquor. They gave it this Name, becauſe ſome Chymiſts pretend that the complete Diſſolution of a Mixt cannot be done in leſs Time than 40 Days; which Period they call the *Philoſophical Month*.

And from hence the Word *Monſtruum* hath come to be the general Term for any Diſſolvent; and any Liquor which will exactly diſſolve all the Parts of any Body, is called a proper *Menſtruum* for that Body: As *Aqua Regalis* is for Gold; *Aqua Fortis*, or Spirit of Nitre, for moſt other Metals; *Common Water* for Salt, or Sugar, &c.

And here it may not be amiſs to give a Solution of one Difficulty, *viz.* Why great Lumps or Fragments of Gold, &c. will readily deſcend to the Bottom of the Glaſs, and yet when they come to be cut or divided into very ſmall Particles or Atoms, tho' of the ſame ſpecifick Gravity with thoſe greater Lumps, yet theſe ſhall ſwim, and be ſuſpended in the *Menſtruum*.

In order to the accounting for which, we may firſt conſider, That the Parts of no Fluid can be ſo eaſily ſeparable, but that they will a little reſiſt or retard the Deſcent of any heavy Body through them; and this Reſiſtance is *(cæteris paribus)* ſtill proportionable to the Surface of the deſcending Bodies. But the Surfaces of Bodies do by no means increaſe or decreaſe in the ſame Proportion as their Solidities do: For the Solidity increaſes as the Cube, but the Surface only as the Square of the Diameter. Wherefore 'tis plain very ſmall Bodies will have much larger Surfaces, in Proportion to their Solid Content, than larger Bodies will; and conſequently, when they grow exceeding ſmall, may eaſily be conceived to be buoyed up by the Fluid.

Indeed it doth ſometimes happen that a *Menſtruum* will diſſolve and keep ſuſpended in it, without letting them emerge to the Top, the Parts of a Body lighter in *Specie* than it; as when Camphire is diſſolved into a Liquor, and that Liquor well mingled with Oyl of Vitriol; which is an Effect not agreeable to the Laws of *Hydroſtaticks*: But then it may be conſider'd, that there may be ſome ſuch peculiar Texture in the Parts of the Camphire, as may make them ſo joyn or adhere to the Parts of the Oyl, as that, tho' heavier, yet they ſhall not be impelled up to the Surface, at leaſt for a Time: Which we ſee is the Caſe, in ſome meaſure, of an accurate and well-proportioned Mixture of Oyl and Water.

Mr. *Boyle* mentions a *Menſtruum* which he extracted from Bread alone, that would work on Bodies more compact than many hard Minerals, nay, even on Glaſs it ſelf, and do many things that *Aqua Fortis* could not do. It was thus made: Cut Brown Houſhold-Bread, either of Wheat or Rye,

Rye, (though the Rye is beſt) into Slices; and when they are a little dried, fill with them a Glaſs Retort, and draw off in a Sand-Furnace by Degrees of Fire, what will come over. Separate the Oyl from the Liquor in the Receiver by a Tunnel, or a Filtre, and in a gentle Heat free the Spirit from ſome of its Phlegm, (though this is not always neceſſary). With this, he ſaith, he drew Tinctures not only from Crude Corals, but even from the *Lapis Hæmatites*, and *Granates*, unpowdered; nay, alſo from Diamonds and Rubies. Yet by no means was this ſo Corroſive a Liquor as *Aqua Fortis*, or as the other Acid Menſtruums.

From hence therefore we may learn to ſuſpend our Aſſent as to that bold Aſſertion of ſome Phyſicians and Naturaliſts, That 'tis impoſſible any Medicine can be found out, that ſhall diſſolve the Stone in the Bladder or Kidneys, but what muſt alſo corrode and deſtroy the Veſſels through which it paſſes in the Body. For there are many Menſtruums effectually Corroſive, that will not work at all on ſome Bodies; which yet other Things, though of no ſuch Corroſive Nature to the Tongue or the Touch, will readily diſſolve. Thus Quickſilver will diſſolve Gold, though there be no ſenſible Appearance of any Corroſiveneſs in the Mercury, either to the Finger, or even to the Tongue; and yet neither *Aqua Fortis*, nor Oyl of Vitriol, nor Spirit of Nitre, will touch this Metal, though they are ſome of the moſt Corroſive Menſtruums in Nature. Cold Water will diſſolve the White of an Egg; which the pureſt Spirit of Wine will not divide, but coagulate; as will alſo the Acid Liquors, Spirit of Salt, and Oyl of Vitriol. Thus alſo Common Oyl will diſſolve Brimſtone, though it appear ſo ſoft and ſmooth upon the Tongue, and will not diſſolve ſo much as an Egg-ſhell; and yet that General Diſſolvent, *Aqua Fortis*, will not touch Brimſtone. Many more Inſtances of this Nature might be given; by which it appears, that Menſtruums do not operate by virtue of any manifeſt Quality, ſuch as Heat, Moiſture, or even Acidity it ſelf, but rather by ſome mechanical and peculiar Fitneſs that there is between the Shape, Bulk, Solidity, *&c* of the Corpuſcles both of it and the Body to be diſſolved.

MENSTRUUM *Peracutum*, is a Menſtruum mentioned by Mr. *Boyle*, and made by drawing off Spirit of Nitre ſeveral times from Butter of Antimony. He ſaith, That by the Help of this, he was able, without a very violent Fire, and in a few Hours, to elevate a good Quantity of Crude Gold.

MENSURABILITY, is an Aptitude in a Body, whereby it may be apply'd or conform'd to a certain Meaſure.

MENSURATION, or *Meaſuring*, is to find the Superficial Area, or Solid Content, of all Surfaces and Bodies. The Rules to do which, as exactly as is poſſible, you will find under the Names of the ſeveral *Figures* and *Solids*.

MEPHITICAL *Exhalations*, are poiſonous or noxious ones, iſſuing out of the Earth. Theſe the *Latins* uſed to call *Mephites*; whence comes the *Italian Moſeta*, which is the Term they have for the famous *Grotta de Cani*, near *Puzzoli*, about two Miles from *Naples*, which is ſo called, becauſe its poiſonous Steams will kill Dogs, (and no doubt any other Animals) if held long over, and within the Stench of the Steams.

MERCATOR's *Chart*, or *Projection*, is a Projection of the Face of the Earth in *Plano*; wherein the Degrees upon the Meridian increaſe towards the Poles in the ſame Proportion that the parallel Circles decreaſe towards them.

'Tis called *Mercator's Chart*, or *Projection*, becauſe *Mercator* was the firſt that publiſhed *Charts* ſo made: Tho' our Country-man Mr. *Wright* was really the firſt that made the Tables for this *Projection*.

Though the *Plain Chart* be very eaſie and uſeful in ſhort Voyages, and will ſerve in the longeſt Voyages, if you ſail Home in or near the oppoſite Rhumb you went by; as the Ancients, who being Coaſters, did before the Uſe of the Compaſs: Yet foraſmuch as few Places, or indeed none but ſuch as lie under the ſame Meridian, or under the Equinoctial, can therein be expreſſed according to their true Situation and Diſtance one from another; but if they be laid down true by the Courſe and Diſtance, the Difference of Longitude will be falſe; if they be laid down by the Courſe and Difference of Longitude, then will the Diſtance and Difference be more than it ſhould be; and if they be laid down by their Diſtance and Difference of Longitude, (which in many Caſes is impoſſible) then the Difference of Latitude will always be too little, and the Rhumb too wide from the Meridian; and if they be laid down by their Latitudes and Separation, then the Courſe will be wide, and the Diſtance too much, *&c*.

And ſince that the Places in particular *Maps* or *Charts* being laid down in ſome, one way, and in others another, and theſe Pieces many times tack'd together, without due Conſideration of the differing Methods, Places have been laid down by: This, I ſay, being ſo, the *Geography* and *Hydrography* of the World is ſo corrupted, that too many Deſcriptions of the Whole, or of the large Parts of it, are enormouſly Erroneous, and the Shape of the Land much diſtorted. It were to be wiſhed therefore, that the World would not put over-much Value on, but wean it ſelf from the Uſe of the *Plain Chart*; and by making the *True Chart* Eaſie and Familiar, bring it in Reſpect and Uſe.

It was the great Study of our Predeceſſors, to contrive ſuch a *Chart in Plano*, with ſtrait Lines, on which all or any Parts of the World might be truly ſet down, according to their Longitudes, Latitudes, Bearings or Diſtances.

A Way was hinted for this near Two thouſand Years ſince by *Ptolemy*, and a General Map according thereto, made in the preceding Age by one *Mercator*; but the Thing demonſtrated, and a Ready Way ſhew'd of deſcribing it, was not 'till Mr. *Wright* taught to inlarge the *Meridian Line* by the continual Addition of Secants; ſo that all the Degrees of Longitude might be proportional to thoſe of Latitude, as on the Globe: Which he has done after ſuch an Excellent Manner, that in many Reſpects, it is far more convenient for the Navigator's Uſe, than the Globe it ſelf; and will truly ſhew the Courſe and Diſtance from Place to Place, which way ſoever a Ship ſail forth, or return.

PROBLEMS.

1. *To find the Meridional Miles, answering to any Difference of Latitude.*

First, By the *Table of Meridional Parts*, which are printed in most Books of Navigation,

Find the Degrees of either Latitude over-head, and the Minutes in the Left-hand Column downwards; and in the Angle of meeting are the Parts for that Latitude.

Thus also find out the Parts for the other; then, if both Latitudes be of the *same Name*, that is, both North, or both South, subtract these one from the other; and that Remainder contains the *Meridional Miles* sought. If of *different Name*, add them together; as in *Example* 2.

Example.

Required to find the *Meridional Miles* between Latitude 43° 15' North, and 50° 20' N.

Latitude 50° 20' ——— 35057 } Mer. Pt.
Latitude 43 15 ——— 28837 }

Merid. Difference of Lat.—6220

Example 2.

Let one Lat. be 20° 19' S. —12423 } Mer. Pt.
The other Lat. 18 53 N.—11541 }

Merid. Difference of Lat. — 23963 Sum.

PROBLEM II.

2. *To find the Meridional Difference of Latitude by the Table of Artificial Tangents.*

The *Logarithmick Tangents* above 45 Degrees, accounting every 30 Minutes to be one Degree, and every Minute to be two Minutes of the *Meridian Line*, are in the same *Ratio* with the *Meridional Parts*, made by the continual Addition of *Natural Secants*.

Therefore, Take half of each of the Given Latitudes, and to each half add 45°, looking the Tangents of their Arches in the Table of *Logarithmick Tangents*; the Difference of these Tangents divide by 1263, the Quotient will be the Meridional Miles or Minutes.

Example 1.

Lat. 50° 20', its ½ = 25° 10'; which added to 45°, makes 70° 10', whose Tangent is - - - - - - - - - } 4428786

½ *Lat.* 43° 14', is 21° 37' ½; which added to 45°, makes 66° 37' ½, whose Tangent is, omitting the Index, - - } 3642940

785846

1263) 785846 (622 = Merid. Diff.
280
278
260

Example 2.

The ½ of *Lat.* 20° 17' S. is 10° 18 ½, which added to 45°, make 55° 8' ½, whose Tangent is - - - - - - } 1570607

½ *Lat.* 18° 53', N. is 9° 26' ½, which added to 45°, makes 54° 26' ½, its Tangent is - - - } 1457970 / 3028577 Sum.

1263) 3028577 (2397 = Mer. Diff. Lat.
50260
123
100
1166

PROBLEM III.

3. *The Latitudes and Difference of Longitudes of Two Places given, to find the Course and Distance between them.*

Admit the *Course* and *Distance* between the *Lyzard*, in Latitude 50° 10' N. and *Antego* in Latitude 17° 25 N. whose Difference of Longitude is 54° 15' W. be required.

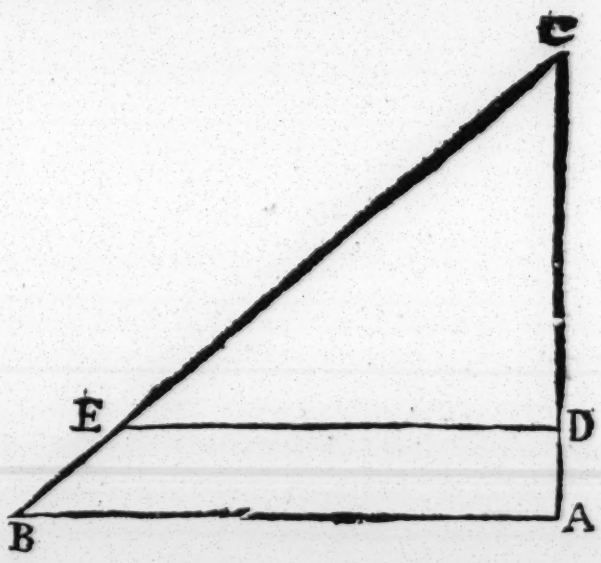
From 50° 10' } N. *Lat.* { *Lyzard* } M. Pt. { 3490
Subtr. 17 25 } { *Antego* } { 1061

32 45 — 2429 = to
60 — (Merid. Diff. Lat.

1965 = Diff. Lat. — Diff. Long. = 54° 15'
(= 3255 Miles W.

Geometrically.

Draw the Meridian C A, which make equal to 2429, the *Merid. Diff. Lat.* Erect the Perpendicular A B, which let be equal to the *Diff. of Longit.* 3255; draw C B; make C D equal to the proper *Diff. of Lat.* 1965; and erect the Perpendicular D E.



In the Triangle A B C — Given { C A = Mer. Diff. Lat. = 2429; B A = Differ. Longit. = 3255 } Required { ∠ C = Course. ∠ B = Compl. Course.

In the Triangle C D E — Given { C D = Proper Diff. Lat. = 1965 and ∠ C = Course. } Required { C E = Dist. of the Places.

For the *Course*, say,

As Mer. Diff. Lat.: Rad. : : Diff. Long. : T. Course
2429 min. : T. 55° : : 3255 min. : T. 53° 16′.

Operation by the *Logarithms*.

To the Arithmetical Complement of the Log. Mer. Diff. Lat.	2429	— 6.614573
Add the Log. of the Diff. Long.	3255	— 3.512551
Sum is the T. of the Course, 53° 16′		—10.127124

By Gunter's *Scale*.

The Extent from . .	2429	on the Line of
to	3255	Numbers.
Will reach from T. 45° 00′		on the Line of
to the T. of the Course . . .	53 16	Tangents.

For the *Distance*, say,

As the Co-Sine of the Course : Rad. : : D. L.: Dist.
S. 36° 44′ : S. 90° 00′ : : 1965 : 3285.

Operation by the *Logarithms*.

To the Arithmetical Complement of the Co. S. Course - - - - - -	36° 44′	— 0.22323
Add the Log. of the Diff. Lat.	1965	— 3.29336
Sum is the Log. of the Distance,	3285	— 3.51659

By Gunter's *Scale*.

The Extent from	S. 36° 44′	on the Line of
to the - - -	S. 90 00	Sines.
Reaches from ——	S. 1965 ——	on the Line of
to - - - - - -	1965 ——	Numbers.

PROBLEM IV.

4. *The Latitude and Course given, the Distance, Difference of Longitude and Departure, required.*

Example.

Sailing from the *Lyzard*, Lat. 50° 10′ N. and the Course being 53° 16′ S. Westerly (Variation and Leeward-way, *&c.* allow'd for) or S. W. $\frac{3}{4}$ W. near; and finding by Observation the Ship to be in Latitude 17° 25′ North; What's the *Distance run*, *Departure*, and *Difference of Longitude*?

From	50° 10′ N.	Lat.	*Lyzard*	M.Pt	3490
Subst.	17 25 N.		observ'd		1061
Rem.	32 45 = 1965 = Diff. Lat.			M. Diff. Lat.	2429

Distance, what?

As the Sine of the Course : Rad : : Diff. Lat : Dist.
and 36° 44′ : S. 90° 00′ : : 1965 : 3285.

Departure, what?

Radius : Mer. Diff. Lat. : : T. Course : Diff. Long.
T. 45 ; 2429 min : : T. 53° 16′ : 3255. min.

Operation by the *Logarithms*.

To the Log. Mer. Diff. Lat.	2429	—3.38542
Add the Tangt. of the Course,	53° 16	—10.12712
Sum = Log. Diff. Longitude,	3255.	3.51254

By Gunter's *Scale*.

The Extent from T.	45°	on the Line of
to the Tangent of	53° 16′	Tangents.
Reaches from - -	2429	on the Line of
to - - - - -	3255	Numbers.

PROBLEM V.

5. *The Latitude and Distance being given, Course, Departure, and Difference of Longitude are required?*

Example.

Sailing North-Eastward from *Antego* 3285 min. and by Observation finding my Latitude to be 50 deg. 10 min. North; What's the *Course*, *Departure* and *Difference of Longitude*?

From	50° 10′ N.	Lat.	observ.	M. Pt	3490
Subst.	17 25 N.		*Antego*		1061
	32 45 = 1965 = Dif. Lat.			M. Dif. Lt.	2429

Course, what?

Distance : Diff. Lat. : : Radius : Co-Sine Course,
3285 : 1965 : : S. 90° 00′ : S. 36° 44′

Operation by *Logarithms*.

To the Arithmetical Complement of the Log. of the Distance - - - -	3285	—6.48341
Add the Log. of the Diff. Lat.	1965	—3.29336
Sum = Co-Sine of the Course,	36° 44′	—9.77677

By Gunter's *Scale*.

The Extent from Distance	3285	on Line of
to the Diff. Lat. - - -	1965	Numbers.
Reaches from S. of Radius,	90° 00′	on Line of
to the S. Compl. of Course	36 44	Sines.

Then the { Departure / Diff. Longit. } is found by *Prob.* I. II.

PROBLEM VI.

6. *The Latitude and Departure given, Required the Course, Distance, and Difference of Longitude.*

Example.

A Ship from Latitude 50° 10′ N. and Longitude 00° 00′ runs South-Westerly 'till her Departure be 2633 Miles, and the observed Latitude 17° 25′ North; I demand the *Course*, *Distance* and *Difference* of *Longitude*?

Diff. Lat. : Departure : : Radius : T. Course. 1965
: 2633 : : T. 45° 00′ : T. 53° 16′.

Operation

Operation of the Logarithms.

To Ar. Co. Log. of Diff. Lat. 1965—6.70664
Add the Log. of Departure 2633—3.42048

Sum = T. of the Course — 53° 16--10.12712

By Gunter's *Scale.*

The Extent from Diff. Lat. 1965 } On Line of
to the Departure · · · 2633 } Numbers.
Reach. from T. of Radius, 45° 00′ } On Line of
To the T. of the Course 53 16 } Tangents.

Then {Distance / Differ. Longit.} is found by *Prob.* I. II.

PROBLEM VII.

7. *One Latitude, Course and Distance given; the Difference of Latitude, and Difference of Longitude required.*

Example.

A Ship from 50° 10′ N. Latitude, and 00° 00′ Longitude, runs with a Course 16° 32′ S. westerly 3285 Miles: What is the Difference of Latitude, and Difference of Longitude?

For the *Difference of Latitude*, say,

Radius: Co-Sine Course:: Distance: Differ. Lat.
S. 90° 00′: S. 36° 44′:: 3284 m: 1965.

Operation by the *Logarithms.*

To the 7, of the Course 53° 16′—9.77676
And the Logar. Distance 32 85—3.51659

Run = Log. Diff. Lat. 19 65—3.29335

By Gunter's *Scale.*

The Extent from S. Radius, 90° 00′ } On Line of
To the S. Compli. Course 36 44 } Sines.
Reaches from the Distance 32 85 } On Line of
To the *Differen. Latitude* 19 65 } Numbers.
From 50° 10′ = Departed } Lat. Mer. Pts. {3490 / 1061
Subst. 32. 45 = Differen.
Rem. 17. 25 = Present } Mer. Diff. Lat. = 2429

Diff. Long. find by *Prob*, 2. in 3255 = 54° 15′ W.
From 54° 15′ = Difference } Longitude.
Subst. 00 00 = Departed }
Rem = 54° 15′ W. Present

PROBLEM VIII.

8. *One Latitude, Departure and Course given: Required Distance, Difference of Latitude, and Difference of Longitude.*

Example.

Sailing South 53° 16′ West, from Latitude 5° 10′ North, Longitude 00° 00′, till my Departure be 2633 Miles: What's my Distance, Latitude and Longitude?

Distance / Diff. Lat. } by C. 6. of *Plain Sail.* is { 3285 / 1965 = 3245

From 50° 10′ N. = Departed } L.M.P. {3490 / 1061
Subst. 32 45 N. = Difference }
Rem. = 17 25 = 1985 X Pres. } M.D.Lat. 2429

For the *Difference of Longitudes*, say,

Proper Diff. Lat: M.R. Diff. Lat:: Depart: D. Long.
1965 m : 2429 m :: 2633 : 3255

Operation by *Logarithms.*

To Ar. co. Log. Diff. Lat. 1965——6.70663
Add the Log. { Mer. Diff. Lat. 2429—3.38542 / Departure 2632——3.42049

Sum = Log. Diff. Long. 3255 = 54° 15′ 3.51254

By Gunter's *Scale.*

The Extent from Diff. Lat. 1965 }
To the Mer. Differ. Latit. 2429 } on Line of Num.
Reaches from Departure 2633 }
To the Differ. of Long. 3255 }

From 00° 00′ = Departed }
Substract 54 15 = Difference } Longitude.
Rem. = 54 15 W. = Present. }

PROBLEM IX.

9. *One Latitude, Distance and Departure given: The Course, Difference of Latitude, and Difference of Longitude required.*

Example.

From Latitude 50° 10′ N. and Longitude 00° 00′, Sailing South Westward 3285 m. until the Departure be 2633 m: I demand the Course sail'd, Latitude and Longitude.

By C. 4. of *Plain Sailing* { Course = 53° 16′ W. / Diff. L. = 1965

By *Prob.* 6. Present Latitude = 17° 45′ N.
And Meridian Differ. Latitude = 2429

Difference } Long. by *Prob.* 6. is { 3255 = 54° 15′ / —— 54 16
Present }

PROBLEM X.

10. *One Latitude, Course and Difference of Longitude given: The Difference, Latitude, Distance and Departure required.*

Example.

From Latitude 53° 10′ N. sailing South 53° 16′ Westerly, till I am in the Longitude 54° 45′ W. What's my Distance, Departure and Difference of Latitude?

From 00° 00′ N. Departed }
Sustract 54 15 W. Present } Longitude.
Rem. = 54 15 = 3255 = Differ. }

For the *Course*, say,

As Mer. Diff. Lat.: Rad. :: Diff. Long.: T. Course
2429 min. : T. 55° :: 3255 min. : T. 53° 16′.

Operation by the *Logarithms*.

To the Arithmetical Complement of the Log. Mer. Diff. Lat.	2429 —	6.614573
Add the Log. of the Diff. Long.	3255 —	3.512551
Sum is the T. of the Course, 53° 16′ —		10.127124

By Gunter's *Scale*.

The Extent from . .	2429	on the Line of Numbers.
to	3255	
Will reach from T.	45° 00′	on the Line of Tangents.
to the T. of the Course . . .	53 16	

For the *Distance*, say,

As the Co-Sine of the Course : Rad. :: D. L.: Dist.
S. 36° 44′ : S. 90° 00′ :: 1965 : 3285.

Operation by the *Logarithms*.

To the Arithmetical Complement of the Co. S. Course - - - - - -	36° 44′ —	0.22323
Add the Log. of the Diff. Lat.	1965 —	3.29336
Sum is the Log. of the Distance,	3285 —	3.51659

By Gunter's *Scale*.

The Extent from	S. 36° 44′	on the Line of Sines.
to the - - -	S. 90 00	
Reaches from —	S. 1965 —	on the Line of Numbers.
to - - - - -	1965 —	

PROBLEM IV.

4. *The Latitude and Course given, the Distance, Difference of Longitude and Departure, required.*

Example.

Sailing from the *Lyzard*, Lat. 50° 10′ N. and the Course being 53° 16′ S. Westerly (Variation and Leeward-way, &c. allow'd for) or S. W. ¾ W. near; and finding by Observation the Ship to be in Latitude 17° 25′ North; What's the *Distance run*, *Departure*, and *Difference of Longitude*?

From	50° 10′ N.	Lat.	*Lyzard*	M.Pt	3490
Subst.	17 25 N.		observ'd		1061
Rem.	32 45 = 1965 = Diff. Lat.			M. Diff. Lat.	2429

Distance, what?

As the Sine of the Course : Rad :: Diff. Lat : Dist.
and 36° 44′ : S. 90° 00′ :: 1965 : 3285.

Departure, what?

Radius : Mer. Diff. Lat. : : T. Course : Diff. Long.
T. 45 : 2429 min : : T. 53° 16′ : 3255. min.

Operation by the *Logarithms*.

To the Log. Mer. Diff. Lat.	2429 —	3.385 42
Add the Tangt. of the Course,	53° 16 —	10.127 12
Sum = Log. Diff. Longitude,	3255.	3.512 54

By Gunter's *Scale*.

The Extent from T.	45°	on the Line of Tangents.
to the Tangent of	53° 16′	
Reaches from - -	2429	on the Line of Numbers.
to - - - - -	3255	

PROBLEM V.

5. *The Latitude and Distance being given, Course, Departure, and Difference of Longitude are required?*

Example.

Sailing North-Eastward from *Antego* 3285 min. and by Observation finding my Latitude to be 50 deg. 10 min. North; What's the *Course*, *Departure* and *Difference of Longitude*?

From	50° 10′ N.	Lat.	observ.	M. Pt	3490
Subst.	17 25 N.		*Antego*		1061
	32 45 = 1965 = Dif. Lat.			M. Dif. Lt.	2429

Course, what?

Distance : Diff. Lat. : : Radius : Co-Sine Course,
3285 : 1965 :: S. 90° 00′ : S. 36° 44′

Operation by *Logarithms*.

To the Arithmetical Complement of the Log. of the Distance - - - -	3285 —	6.48341
Add the Log. of the Diff. Lat.	1965 —	3.29336
Sum = Co-Sine of the Course,	36° 44′ —	9.77677

By Gunter's *Scale*.

The Extent from Distance	3285	on Line of Numbers.
to the Diff. Lat. - - -	1965	
Reaches from S. of Radius,	90° 00′	on Line of Sines.
to the S. Compl. of Course	36 44	

Then the { Departure / Diff. Longit. } is found by *Prob.* I. II.

PROBLEM VI.

6. *The Latitude and Departure given, Required the Course, Distance, and Difference of Longitude.*

Example.

A Ship from Latitude 50° 10′ N. and Longitude 00° 00′ runs South-Westerly 'till her Departure be 2633 Miles, and the observed Latitude 17° 25′ North; I demand the *Course*, *Distance* and *Difference of Longitude*?

Diff. Lat. : Departure : : Radius : T. Course. 1965
: 2633 : : T. 45° 00′ : T. 53° 16′.

Operation

Operation of the Logarithms.

To Ar. Co. Log. of Diff. Lat. 1965—6.70664
Add the Log. of Departure 2633—3.42048

Sum = T. of the Course — 53° 16--10.12712

By Gunter's *Scale.*

The Extent from Diff. Lat. 1965 { On Line of
to the Departure . . . 2633 { Numbers.
Reach. from T. of Radius, 45° 00' { On Line of
To the T. of the Course 53 16 { Tangents.

Then {Distance / Differ. Longit.} is found by *Prob.* I. II.

PROBLEM VII.

7. *One Latitude, Course and Distance given; the Difference of Latitude, and Difference of Longitude required.*

Example.

A Ship from 50° 10' N. Latitude, and 00° 00' Longitude, runs with a Course 16° 32' S. westerly 3285 Miles: What is the Difference of Latitude, and Difference of Longitude?

For the *Difference of Latitude*, say,

Radius: Co-Sine Course:: Distance: Differ. Lat.
S. 90° 00': S. 36° 44' :: 3284 m: 1965.

Operation by the *Logarithms.*

To the 7, of the Course 53° 16'—9.77676
And the Logar. Distance 32 85—3.51659

Run = Log. Diff. Lat. 19 65—3.29335

By Gunter's *Scale.*

The Extent from S. Radius, 90° 00' } On Line of
To the S. Compli. Course 36 44 } Sines.
Reaches from the Distance 32 85 } On Line of
To the *Differen. Latitude* 19 65 } Numbers.
From 50° 10' = Departed } Lat. Mer. Pts. {3490 / 1061
Subst. 32. 45 = Differen. }
Rem. 17. 25 = Present } Mer. Diff. Lat. = 2429

Diff. Long. find by *Prob*, 2. in 3255 = 54° 15' W.
From 54° 15' = Difference } Longitude.
Subst. 00 00 = Departed }
Rem = 54° 15' W. Present }

PROBLEM VIII.

8. *One Latitude, Departure and Course given: Required Distance, Difference of Latitude, and Difference of Longitude.*

Example.

Sailing South 53° 16' West, from Latitude 5° 10' North, Longitude 00° 00', till my Departure be 2633 Miles: What's my Distance, Latitude and Longitude?

Distance } by C. 6. of *Plain Sail.* is { 3285
Diff. Lat. } { 1965 = 3245

From 50° 10' N. = Departed } L.M.P. {3490
Subst. 32 45 N. = Difference } {1061
Rem. = 17 25 = 1985 X Pref. } M.D.Lat. 2429

For the *Difference of Longitudes*, say,

Proper Diff. Lat: M.R. Diff. Lat:: Depart: D. Long.
1965 m : 2429 m :: 2633 : 3255

Operation by *Logarithms.*

To Ar. co. Log. Diff. Lat. 1965——6.70663
Add the Log. { Mer. Diff. Lat. 2429—3.38542
{ Departure 2632 ——3.42049

Sum = Log. Diff. Long. 3255 = 54° 15' 3.51254

By Gunter's *Scale.*

The Extent from Diff. Lat. 1965 }
To the Mer. Differ. Latit. 2429 } on Line of Num.
Reaches from Departure 2633 }
To the Differ. of Long. 3255 }

From 00° 00' = Departed }
Substract 54 15 = Difference } Longitude.
Rem. = 54 15 W. = Present. }

PROBLEM IX.

9. *One Latitude, Distance and Departure given: The Course, Difference of Latitude, and Difference of Longitude required.*

Example.

From Latitude 50° 10' N. and Longitude 00° 00', Sailing South Westward 3285 m. until the Departure be 2633 m: I demand the Course sail'd, Latitude and Longitude.

By C. 4. of *Plain Sailing* { Course = 53° 16' W.
{ Diff. L. = 1965

By *Prob.* 6. Present Latitude = 17° 45' N.
And Meridian Differ. Latitude = 2429

Difference } Long. by *Prob.* 6. is { 3255 = 54° 15'
Present } { ——54 16

PROBLEM X.

10. *One Latitude, Course and Difference of Longitude given: The Difference, Latitude, Distance and Departure required.*

Example.

From Latitude 53° 10' N. sailing South 53° 16' Westerly, till I am in the Longitude 54° 45' W. What's my Distance, Departure and Difference of Latitude?

From 00° 00' N. Departed }
Sustract 54 15 W. Present } Longitude.
Rem. = 54 15 = 3255 = Differ. }

For the Meridian Difference of Latitude, ſay,

Radius : c T. Courſe :: Diff. Long : Mer. Diff. Lat.
T. 45° : T. 36° 44′ :: 3255 : 2429 m.

Operation by the *Logarithms.*

To the c T. Courſe —— 36° 44′ —— 9.87290
Add Log. Diff. Longit. 3255 m. —— 3.51255

Sum Rad. = Log. Mer. Diff. Lat. 2529 m. 3.38545

By Gunter's *Scale.*

The Extent from T. Radius 45° } on Line of Tan.
To T. Compl. Courſe — 36° 44′ }
Reaches from Diff. Long. 3255 } on Line of Num.
To Merid. Differ. Latit. 2429 }

From 3490 } Mer. { Parts in Dep. } Lat. { 50° 10′
Subſt. 2429 } { Difference } { North.
Rem. 1061 } { Parts in preſ. } { 17 25

Then find the Diſtance and Departure, by *Caſe* 2. *Plain Sailing.*

PROBLEM XI.

11. *The Difference, Longitude and Diſtance of two Places in the ſame Latitude being given, to find the Latitude.*

Example.

Two Ships in the Equator 400 Miles from one another ; one ſails North, the other South alike Diſtances, till they are 150 Miles aſunder : What Latitude are they in ?

Proportion.

Differ. Long. : Radius : : Diſtance : S. Latit.
400 : S. 90° 00 : : 150 *M.* : S. 22° 01′

Operation by the *Logarithms.*

To the Ar. co. Log. Diff. Long. 400 —— 7.39794
Add Logarith. of the Diſtance 150 —— 2.17600

Sum = S. Latitude —— 67° 59′ —— 9.57394

By Gunter's *Scale.*

The Extent from Differ. Long. 400 } on Line of
To the —— Diſtance 150 } Numbers.
Reaches from S. Radius 90° 00′ } on Line of
To S. Compleat Latitude 67 59 } Sines.

PROBLEM. XII.

12. *The Differences of Longitude between two Places of the ſame Latitude, being given : To find their Diſtance.*

Example.

The Diſtance between *Martinico,* and *Cape Verde,* is required.

From 54° 50′ } = Long. { *Martin.* } L. 14° 50′
Subſt. 11 30 } { *C. Verde.* } North.

Rem. = 43 20 = 2600 Miles = Differ. Long.

Radius : Diff. Long. : : S. Latit. : Diſtance.

Operation by the *Logarithms.*

To Log. Differ. Longitude 2600 —— 3.41497
Add the S. Latitude 14° 50′ —— 9.91528

Sum — Rad = Log. Diſtance 2513 —— 2.40025

By Gunter's *Scale.*

The Extent from S. Rad. 90° 00′ } on Line of
To the S. Com. Latitude 75 10 } Sines.
Reaches from Differ. Longit. 2600 } on Line of
To the Diſtance —— 2513 } Numbers.

PROBLEM XIII.

13. *The Diſtance between two Places in the ſame Parallel given : Required, To find the Difference of Longitude.*

Example.

Sailing from *Cape Verde,* in Latitude 14° 50′ North to an Iſland 2513 Miles Weſt : I demand the Longitude of the Iſland.

c S. Lat : Diſtance : : Radius : Diff. Long.
S. 75° 10 : 2513 : : S. 90° 00′ : 2600 Miles

Operation by the *Logarithms.*

To ar. co. S. Latitude 14° 50′ —— 0.01472
Add Log. of the Diſtance 2513 —— 3.40025

Sum = Log. Diſt. Long. 2600 Miles —— 3.41797

By Gunter's *Scale.*

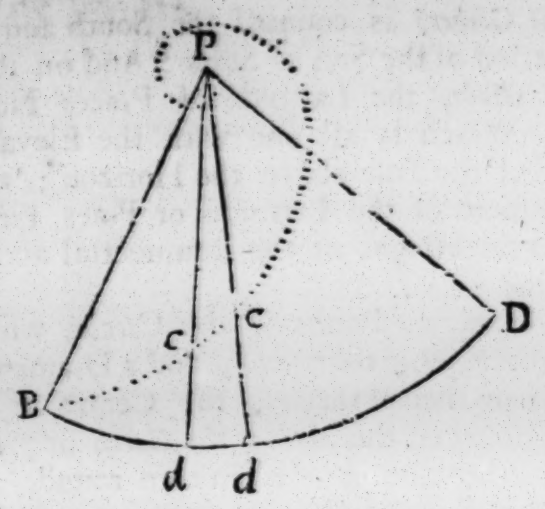
The Ext. from S. Compl. Lat 75° 10′ } on Line of
To the Sine of the Radius — 90 00 } Sines.
Reaches from Diſtance —— 2513 } on Line of
To the Difference of Longitude - 2600 } Numbers.

To 2600 | = 43° 20′ = Diff. Long. in D. and M.
Add 60 | 11 30 = Long of *Cape Verde.*

Sum = 54. 50 = Longitude of the Place the Ship is in.

That the *Meridian Line* in *Mercator's Chart,* is a Scale of Logarithmick Tangents of the half Complements of the Latitude : The incomparable Mr. *Halley* demonſtrates thus.

Suppoſing P the *Pole.*
B D the *Equinoctial.*
P C, P *c*, &c. *Co-Latitudes.*
B *c c*, C P a *Rhumb Line.*



1. The Lines P B, P *c*, P C, are the Tangents of half the Co-Latitudes in the *Stereographick Projection*, (by *Prob.* 1. in *Spherick Projection.*)

2. The Difference of Longitudes, or Angles at the Pole (B P C, *&c.*) between them, are Logarithms of the *Rationes* of thoſe Tangents one to another, (by the known Property of *Proportional Spirals.*) But the *Nautical Meridian Line*, is no other than a Table of Longitudes, anſwering to each Minute of Latitude on the Rhumb Line, making an Angle of 45 Degrees with the Meridian: Wherefore the Meridian Line is no other than a Scale of Logarithmick Tangents, of the half Complements of the Latitudes. *Q. E. D.*

Whence he deduces the following

COROLLARIES.

1. Becauſe that in every Point of any Rhumb Line, the Difference of Latitude is to the Departure as the Radius to the Tangent of the Angle that Rhumb Line makes with the Meridian; and thoſe equal Departures are every where to the Difference of Longitude, as the Radius to the Secant of the Latitude: It follows, that the Differences of Longitude are on any Rhumb, Logarithms of the ſame Tangents, but of a different Species; being proportioned to one another, as are the Tangents of the Angles made with the Meridian.

2. Hence any Scale of Logarithmick Tangents is a Table of the Differences of Longitude, to ſeveral Latitudes, upon ſome determinate Rhumb or other: And therefore, as the Tangent of the Angle of ſuch Rhumb, to the Tangent of any other Rhumb; ſo the Differences of the Logarithms of any two Tangents, to the Difference of Longitude on the propoſed Rhumb, intercepted between the two Latitudes, of whoſe half Complements you took the Logarithmick Tangents.

MERCATOR's *Sailing*, is the Art of finding on a Plane the Motion of a Ship upon any aſſign'd Courſe, true in Longitude, Latitude and Diſtance; the Meridians being all parallel, and the Parallels of Latitude Strait Lines. The Way to do this, you have before in *Mercator*'s *Chart*.

MERCURY, according to the Chymiſts, is the Third of their *Hypoſtatical Principles*; and is the ſame with what we call Spirit; which ſee.

MERCURIES *of Metals*, are Things much boaſted of by the Chymiſts; but they deliver the Proceſſes of making them ſo obſcurely, that we have juſt Reaſon to believe they had no Mind to be diſproved by being underſtood.

Yet Mr. *Boyle* tells us expreſly, that he ſhewed a certain Chymiſt of his Acquaintance a Way to draw a true Running Mercury, or Quick-ſilver, from Antimony; and that it ſucceeded well.

MERCURIUS *Dulcis*, or Sweet Sublimate of Mercury, by the Chymiſts ſometimes called *Aquila alba*, is thus made. Sixteen Ounces of Sublimate Corroſive being powder'd in a Glaſs, or Marble Mortar, for it muſt never be done in a Metalline one) is mixed by little and little with Twelve Ounces of Mercury revived from Cinnabar, (or pure Mercury): The Mixture is ſtirred about with a Wooden Peſtle, till all the Crude Mercury diſappear; then it is put into a Matraſs, two Thirds of which remain empty: The Veſſel is heated in Sand, gently at firſt, but afterward the Fire is encreaſed to the Third Degree. In four or five Hours the Sublimate will ſtick to the Top and Neck of the Glaſs: Fling away all that is not White, and then powder that, and ſublimate it again, and a Third time, if you would have it very white. Thus is the ſtrongeſt Poiſon, perhaps in Nature, corrected into a very gentle and uſeful Medicine, by adding more Mercury to it. The Reaſon of which ſeems to be, That by theſe New Sublimations, the Corroding Acids of the Sublimate have their Points broken, and perhaps ſome of them loaded with the Addition of more Mercury, and ſo can't act with the ſame deleterious Force as they did before.

MERCURIUS *Vitæ*. See *Algorot*.

MERCURY. According to M. *Caſſini*, the greateſt Diſtance of *Mercury* from the Earth is 32704, the mean Diſtance 22000, and the leaſt Diſtance 11296 Semi-diameters of the Earth: Therefore his mean Diſtance will be about 88000000 Engliſh Miles; and the Diameter of *Mercury* is $\frac{3}{4}$ of the Diameter of the Earth, and therefore the Globe of *Mercury* muſt be $\frac{3}{7}$ of that of the Earth.

Mr. *Azout* pretends to prove, That tho' *Mercury* be ſo near the Sun, the Light there is not capable of burning any Objects. But Sir *Iſaac Newton* makes the Heat of *Mercury* ſo great, as to be Seven times as much as the Heat of our Summer Sun; which he found by Experiments deſignedly made by the Thermoſcope, is enough to make Water boil. And therefore if Bodies will not be there enkindled by ſuch a Degree of Heat, it muſt be becauſe their Degree of Denſity is proportionably greater than that of ſuch kinds of Bodies on our Earth: Wherefore undoubtedly this Fiery Planet is uninhabitable by ſuch Creatures as live on our Earth.

Capt. *Halley*, in his Obſervation of *Mercury* ſeen in the Sun, *A. D.* 1677, at St. *Helena*, ſaith, That this Planet may be ſeen Nine times in the Sun, near the Aſcending Node, *A. D.* 1710, 1723, 1736, 1743, 1756, 1769, 1776, 1782, 1789, in *October*; and Four times near the other Node, in the Month of *April*, *A. D.* 1707, 1753, 1786, 1799; all within this Century.

Dr. *Gregory*, in his Comparative Aſtronomy, at the End of his *Aſtron. Phyſ. & Geom. Elementa*, conſiders what *Phænomena* in the Heavens would appear to an Eye placed in this Planet *Mercury*, *viz.*

2. That the Diameter of the Sun ſeen from thence, would be trebble of what it is ſeen from the Earth, becauſe that Planet is thrice as near to it as we are; and conſequently the Sun's Disk to an Eye there, will be Seven times as great as what

it appears to us; and all other things conſider'd, the Light and Heat in *Mercury* will be ſeptuple of ours, at ſome times: But theſe Qualities will be much *intended* and *remitted*, according to the diverſe Diſtance of *Mercury* from the Sun; for his Orbit is the moſt Excentrick of any of the Planets.

2. The Gravity of *Mercury* towards the Sun will be ſeven times greater than in the Earth. The Denſity of *Mercury*, and conſequently the Gravity of Bodies placed on its Surface, towards its Centre, cannot ſo accurately be determin'd, as the Gravity of the Planet towards the Sun: But however, in *Prop.* 49. *Lib.* 3. *Schol.* he ſhews a Way to gueſs Analogically at it. And no doubt this Planet is much denſer than the Earth, becauſe of the Over-proportion of Heat there.

3. It doth not yet appear by Obſervations, whether *Mercury* revolves round his Axis, or not, and conſequently what the Length of his Day is; but 'tis probable he hath ſuch a Motion as well as the other Planets, but his Year is ſcarce equal to a Quarter of ours. What Variety of Seaſons and Weather *Mercury* is ſubject to, is uncertain; becauſe the Inclination of his Axis, on which he revolves about himſelf, to the Plane of the Orbit, which he deſcribes round the Sun, is unknown.

4. To an Eye placed in *Mercury*, and looking towards the Sun, the Solar Spots (if at any time ſuch there are) will appear to traverſe his Disk ſometimes in a Right-Line, from Eaſt to Weſt; and ſometimes their Path will appear Elliptical, bending ſometimes one way, and ſometimes another. And the whole Variety of this Appearance will be abſolved in a Year's Time, in which the Path of the Solar Spots will appear to be twice Rectilinear: But indeed the Path of theſe Spots will be almoſt continually in a Right Line, becauſe *Mercury* never much declines from the Plane of the Sun's Equator.

5. The other Five Planets being above *Mercury*, their *Phænomena* will be much the ſame as to an Eye at the Earth: So that *Venus* and our Earth, when in Oppoſition to the Sun, will ſhine with a full Orb, and conſequently afford a great Light to this Planet at Night. But the Superior Planets will not afford him ſo much Light as they do us.

6. The Sun's and the other Planets Places, and the *Phænomena* of Comets are found the ſame Way in *Mercury*, and after the ſame manner, and will appear as they do to us on the Earth.

MERIDIAN, is a great Circle paſſing through the *Poles of the World*, and both *Zenith* and *Nadir*, croſſeth the Equinoctial at Right Angles, and divideth the Sphere into two equal Parts, one Eaſt, the other Weſt; and has its Poles in the Eaſt and Weſt Points of the Horizon. 'Tis call'd *Meridian*, becauſe when the Sun cometh to the South Part of this Circle, 'tis then *Meridies*, *Mid-day*, or *High-noon*; and then the Sun hath his greateſt Altitude for that Day, which therefore is called the *Meridian Altitude*.

Theſe *Meridians* are various, and change according to the Longitudes of Places; ſo that they may be ſaid to be infinite in Number, for that all Places from Eaſt to Weſt have their ſeveral *Meridians*: But there is (or ſhould be) one *Fix'd*, which is called the *Firſt Meridian*.

MERIDIAN on the *Globe* or *Sphere*, is repreſented by the Brazen Circle, in which the Globe hangs and turns. 'Tis divided into Four 90's or 360 Degrees, beginning at the Equinoctial.

On it, each way from the Equinoctial, on the *Celeſtial Globes*, is counted the South and North Declination of the Sun or Stars: And on the *Terreſtrial Globe*, the Latitude of Places North or South. Which is all one with the Elevation or Height of the Pole above the Horizon; and the Complement of the Latitude or Poles Height is equal to the Height of the Equinoctial above the Horizon.

There are two Points of this Circle, which are called the *Poles of the World*; and a Diameter continu'd from thence through the Centre of either Globes, is called the *Axis of the Earth* or *Heavens*, on which they are ſuppoſed to turn round.

On the *Terreſtrial Globes* there are uſually 36 *Meridians* drawn, one through every Tenth Degree of the Equator, or through every Tenth Degree of Longitude.

The Uſes of this Circle, are,

1. To ſet the Globes to any particular Latitude.
2. To ſhew the Sun's or a Star's Declination, Right Aſcenſion, or greateſt Altitude, *&c.*

PROBLEM.

To find the Sun's Meridian Altitude *or* Depreſſion *at Night by the Globes.*

Bring the Sun's Place to the *Meridian* above the Horizon, for his *Noon-Altitude*; which will ſhew the Degrees of it, counted from the Horizon. For his *Midnight-Depreſſion* below the North Point of the Horizon, you muſt bring the oppoſite Point to the Sun's preſent Place, as before to the *Meridian*; and the Degrees there intercepted between that Point and the Horizon, are his *Midnight-Depreſſion*.

MERIDIAN *Line*, on a Dyal, is a Right Line ariſing from the Interſection of the Meridian of the Place with the Plane of the Dyal. This is the Line of 12 a Clock, and from hence the Diviſion of the Hour Lines begins.

To draw a True Meridian Line *upon an Horizontal Plane.*

Firſt, Get a plain thick Board, of a Foot Square, or more; then upon one of the Edges or Corners, as near as may be, faſten a ſtrong Iron Pin, about 10 or 11 Inches long, and make it ſo faſt, that it will not ſhake or yield in the leaſt: It matters not whether it be perpendicular or not.

Set this Board horizontally in your Garden with Earth or Sand upon the Ground, or elſewhere about 9 a Clock; (the beſt Time is, when the Sun is near the Solſtice, ſuppoſe about the 10th of *June*) ſee where the Head of this Iron Pin (which muſt be ſharp at the top) giveth its Shadow upon the Board, mark that Place: Then take a Wooden Ruler, ſharp alſo at one end, and lay it ſo upon the ſharp end of the Iron Pin, that the ſharp end of the Ruler may touch the Mark; then carrying it ſteady, make the Segment of a Circle towards the North. Come again about 3 a Clock in the Afternoon, and mark where the Shadow of the top of the Iron Pin is, in that Segment again. Then draw a Line from thoſe two Marks, which will be Eaſt and Weſt, and the Perpendicular to that Line will be a *Meridian*; and if you halve that Line, the Perpendicular will go through the Centre of the whole Circle: For that Segment is

part

part of the Basis of a Cone, whose Vertex is the Top of the Iron Pin.

But because the Sun may be under a Cloud, when you come at Three a Clock, you may make three or four more Segments, and use them as you used this.

This Method would be very exact, if the Sun moved as the Fixed-Stars do; but because the Sun hath a proper Motion, as a Planet, there will be some inconsiderable Error, which yet may be corrected; For seeing the Sun in one Minute of an Hour moveth as much by his daily Motion, as he loseth in 6 Hours by his proper Motion; you shall add as much in the way which the Shadow goes in the last Mark, as that Shadow moveth in one Minute, which you may measure by your Pulse or Pendulum; so the last Point will not be taken just in the Segment, but a little without it.

Under the Word *Pole-Star*, you have another good Method for drawing a true *Meridian Line*.

Mr. *Stephen Gray*, in *Philos. Transact.* N° 260, gives a *New Method of drawing a True Meridian Line by the Pole-Star*; as also, *How to find the Hour by the same*. Thus,

Take the Gnomon of an Horizontal Dyal for the Latitude of the Place, and to the Hypothenuse fix two Sights, whose Centres may be parallel to the same: Let the Eye-sight be a small Hole; but the other's Diameter must be equal to the Tangent of the double Distance of the North-Star from the Pole, the Distance of the Sights being made *Radius*. Let the Stile be rivetted to the End of a straight Ruler; then when you would make use of it, lay the Ruler on an Horizontal Plane, so that the End to which the Ruler is fix'd, may hang over: Then look through the Eye-sight, moving the Instrument 'till you see the North Star appear to touch the Circumference of the Hole in the other Sight, on the same Hand with the Girdle of *Cassiopeia*; or on the opposite side to that, whereon the Star in the Great Bear's Rump is at that Time: Then draw a Line by the Edge of the Ruler, and 'twill be a True *Meridian Line*, as is very easie to demonstrate.

In *Philos. Trans.* N° 270, he improves this Method, and describes an Instrument, whereby he not only draws a True *Meridian*, but finds the Hour and Minute of the Day or Night, by the Help of the Pole-Star, exactly. His Instrument he thus describes:

Let there be taken a Telescope, of about 16 Foot, or longer, if you please; in the Plane of its *Focus*, place a Ring of Brass at Right Angles to the Glass, the Diameter of the inward Circle being equal to the double Tangent of the Pole-Star's Distance from the Pole; the Focal Length of the Object-Glass being made *Radius*, as was said in the Description of the *Meridian Instrument*. Let the Ring be divided into 24 Hours, with their Minutes, numbred from the Right Hand towards the Left, as in our common Nocturnals: The Eye-Glass must be equal in its Diameter to the Horary Ring. But this perhaps will be thought too chargeable, especially for such large Telescopes as he speaks of; wherefore he gives this Contrivance: The Eye-Glass must lie in a broad Index, towards one End; this is to turn on a Centre-pin that lies in the Centre of the Glass, and consequently over the Centre of the Horary Ring, from which it must be equal to the Distance of the Focus of the Eye-Glass; then let the Tube be elevated to the Height of the Pole, and directed to the Pole-star; 'till by turning the Index about, you can perceive the Star to touch the Horary Ring on that side the Star in which the *Great Bear*'s Rump lies, or on the opposite to that in the Hip of *Cassiopeia*: But on the contrary, had not the Glass inverted the Object, then bring one of the Twelves to be in a Perpendicular to the other, by a plain Line; so will the Star stand at its Horary Distance from the *Meridian*: Or if the Latitude of the Place be unknown, by the Right Ascension of the Sun and Star, the Time of its coming to the *Meridian* will be easily obtain'd, then the Hour of the Night found, will as easily give the Star's Horary Distance from the *Meridian*. Then elevate the Tube towards the Star, bringing the *Meridian*, or 12 and 12, into the Plane of the Perpendicular; turn the Glass about, 'till you see the Pole-star stand at its Horary Distance from the *Meridian*; so will the Instrument, when fix'd, shew the Horary Distance throughout the whole Day, or as long as it remains in this Position, by the apparent Motion of the Star in the Ring.

The best Time to fix the Instrument, will be when this, or any of the other two Stars above-mention'd, are about 6 Hours from the *Meridian*.

Note, That the Latitude of the Place is now given with the utmost Preciseness; for the Axis of the Glass lies now in the Axis of the World; and if one of the sides of the Tubes be parallel thereto, as it ought to be, at the upper End hang a Line or Plummet, from the Point of Suspension; find another Point equal in Distance to the Length of the Line, or a Knot towards the lower End, the Distance from this Knot to the former Point will be but the Chord of the Latitude; and if from the same Edge of the Index another Line and Plummet be hung towards the lower End of the Tube, these two Lines, when at rest, will be in the Plane of the *Meridian*.

This Instrument may be made to shew the Hour with as much Facility as a Clock or Sun-Dial, if the Horary Ring be made to move within a larger fixed one; and the outward Circle of the former be divided into the Days of the Month, respect being had to the Right Ascension of the Sun and Star: Then bringing the two opposite Points in the fixed Circle, to the Perpendicular, which is done at the fixing of the Instrument, move the Circle 'till the Day of the Month come to any of these, and the Ring is rectified for that Day; and if the Air be clear, you'll see the Star stand at the true Time of the Day or Night.

It may be objected, That in few Years, by the Annual Increase of its Declination, the Pole-star will, by moving in a lesser Circle, be brought too far from the Edge of the Ring, that the exact Hour and Minute cannot well be distinguished. But this Inconveniency, when it is one, may be remedied several ways; either by making a lesser Ring, or by extending a fine Thread of Silk cross the Ring, 'till it cuts the Star, and at the same time it gives the Hour; or, which will yet make this Instrument commodious for other Purposes, there may be made an Index to move on the Centre of the Hour-wheel, which being brought to cut the Star with the Edge that proceeds from the Centre, it will at the same time cut the Hour. And you need not be sollicitous about the exact Diameter of the Ring, provided

it

it do but a little exceed the Diſtance of the Pole-Star from the Pole, the Focal Length of the Glaſs being made Radius.

Our moſt Accurate and Judicious Aſtronomer, Mr. *John Flamſteed*, has diſcovered, That there is a Parallax of the Earth's Annual Orbit at the Pole-ſtar, of about 40 or 45 Seconds; whereby the Diameter of the Star's Parallel is greater in *June* than in *December*, by about one Minute two Seconds; which he has evinced from 7 Years ſucceſſive Obſervations: Whereby the Earth's Annual Motion is indubitably demonſtrated, as appears from his Learned Letter to Dr. *Wallis* on that Subject.

Now if on the Edge of this Index there be drawn a Scale of Degrees, Minutes and Seconds, to the Radius of the Glaſs, we ſhall not only have a very Accurate Inſtrument for the Hour, but be furniſh'd with one whereby we ſhall ſee the Truth of the Earth's Motion confirmed by the Acceſs and Receſs of our Star towards and from the Pole, according to the Earth's Place in the Ecliptick, as that learned Perſon above-mentioned has diſcover'd; and that not only when the Star tranſits the *Meridian*, but in a clear Air at any Time of the Day: One ſhall likewiſe obſerve that Annual Increaſe of the Pole-ſtars Declination, cauſed by the Proceſſion of the Equinox.

Moreover, he, from his own Obſervation, aſſures us, That the Pole-ſtar may be ſeen in the Day-time with a Teleſcope of 16 Foot; of which he gives particular Inſtances: As, On the 26th of *April*, 1701, with ſuch a Teleſcope he ſaw the Pole-ſtar from four a Clock in the Morning, 'till ſeven; and could have ſeen it longer, had not Clouds interpos'd. Alſo, On the 1ſt of *May*, he did not look for the Star 'till the Sun had been up more than half an Hour, *viz.* at Five in the Morning, yet ſoon found it; and ſaw it afterwards at Pleaſure, 'till half an Hour after Nine the ſame Morning. So that 'tis not to be doubted, but this Star may be ſeen in a Clear Day throughout the Year.

The Declination of the Pole-ſtar for the Year 1700, is 87° 42′ 51″ by *Ricciolus* his Catalogue of Fixed Stars, in the *Appendix* to Mr. *Edward Sherbourn's Sphere* of *Manilius*, &c. Hence its Diſtance from the Pole at that Time might be aſſumed 2° 17′ the Focal Length of the Object-glaſs being 15 Foot 6 Inches; ſo that the Diameter ſhould be 14 Inches and $\frac{84}{100}$ Parts of an Inch, which is the natural Tangent of the former Ark 2° 17′ doubled; a Circle large enough to be divided into Minutes and Halves, which will be ſo magnified by the Eye-glaſs, that 'twill be eaſie to diſtinguiſh the Time to a few Seconds.

'Tis true, there is ſome Difficulty in fixing up this Inſtrument; and when it is ſo, to keep it from varying from its due Poſition; but yet 'tis not inſuperable. And for ſmall Inſtruments, of about 2 or 3 Foot long, there cannot be a more accurate, facile, and expeditious Way than this for drawing a *Meridian Line*.

Now whether the many Benefits that may accrue to Aſtronomy, do not make the larger one worthy of the Charge and Trouble that may be in compleating it, he leaves to the Conſideration of the Learned.

MERIDIAN *Magnetical*, is a great Circle paſſing thro' or by the magnetical Poles; to which Meridians, the Compaſs (if not otherwiſe hindred) hath reſpect.

MERIDIONAL *Diſtance*, in Navigation, is the ſame with the Departure, Eaſting or Weſting, or the Difference of Longitude between the Meridian under which the Ship now is, and any other Meridian ſhe was before under.

MERIDIONAL *Parts*, *Miles*, or *Minutes*, in Navigation, are the Parts by which the Meridians in Mr. *Wright's* Chart (commonly, though falſely, called *Mercator's*) do increaſe as the Parallels of Latitude decreaſe: And the Co-ſine of the Latitude of any Place being equal to the Radius or Semi-diameter of that Parallel, therefore in the True Sea Chart, or Nautical Planiſphere, this Radius being the Radius of the Equinoctial, or whole Sine of 90°; the *Meridional Parts* at each Degree of Latitude muſt increaſe, as the Secants of the Ark contained between that Latitude and the Equinoctial do decreaſe. The Tables therefore of *Meridional Parts*, which you have in Books of Navigation, are made by a continual Addition of Secants: They are calculated in ſome Books (as in Sir *Jonas Moor's* Tables) for every Degree and Minute of Latitude; and theſe will ſerve either to make or graduate a *Mercator's Chart*, or to work the *Mercator's Sailing*. To uſe them, you muſt enter the Table with the Degree of Latitude at the Head, and with the Minute on the firſt Column towards the Left Hand; and in the Angle of Meeting you will have the *Meridional Parts*.

Having the Latitudes of two Places, to find the Meridional Miles or Minutes between them, conſider whether the Places be one under the Equinoctial and the other wide thereof; or the one on the one ſide of the Equinoctial, and the other on the other; or whether they both lie on the ſame ſide: For, according to theſe Poſitions, there's a Threefold Caſe.

1. When one Place lieth under the Equinoctial, then the Meridional Minutes that are found next under the Degree of Latitude the other Place lieth in, is the Meridional Difference of Latitude, or Latitude enlarged.

2. When one Place hath North Latitude, and the other South, add the Meridional Minutes belonging to each Latitude together, and the Sum is the Meridional Minutes between them.

3. When both Places are towards one Pole, then ſubſtract the Meridional Parts anſwering to the leſſer Latitude, out of thoſe for the greater, and the Remainder will be the Meridional Minutes required.

Examples of theſe Caſes will make them more plain, which ſhall be theſe:

Example I.

To find the Meridional Parts *or* Minutes *between the Equinoctial and Latitude* 43° 11′.

In the Column under 43, and right againſt 11 Minutes in the Left Hand Column ſtands 2878.2, the Meridional Parts required.

Example

Example II.

Let it be required to find the Meridional Parts *between* 25° 13′ *South Latitude, and* 51° 30′ *North.*

Under 51° and againſt 30′ is——3616.8
Under 25° and againſt 13′ is——1564.3

The Merid. Parts between the two, are----5181.1

Example III.

To find the Meridional Minutes *between the Latitudes* 32° 15′ *North, and* 53° 23′ *North.*

Under 53° and againſt 23′ is——3802.2
Under 32° and againſt 15′ is——2046.1

The Meridional Parts between the Latitudes propoſed, are——1756.1

MERLON, in Fortification, is that Part of the Parapet which lies betwixt two Embraſures, being from 8 to 9 Foot long on the ſide of the Cannon, and 6 on the ſide of the Field; as alſo 6 Foot high, and 18 thick.

MESARAICK *Veins*, ariſe from, or are rather encloſed in the *Meſentry*, being Branches of the *Vena Porta*.

MESARÆUM, the ſame with *Meſenterium*; whence its Veſſels are called as well *Meſaraick* as *Meſenterick*.

MESENTERY, is the Membrane of the *Peritonæum* doubled, enriched with Glandules, Nerves, Arteries, Veins, Chyliferous and Lymphatick Veſſels: It is in the middle of the *Abdomen*, and contains the Inteſtines in a wonderful manner. It has a great Glanduſe in the middle, called *Pancreas Aſellis*; about which are ſeveral other leſs Glandules, to which the Milky Veſſels of the firſt Rank tend, from the Inteſtines and Lymphatick Veſſels, from the Liver and other Parts: From theſe Glandules again the Milky Veſſels of the ſecond Rank aſcend to the Veſſel that carries the Maſs of Chyle, and diſcharge themſelves into it. *Blanchard*.

MESENTERICK *Arteries*: The Upper of which is ſaid to diſtribute it ſelf among the ſmall Guts; and the Under one to go to the lower Part of the *Meſentery*.

MESN, or *Meaſn*, a Term in Law, ſignifying him that is Lord of a *Manor*, and ſo hath Tenants holding of him; yet himſelf holds of a Superiour Lord. It ſignifies alſo a Writ, which lieth where there is *Lord*, *Meſn* and *Tenant*: The *Tenant* holdeth of the *Meſn* by the ſame Services whereby the *Meſn* holdeth of the *Lord*; and the *Tenant* of the *Meſn* is diſtrain'd by the Superior *Lord*, for that his Service or Rent which is due to the *Meſn*.

MESOCOLON, is that Part of the *Meſentery* which is continued to the Great Guts, lying in the midſt of the Gut *Colon*, whereto it is joined in its whole Courſe, and in its loweſt Border ſticks to a Part of the *Rectum*.

MESOLABIUM, in Mathematicks, is an Inſtrument for finding Mean Proportionals.

MESOPLEURII, are the Intercoſtal Muſcles, Twenty two on each ſide; Eleven External, and as many Internal.

METACARPUS, and *Metacarpium*, is the Back of the Hand, made of Four oblong little Bones, which expand the Palm of the Hand, and they are called *Poſt-brachialia*.

METACARPUS, is a Bone of the Arm, made up of Four Bones which are annexed to the Four Fingers; that which ſuſtains the Fore-finger is the biggeſt and longeſt. They are round and long, a little convex and round towards the Back of the Hand, and concave and plain towards the Palm: They are hollow in the middle, and full of Marrow; they touch one another only at their Extremities, leaving Spaces in their middle, in which lie the *Muſculi interoſſei*. In the upper end there is a *Sinus*, which receives the Bones of the Wriſt, and their lower Extremity is round, and is received into the *Sinus* of the firſt Bones of the Fingers.

METACONDYLI, are the utmoſt Bones of the Fingers.

METALS and *Minerals*. The Excellent Promoter of all uſeful Learning, Biſhop *Wilkins*, in his Real Character, gives the following Table of Metals.

Metal *is a* Mineral, *for the moſt part of a Hard Conſiſtence, Cloſe,* Ductile, *and* Fuſil; *and may be diſtinguiſhed into*

I. *Perfect.*

And this is either, { *Natural*, or *Factitious.*

II. *Imperfect.*

With Reference to { *Metalline Kinds*, or, *Recrementitious* Parts.

Firſt, *Natural Metals* are ſuch as of themſelves grow in the Earth, without any kind of Mixture or other help by the Art of Men. And theſe are either,

1. More Rare and Precious: Of a

Yellowiſh Colour, moſt *heavy*; not growing in particular Mines, where it is debaſed with any droſſie Mixture, but found pure either in ſmall Sands, or rocky Branches; and this is *Gold*.
Whitiſh Colour, next in Value to Gold, not ſubject to Ruſt, yielding (when ſtruck) a pleaſant Sound; as *Silver*.

2. Of a Middle Value, and of a

Whitiſh Colour, and more ſoft Conſiſtence, as *Tin*: Or of a
Reddiſh Colour, as *Copper*.

3. Of a Baſer Value, and more Common,

are

Lead, which is of a yet ſofter Conſiſtence, a *darkiſh* Colour, and not *Sonorous*.
Iron, which is of an hard Conſiſtence, and of a ruſty dark Colour too.

Secondly, Factitious *Metals*, are ſuch as are made by the Art of Man: Of which ſome are made of

Copper, and *Lapis Calaminaris*, as *Braſs*. Some of
Tin, *Lead*, and *Tin-Glaſs*, as *Pewter*. Or of
Iron depurated, by frequent heating, and beating, and boiling with Salts; as *Steel*.

Thirdly, *Imperfect Kinds* of Metal, are either

Fluid, as *Mercury* or *Quick ſilver*: Or,
Solid and Conſiſtent. And ſome of theſe are uſed for
Purging, and chiefly upwards, as *Antimony*. Some are uſed for making of
Pewter, being of a ſhining brittle Subſtance, as *Biſmuth* or *Tin-Glaſs*. Others are uſed for making of
Solder, as *Spelter*, *Zink*, or *Spalt*. And ſome are made uſe for
Painting, as *Cinnabar*, *Vermilion*, and *Black Lead*.

Fourthly, *Recrementitious Parts* of Metals, are ſuch as are caſt off either in the *Preparation* of them by

Melting; as *Litharge*, which is a kind of Scum ariſing from the Purification of Silver from Lead; and *Spodium* and *Pompholix*, which fly out from Copper when it is in Fuſion, and either fall down again to the Ground, as the former, or adhere to the Roof or Walls, as the latter: Or elſe they come from the Metal by
Beating or Hammering, as the *Scoria*, or Scales; or ariſe from
Corruption either in the general way, as *Ruſt*, or after a particular manner, as in the making of *Verdigreaſe* and *Ceruſe*; one from Copper, or Braſs, and the other from Lead.

But notwithſtanding this Scheme be a good general Summary; yet a good Diſcourſe on this Subject is very much wanting; and indeed, to do it well, will be a very difficult Task: Becauſe in the *Mineral Kingdom* (as Dr. *Woodward* obſerves in his Excellent Natural Hiſtory of the Earth, *Part* 4.) there is nothing *Regular*, *Conſtant*, or *Certain*: Neither *Colour*, *Figure*, nor their *Place* or Situation in the Earth, are to be truſted to, or relied upon, ſo as poſitively to make any Judgment from thence.

A common *Marchaſite*, or *Pyrites*, ſhall have the Colour and Brightneſs of Gold or Silver, and yet afford nothing but a little Sulphur and Vitriol; whilſt another Body, having only the Reſemblance of a Pebble or a Stone, ſhall have a plentiful Admixture of a valuable Metal in it.

Nothing is more common than to find the ſame Metal ſhot alſo into very different Forms and Figures; as well as to find different kinds of Metal of the ſame Form and Figure: And a Body which hath the ſhape and appearance of a Diamond, may prove upon Examination, to be nothing but Chryſtals or *Selenites*; nay, perhaps only common Salt, or Alum, naturally Chryſtalliz'd, or ſhot into that Form.

So alſo as to their Place in the Earth, there is the ſame Uncertainty: Sometimes we find them in the Perpendicular Fiſſures, or Intervals of the *Strata*; ſometimes interſperſed in the Bodies of the *Strata*, and ſometimes in both: Only indeed in the Gems there is this Difference, That the *Topazes*, *Amethiſts*, *Emeralds*, &c. which grow in the Fiſſures, are ordinarily Chryſtallized or ſhot into Angular Figures, whereas thoſe found in the *Strata*, are in rude Lumps, only like ſo many Yellow, Purple, or Green Pebbles; not but that even theſe that are thus lodged in the *Strata* are alſo ſometimes found Chryſtallized, and in the Forms of *Cubes*, *Rhombs*, &c. but then thoſe found in the *Strata*, are eaſily diſtinguiſhed from the other, becauſe they are without their *Root*, (as the Jewellers call it) or the Abruptneſs at their Ends, whereby the others adhere to the Stone or Sides of the Intervals, which Abruptneſs is occaſioned by their being broken off from thence: And thoſe which are found incloſed in ſolid Stone, Marble, &c. being difficultly ſeparable from the Stony Matter which adheres to them on all ſides, have commonly ſome of that Matter ſticking to them on all their ſides; whereby they are diſtinguiſhed from thoſe found in the *Perpendicular Intervals*, they adhering only by one End, as was above obſerved.

The ſame *Metals* are alſo placed indifferently in all kind of Terreſtrial Matter, or in *Strata* of very different Natures. They are frequently alſo variouſly intermixed one with another; ſo that 'tis a rare thing to find any of them Pure and Simple, but Copper and Iron ſhall be in the ſame *Maſs*, Gold and Copper, Silver and Lead, Tin and Lead; yea, ſometimes all the Six together in one and the ſame Lump.

'Tis the ſame thing with *Minerals*; and Minerals and Metals are very often Blended and Intermixed together.

Now the Knowledge of this may be of good uſe to undeceive thoſe, who by reading of ſome Authors, are perſuaded, That all things relating to Metals and Minerals, are tranſacted by Nature, in a moſt regular and Accurate Order, whereas indeed there is nothing like that; and the only ſtanding Teſt, and diſtinguiſhing Characteriſtick of any Metal or Mineral, muſt be ſought for in the Conſtituent Matter of it, and it muſt firſt be brought down to that, before any certain Judgment can be given of it.

Thoſe Metals and Minerals which are repoſited in the Bodies of the *Strata*, are either found there in Grains, or ſmall Particles, or elſe amaſſed into Balls, Lumps, or Nodules; which Nodules are either of an irregular and uncertain Figure; as the common *Pyritæ*, *Flints*, *Agates*, *Onyxes*, *Pebbles*, *Cornelians*, *Jaſpers*, &c. or elſe they are of a Figure ſomewhat regular and obſervable; as the *Belemnites*, the ſeveral ſorts of *Mineral Coral*, the *Stelechites*, the *Lapis Mucetoides*, vulgarly called, *Fungites*: The *Aſtroites*, or *Starry Stone*; as well that ſort with the *prominent*, as that with the Concave Stars: The *Selenites*, the Echinated Chryſtalline Balls, with many more Analogous Bodies.

Thoſe which are contained in the Perpendicular Intervals of the *Strata*, are either ſuch as are there gathered into a Rude Heap, without any particular Form or Order, lying included within the two oppoſite Walls or Sides of the ſaid Intervals,

vals, which, according to their Quantity, they wholly, or partly fill.

In ſuch manner is *Sparr*, and other Minerals uſually found; as alſo the common Ores of Lead, Tin, Iron, and other Metals: or elſe ſuch as are diſtinguiſhable by being of ſome obſervable Figure; as the *Sparry Stiriæ* or *Iceycles*, called *Stalactitæ*, or rather *Stagonitæ*; the Native *Saline Iceycles*, or *Sal Stalactitum*; the *Vitriolum Stalactitum Nativum*; the *Vitriolum Capillare*; the *Alumen Stalactitum* and *Capillare*; *Minera Ferri Stalactica*, which when ſeveral of the Cylindrick *Stiriæ* are contiguous, growing together, as it were, in one Sheaf, is called *Bruſh Iron Ore*; the *Argentum Arboreſcens* and *Capillare*. To theſe add alſo the cryſtallized Ores and Minerals, *viz.* the Tin, and mundick Grains, the Iron Rhombs, cryſtallized Nitre, Salt, Alum, Vitriol and Sulphur: Of which ſort alſo are the Gems or Stones that are here ſhut into Cubes, into Pyramidical Forms, or into Angulated Columns, conſiſting of ſix Sides, and mucronated or terminating in a Point; being either *Opake* or *Pellucid*, or but partly ſo, and coloured Black, White, Grey, Red, Purple, Blue, Yellow or Green; *v. gr. Chryſtal*, the *Pſeudo-Adamantes*, the *Corniſh* and *Briſtol-Stones*, *Cryſtallized Sparrs*, the *Iris*, the *Amethyſt*, the *Sapphire*, the *Topaz*, the *Emerald*, &c.

As to the Origin and Production of Metals and Minerals, the Doctor from the Light his Obſervations have given him, comes to theſe Concluſions.

1. That the far greateſt Part of our Metals and Minerals, *viz.* all ſuch as are now found in the *Strata*, do owe their preſent Frame and Order to the *Univerſal Deluge*, when the *Strata* of Stone, Earth, Marble, &c. themſelves were alſo formed. At which Time alſo were all metallick and mineral Nodules whatſoever formed; as well thoſe in rude Lumps, ſuch as the common *Pyritæ*, *Flints*, *Pebbles*, *Agates*, *Onyxes*, *Jaſpers*, *Cornelions*, &c. as thoſe of a more obſervable Figure and regular Shape; as the *Selenites*, *Belemnites*, *Stelechites*, mineral Coral.

2. That the metallick and mineral Matter, now found in the perpendicular Intervals or Fiſſures of the ſeveral *Strata*, of which the Body of the Earth is compoſed, was all of it originally, and at the Time of the Deluge, lodged in the Bodies of thoſe *Strata*, that it was educed thence, and tranſmitted into theſe Intervals ſince that Time; the Intervals themſelves not exiſting 'till the *Strata* were formed, and afterwards broken, to let the Water from off the Earth. See *Part* 2. *Conſect.* 3, 6. and *Part* 3. *Sect.* 2. of his *Natural Hiſtory of the Earth*.

But he ſuppoſes, that the Water which is continually aſcending from the Abyſs, towards the Surface of the Globe (ſee *Abyſs*, and the Word *Springs*) continually pervading the Bodies of the *Strata*, detaches out of their Pores and Interſtices, ſuch metallick and mineral Corpuſcles, as lie looſe in its way (and which are withal ſo ſmall as to be capable of paſſing thro' thoſe Interſtices) forcing them along with it to the perpendicular Intervals; where having more Room, and a freer Paſſage than before, it deſerts them and leaves them in thoſe Intervals; and that this way all the mineral and metallick Metals now found in thoſe Places, were brought thither, and there do ſtill grow and increaſe.

But that theſe in the *Strata* do not, nor cannot grow, but on the contrary, are continually leſſened and diminiſhed, by ſo much as hath been conveyed into their perpendicular Intervals, and hath been brought forth on the Surface of the Earth by Springs, Rivers, and Exhalations from the Abyſs, ever ſince the Deluge.

The Doctor ſuppoſes alſo, That the *Bitumen*, which is found in Lumps, or coagulated Maſſes, in *ſome Springs*; and which in others is found floating on the Surface of the Water in the Form of an Oyl (called by Naturaliſts, *Naphtha* and *Petroleum*): That the Salt wherewith the *Salinæ* or Salt Springs abound, the Vitriol, Alum, Nitre, Sulphur, Sparr, and other Minerals, wherewith the *Acidulæ*, or medicinal Springs are impregnated; all theſe Minerals, he ſaith, were firſt lodged in the *Strata* of Stone, Coal, Earth, &c. and have ſince been educed thence, and conveyed into thoſe Springs, by the Water pervading thoſe *Strata* in its Paſſage from the Abyſs towards the ſaid Springs. See a much larger Account of this Matter under the Word *Foſſils*.

METAL, a Word frequently uſed about a Piece of Ordnance, or great Gun: The Outſide or Surface of her is called, The *Superficies of her Metals*: When the Mouth of a great Gun lies lower than her Breech, they ſay, She *lies under Metal*; but if ſhe lies truly level, point-blank, or right with the Mark, they ſay, She *lies right with her Metal*.

METALLURGY, is the Working or Operation upon Metals, in order to render them moſt fine, hard, bright, beautiful, ſerviceable or uſeful to Mankind.

METAPEDIUM, the ſame in the Foot that *Metacarpus* is in the Hand.

METAPHOR, a Trope in *Rhetorick*, by which we put a ſtrange and remote Word for a proper Word, by reaſon of its Reſemblance with the Thing of which we ſpeak: As a King is called the Head of his Kingdom, becauſe he commands the Members of the Politick Body, as the Head does the Natural Body.

METAPHRENUM, is that Part of the Back, which comes after the *Diaphragm*. *Blanchard*.

METAPTOSIS, is the degenerating of one Diſeaſe into another, as of a *Quartan Ague*, into a *Tertian*; and on the contrary, of an *Apoplexy* into a *Palſie*, &c.

METASTASIS, is when a Diſeaſe goes from one Part to another; which happens to Apoplectick People, when the Matter which affects the Brain is tranſlated to the Nerves.

METATARSUS, is compoſed of five little Bones, connected to thoſe of the firſt Part of the Foot, which immediately ſucceeds the Leg.

METEORS, (according to the *Carteſians*) are certain various Impreſſions made upon the Elements, exhibiting them in different Forms, and are called *Meteors* from their Elevation; becauſe for the moſt part, they appear to be high in the Air; and they are either Fiery, Airy, or Watery.

Fiery Meteors, are ſuch as conſiſt of a fat, ſulphurous kindled Smoke, whereof there are ſeveral Kinds; as *Ignis Fatuus*, *Trabs*, *Ignis Pyramidalis*, *Draco Volans*, *Capra Saltans*, *Thunder* and *Lightning*, &c.

Airy Meteors, are ſuch as conſiſt of flatuous and ſpirituous Exhalations, as *Winds*, &c.

Watery Meteors conſiſt of Vapours, or Watery Particles, by the Action of Heat ſeparated from each other, and variouſly modified, as *Rain*, *Dew*, &c.

Dr. *Woodward*, in his *Natural Hiſtory of the Earth*, p. 208. ſuppoſes the Matter of *Meteors* to be in good meaſure of a mineral Nature; and that the mineral Particles contained in the *Strata* of the Earth, are raiſed up by the Subterranean Heat or Fire, along with the Vapours aſcending from the Abyſs, and pervading thoſe *Strata*, and eſpecially at ſuch times as the Sun's Power is ſo great, as to penetrate the exterior Parts of the Earth, and therefore help to mount them up into the Atmoſphere. Theſe Sulphureous, Nitrous, and other light and active mineral Particles do form Meteors in the Air, and particularly are the Cauſe of *Thunder* and *Lightning*, &c. and other Fiery Compoſitions there.

METHOD, or *Diſpoſition*, is that Action of the Mind, by which we range various Ideas, Judgments and Ratiocinations upon one and the ſame Subject, in that Order which is moſt proper for its Explanation; and a right Method of Enquiry after Truth, or the Proſecution of any Demonſtration, will be found to conſiſt alſo in a regular Train of Arguments and Conſequences rightly diſpoſed in their juſt and natural Order. If you will believe *Des Cartes*, he ſaith, in his Book *De Methodo*, That he was able to maſter the greateſt Depths in *Geometry*, by only obſerving conſtantly theſe four following Rules in his Studies.

Firſt, Never to admit any thing for Truth, and to treaſure it up in the Mind as ſuch, unleſs we be demonſtratively aſſured, that it is ſuch.

Secondly, To divide the Difficulties of the Problem, or Matter inquired after, into ſuch a proper Number of Parts, as is moſt convenient for its Reſolution.

Thirdly, To obſerve exact Order and Method in our Thoughts and Inquiries, ſo as to begin with the plaineſt and eaſieſt Things firſt, and then to proceed on gradually to Things more and more difficult.

Fourthly, To be ſure not to ſlip, over-look, or omit any thing, either in the Difficulties to be ſolved, or in the means of Inquiry.

Theſe are indeed very good Rules, and I queſtion not were very ſerviceable to him in his *Geometrical Inquiries*; but the Sight of our Country-man *Harriot's Algebra*, did him as much Service as all of them.

In *Mathematical Inquiries*, there are Two general Methods commonly made uſe of, the *Analytical*, and the *Synthetical*; which ſee: And to which may be added, the *Zetical* and *Poriſtical* Methods; which you will find under thoſe Words.

METONICK *Year*, or *Period*, is the Space of 19 Years; in which time, the *Lunations* return, and happen as they were before; 'tis ſometimes called, *The Great Metonick Year*, and is the ſame with the *Cycle of the Moon*.

METONYMY, or *Tranſnomination*, (a Figure or Trope in *Rhetorick*) is the putting of one Name for another, or expreſſing a Thing by another Name, than which properly belongs to it; as if we ſhould ſay, *All the World reads* Cicero; Cæſar *ravaged the* Gauls; it would be plain, what we intended, *viz.* That *the World reads* Cicero's *Works*; Cæſar's *Army ravaged the* Gauls.

METOPA, in Architecture, is the Interval or Space between every Triglyph in the Frize of the *Dorick* Order. The Ancients uſed to adorn theſe Parts with Carved Works or Paintings, repreſenting the Heads of Oxen, Veſſels, Baſons, and divers other Inſtruments that were uſed in their Sacrifices.

METRENCHYTA, is an Inſtrument wherewith Liquors are injected into the Womb.

MIASMA, is a contagious Infection in the Blood and Spirits, as in the *Plague*, &c.

MICROCOUSTICKS, the ſame with *Microphones*.

MICROCOSM; The Body of a Man is called the *Little World*, as a kind of Compendium of the Greater.

MICROMETER, is an Inſtrument made of Braſs, being a Movement with a Plate, or Face, divided like a Clock or Watch, with an Index or Hand, which (being turned) moves two ſliding Plates of Braſs with Hairs, and counts on the Plate the Revolves or Turns of the endleſs Screw. This Inſtrument is fitted to a large Teleſcope, and uſed in *Aſtronomy*, to find the Diameters of the Stars, or Planets.

The Deſcription of this Inſtrument of Mr. *Townley*, improved by Dr. *Hook*, you may ſee more at large in *Philoſ. Tranſact.* N. 29. and the Uſes in N. 25. See Vol. II.

MICROPHONES, are Inſtruments contrived to magnifie ſmall Sounds, as *Microſcopes* do ſmall Objects.

MICROSCOPE, is an Optical Inſtrument, which by extremely magnifying (as they ſay) any Object, helps us to diſcover the minute Particles of which Bodies are compoſed, and the curious Frame and Contexture of them.

To make very ſmall ſingle Eye-glaſſes for Microſcopes.

Get ſome very ſmall Silver-wire, and double it up and down like a Skein of Thread, in order to make a Wick (for a Lamp) of a moderate ſize; then fill a Lamp with *Spirit of Wine*, well dephlegmated, and uſe the Silver-wire inſtead of a Cotton-wick: Then having ready ſome fine Glaſs beaten, powdered, and ſifted very ſmall, and well waſhed and dried, take ſome of it on the Point of a Silver Needle filed very ſmall, and wetted a little with Spittle, and holding it in the Flame of the Lamp, turn it about 'till it melt, (as it will ſoon do) into a fine round Globule: You muſt hold it in the Flame no longer than 'till it come to its *round Figure*, leſt you burn it: The only Difficulty is in giving it that Roundneſs exactly, but Practice will ſoon learn you the Knack of it; they muſt be cleanſed afterwards by rubbing them a while on ſoft Leather. *Philoſ. Tranſact.* N. 141.

Thoſe *Microſcopes* that are made with ſingle Convex Glaſſes, muſt have the Object placed in one *Focus* of the Glaſs (or rather a little nearer), and the Eye muſt be in the other *Focus* on the other ſide.

Theſe

Place this under y^e word Microscope

JOHN MARSHALL'S
New Invented
DOUBLE MICROSCOPE,
For Viewing the
CIRCULATION of the BLOOD

Made & Sold by him at the Archimedes &
Golden Spectacles in Ludgate Street.

B. Lens delin: I. Sturt sculp:

These kind of *Microscopes*, when the Glasses are well made, do magnifie exceedingly: Such are our very Famous Mr. *Mellen*'s Glasses, which, I believe, are the best of any in the World of this kind: And such are those of Mr. *Lewenhoeck* of *Delft* in *Holland*, by which so many great Discoveries have been made.

But there is more than one great Inconvenience in these Glasses, *viz.* To magnifie much, the Object must be so near, that it must almost touch the Glass; 'tis also very difficult to fit the Object true to the Glass, and when fitted, to fix it so; and but a very small Part of the Object can be seen at a time. But then they being contrived to carry in the Pocket, are very ready, and will be of vast Use on many Occasions.

The best Glasses of this kind that ever I saw, are made by the above-mentioned Mr. *Mellen*, who formerly lived in *Abchurch-Lane*.

In *Philos. Transact.* N. 42. is an Account of a *Microscope* of *Eustach. Divini* (which is also treated of by *Faber* in his Opticks, (*Prop.* 46.) and which I have in some measure experimented my self to be a very good Method of disposing the Glasses. He uses, instead of a common double Convex Eye-glass, two Plane Convex ones, which are so placed as to touch one another in the middle of their Convex Surface; by which means the Glass will take in more of any Object, will represent it flat, and not crooked, and will magnifie also (as they call it) very much. This Glass had four several Lengths (made by Draws); at the least Length, which was 16 Inches, it magnified Lines 41 times bigger than they appear to the naked Eye; at the second Length 90 times; at the third Length 111 times; at the fourth Length 143.

As to the Method of making the same Glass magnifie differently, at different Lengths, Mr. *Marshall* hath brought it to bear very well in his small Pocket *Microscopes*; and this I take to be a good Improvement, which he hath added to the Glasses of *Campani*, which are made after that manner, but with only one Degree of magnifying with one and the same Glass.

In *Philos. Transact.* N. 221. there is an Account of several Microscopical Experiments, by one Mr. *Stephen Gray*; where he speaks of making *Microscopes* with a Globule of Water only, put into an Hole made in a small Brass Plate, which I my self have often tried; and were it not for the trembling Motion of the Fluid, it would do very well.

He saith also, That by applying a small Globule of Pepper-water, &c. to his bare Eye, (*i. e.* by fixing it on the Surface of his Eye) he could in a darkened Room, by Candle-light or Moon-light, or by looking thro' a small Hole in a piece of Paper, discern the *Animalcula* which were in it, exceedingly magnified; and oftentimes, when the Drop of the Fluid was round and well defined, very distinct and plain.

In N. 232. Mr. *Gray* gives a farther Improvement of his *Water Microscope*.

A Description of Mr. Marshall's Double Microscope.

This Microscope *consists of Three Glasses*;

The Eye-Glass *W.*
The Middle-Glass *A.*
And the Object-Glass *C.*

B. Is the Cover or Lid, to keep out Dust from the Eye-glass *W.*

X. Is the Place for the Eye.

W. A Screw where the Eye-glass lies.

A 1. A Screw where the Middle-Glass lies.

A 2. The Draw.

C. The Object-Glass fix'd in a Brass Button, to screw on or off, as Occasion serves.

Z. The Frame or Basis on which the *Microscope* stands firm.

T. A small Drawer in the Frame or Basis, with a Ledge or Till in it, having six Partitions to hold so many several Object-Glasses, one magnifying more than another, and fixed in Brass Cells ready to screw on at *C*, and marked 1, 2, 3, 4, 5, 6. These Partitions are also marked

1, 2, 3, 4, 5, 6. The other part of the Drawer serves to hold the Object-plate (a); a Pair of small Nippers (b), to take up or handle any Object conveniently; another Object-plate (d), having one side White, and the other Black, to fix your Objects upon, as Black upon White, and White Objects on Black.

L. M. A Brass Ball and Socket, on which the whole Body of the *Microscope* is moveable, so as to lie in any Position for the Light.

K. O. A square Brass Pillar on which the *Microscope* is moveable up and down, by means of the Collar *E*, into which the Arm *D* (holding the *Microscope*) is continued.

G. Another Brass Collar sliding up and down on the Pillar *K. O.* having a small Screw *H.* by which it is, as Occasion serves, fix'd fast to the said Pillar, at any Height.

I. A large Brass Nut, in whose Centre is a Female Screw, fitted to the Male Screw *F*, which is fix'd in the Collar *E*: By the turning of which Nut *I*, (the Collar *G* being first fix'd to the Pillar by the Screw *H*) the *Microscope* is rais'd up or down on the Pillar, and made to come nearer, or go farther from the Object: And which is also a very great Advantage, the Axis of the *Microscope* is always kept perpendicular to that Point of the Object, over which it was first placed; so that here is not the Inconvenience which occurrs in other Glasses, of often losing the Sight of the Object, by screwing the Glass higher or lower.

Q. A Glass Object-Plate fix'd in a Brass Frame, whose Arm *N. N.* is fix'd to the Pillar by means of the Nut *O.* The Arm *N. N.* hath in it a Slit, by which 'tis easily put on, or taken off the Pillar, and by which it may be fix'd upon it at any Distance.

P. A small Fish lying on the Glass-Plate, that the Circulation of the Blood may be seen in part of the Tail-fin, at (c).

R. A Convex-Glass, by whose Help a bright Spot of Light is brought from a Candle at S. standing on the Ground while the *Microscope* stands on the Edge of a Table or Stool; which Spot of Light (c) serves to render the Circulation more conspicuous.

V. A Lead Coffin to be put on the Fish, to hinder it from springing away, and moving his Tail out of the Light.

1, 2, 3, 4, 5, 6, Are Marks on the Pillar *K. O.* which shew you the Distance that the Object-Glass must be from the Object you look upon, according

according as the Object Glaſſes you make uſe of, magnifie more or leſs. Thus, for Inſtance, If you uſe the Object-Glaſs, 5 or 6, (either of which will ſhew the Circulation of the Blood) you muſt fix the upper Edge of the Collar *E*, at the Mark 5 or 6 on the Pillar. And then will the *Microſcope* be very near its exact Diſtance from the Object; ſo that by a ſmall Turn or two of the Nut *I*, either way, you may ſoon exactly fit it to your own Eye, and place the Object in its true diſtinct Baſis.

By this *Microſcope*, Liquors alſo may be very commodiouſly examined; for if you place a ſmall Drop of any Liquor on the Glaſs-plate juſt in the middle of the Spot of Light (c), the Parts of it will become very viſible, and its *Animalcula*, if it have any, will be diſcovered. And thus may the Eels in Vinegar, the ſmall Creatures in Black Pepper-water, or in Waters where Wheat, Barley, *&c.* have been infuſed, the Eels and other ſmall living Creatures in Puddle-water, be as plainly ſeen as by almoſt any other *Microſcope*.

And one Thing I ought not to omit to ſpeak on this Occaſion; which is, That I have often with this Glaſs, ſeen the Circulation of the Blood in the Fins of the Tail of Tadpoles; and indeed more conſpicuouſly here than in any other Creature: For the Fins growing all round the Tail, and coming but a little way out beyond the Body of it, both the Ejaculation of the Blood out by the Arteries, and its Return again by the Veins, is much quicker than in the Tails of Fiſhes; and abundance more Streams, Turns and Windings of the moving Blood are here viſible, than I could ever ſee in any other Animal. To which I may add, That the Creature will live a good while out of the Water, and will lie very ſtill.

The Object and the Image in the diſtinct Baſe being reciprocal (as Mr. *Molineux* ſhews, *p.* 102. of his *Dioptricks*), the Image there may be formed larger than the Object, on which depends the Doctrine of the *Double Microſcope*.

Which Inſtrument I believe, was firſt contrived, at leaſt fitted for Uſe and Obſervation by Dr. *Hook*, F. R. S. and a Deſcription of it is publiſhed in his *Micrographia*.

Since that, Mr *John Marſhal*, at the *Archimedes* in *Ludgate-ſtreet*, hath brought it to a very good Degree of Perfection: And I take his *Double Microſcope* here deſcribed, in all Reſpects, to be the moſt uſeful, handy, and ready Inſtrument of this kind.

I have had *Mellen*'s Glaſſes, and ſeen *Lewenhoeck*'s and *Campani*'s, but I would ſooner have the *Double Microſcope* than any of them, and the Price is much eaſier.

MILIARIS *Herpes*. See *Herpes*.

MILKY WAY, or *Via Lactea*, the *Galaxy*, is a broad white Path or Track, encompaſſing the whole Heavens, and extending it ſelf in ſome Places with a double Path, but for the moſt Part with a ſingle one. Some of the Antients, as *Ariſtotle*, &c. imagin'd that this Path conſiſted only of a certain Exhalation hanging in the Air; but by the Teleſcopical Obſervations of this Age, it hath been diſcovered to conſiſt of an innumerable Quantity of Fixed Stars, different in Situation and Magnitude; from the confuſed Mixture of whoſe Light, its white Colour is ſuppoſed to be occaſioned. It paſſes through the Conſtellations of *Caſſiopeia*, *Cygnus*, *Aquila*, *Perſeus*, *Andromeda*, Part of *Ophiucus*, and *Gemini*, in the Northern Hemiſphere; and in the Southern, it takes in Part of *Scorpio*, *Sagittarius*, *Centaurus*, the *Argo Navis*, and the *Ara*.

Metrodorus, and ſome *Pythagoreans*, thought the Sun had once gone in this Track, inſtead of the Ecliptick; and conſequently, that its Whiteneſs proceeds from the Remains of his Light. As the *Galaxy* is compoſed of an Infinity of ſmall Stars, ſo it hath uſually been the Region in which new Stars have appeared: As the new Star in *Caſſiopeia*, which was firſt ſeen *A. D.* 1572. that in the Breaſt of the *Swan*, and another in the Knee of *Serpentarius*; and ſeveral others, which have appeared for a while, and then become inviſible again.

MILITARY *Architecture*, the ſame with *Fortification*.

MILITARY *Execution*, is delivering a Country up to be ravaged and deſtroyed by the Soldiers, when it refuſes to pay Contribution, *&c.*

MIMOSÆ *Plantæ*, the ſame with *Senſitive*; which ſee.

MINE, in Fortification, is a Hole dug or made by a Pioneer under the Rampart, or under the Face of the Baſtion, whereto there are ſeveral oblique and winding Paſſages: When it is finiſhed, divers Barrels of Powder are placed therein, together with a Train or *Saucidge*; and the Quantity of Powder is proportioned to the Height and Weight of the Body which is to be blown up. There are alſo *Mines* ſprung in the Field, which are called *Fougades*.

The Ally or Paſſage of a *Mine* is uſually about four Foot ſquare; at the end of which is the *Chamber of the Mine*, as they call it. The farther it is carried on, the more it is ſubject to be diſcovered by the Enemy; therefore 'tis beſt not to aim at Mining too far, and to make a new one where the former takes no Effect.

MINE-*Dyal*. is a Box and Needle, with a Braſs Ring divided into 360 Degrees, with ſeveral *Dyals* graduated thereon; generally thus made for the Uſe of Miners.

MINERALS, are hard Bodies dug out of the Earth or Mines (whence the Name) being in part of a Metalline, and in part of a Stony Subſtance, and ſometimes with ſome Salt and Sulphur intermixed with the other. Of theſe ſee a large Account under the more general Word *Foſſils*. See alſo *Stones* and *Minerals*.

MINIM, a Term in Muſick; ſee *Notes* and *Time*.

MINIMA *Naturalia*, are ſuch Particles of Matter, which tho' they have each a determinate Shape and Bulk, yet are too minute to be ſingly ſenſible. Theſe are ſuppoſed to be intire, and undivided, and to be perfectly ſolid; and are the ſame with what in another Word are called *Atoms*, becauſe of their ſuppoſed Indiviſibility.

MINIMENTS, or rather *Muniments*, in Law, are the Evidences or Writings, whereby a Man is enabled to defend the Title of his Eſtate. And ſome ſay this Word *Miniments* includes all manner of Evidences.

MINION, a ſort of Cannon, is either *Large* or *Ordinary*.

The

The *Large Minion*, or one of the longeſt Size, has its Bore 3 ¼ Inch Diameter, and is 1000 Pound weight: its Load is 3 ¼ Pound of Powder; its Shot 3 Inches Diameter, and 3 ¼ Pound weight; its Length is 8 Foot, and its level Range 125 Paces.

The *Ordinary Minion*, its Bore is 3 Inches in Diameter, and weighs about 800 or 750 Pound weight: It's 7 Foot long; its Load 2 Pound and a half of Powder; its Shot near 3 Inches Diameter, and weighs 3 Pounds 4 Ounces; and it ſhoots point-black 120 Paces.

MINIUM, or *Red-lead*, is the common Calx of Lead calcined for 3 or 4 Hours in a Reverberatory Furnace, till it turn to a Red Colour.

MINOR, a Term in Law, ſignifying one in Nonage, Minority, or under Age: But more properly an Heir Male or Female, before they come to the Age of One and twenty; during which Minority their Actions are invalid, &c. Yet a *Minor* may preſent, as Patron to an Eccleſiaſtical Benefice.

MINUTE, is the 60th Part of a *Degree* or *Hour*; ſo that every Hour, or Degree of any great Circle, is divided into 60 Minutes, every Minute into 60 Seconds, each Second into 60 Thirds, &c.

MISADVENTURE, or *Miſaventure*, in Law, has a ſpecial Signification, for the killing of a Man, partly by Negligence, and partly by Chance. As if a Man, thinking no Harm, careleſly throws a Stone, or ſhooteth an Arrow, &c. wherewith he killeth another: In this Caſe he commits not Felony, but only loſeth his Goods, and hath Pardon of Courſe for his Life. Some between *Aventure* and *Miſaventure* make this Diſtinction, That *Aventure* is meer Chance: As if a Man, being upon or near the Water, be taken with ſome ſudden Sickneſs, and ſo falls in, and is drown'd; or into the Fire, and be burn'd to Death. *Miſaventure*, they ſay, is where a Man cometh to his Death by ſome untoward Violence; as the Fall of a Tree, the Running of a Cart-wheel, the Stroke of a Horſe, or the like.

MISE, in Law, hath ſeveral Significations: As firſt, a Gift or Cuſtomary Preſent which the People of *Wales* give to every new King or Prince at their Entrance into that Principality. Sometimes *Miſes* are taken for Taxes or Tollages, *Anno* 25. *E.* 1. 5. Sometimes for Coſts and Expences; as *pro Miſis & Cuſtagiis*, for Coſts and Charges ordinarily uſed in the Entries of Judgment in Perſonal Actions.

Miſe is alſo a Term of Art, appropriated to a *Writ of Right*; ſo called, becauſe both Parties have put themſelves upon the meer Right, to be tried by the *Grand Aſſiſe*, or by *Battel*. So that which in all other Actions is called an *Iſſue*, in a *Writ of Right* is called a *Miſe*; unleſs a Collateral Point be tried, and there it is called an *Iſſue*. To *join the Miſe upon the Meer*, ſignifies, to join the *Miſe* upon the *Clear Right*; which is to join upon this Point, Whether hath more Right, the Tenant or Demandant?

MISERERE *Mei*, or *Chordapſus*, is a moſt vehement Pain in the Guts, proceeding from an Inflammation of them, or Involution, and the Periſtaltick Motion inverted; whence the Excrements are diſcharged by the Mouth. It is called alſo *Volvulus*.

MISERICORDIA in Law, is uſed for an Arbitrary Amerciament impoſed on any for an Offence; for where the Plaintiff or Defendant in any Action is amerced, the Entry is *Ideo in Miſericordia*. It is called *Miſericordia*, becauſe it ought to be very moderate, and rather leſs than the Offence. Therefore if a Man be unreaſonably amerc'd in a Court, not of Record, as in the *Court-Baron*, &c. there is a Writ called *Moderata Miſericordia*, directed to the Lord or his Bailiff, commanding them that they take moderate Amerciaments. Sometimes *Miſericordia* is to be quit and diſcharged of all manner of Amerciaments, that a Man may fall into in the Foreſt.

MISPRISION, a Term in Law, ſignifying Neglect or Overſight. As for Example:

Miſpriſion of Treaſon or Felony, is a Neglect or Light account ſhewed of *Treaſon* or *Felony* committed, by not revealing it when we know it to be committed; or by letting any Perſon committed for Treaſon or Felony, or Suſpicion of either, to go, before he be Indicted. *Miſpriſion of Treaſon*, is the Concealment, or not diſcloſing of known Treaſon: For which, the Offenders are to ſuffer Impriſonment during the King's Pleaſure; loſe their Goods, and the Profits of their Lands, during their Lives. *Miſpriſion of Felony*, is only Finable by the Juſtices before whom the Party is attainted: But Juſtices of the *Common-Pleas* have Power to aſſeſs Fines and Amerciaments upon Perſons offending by *Miſpriſions*, Contempts, or Neglects, for not doing, or miſdoing any thing in or concerning Fines. *Miſpriſon of Clerks*, is a Neglect of Clerks in writing, or keeping Records. By the *Miſpriſion of Clerks*, no Proceſs ſhall be annulled or diſcontinued: And *Juſtices of Aſſize* ſhall amend the Defaults of Clerks *miſpriſing* of a Syllable, or Letter, in writing.

MISSEN-*Maſt* of a Ship is a round and long piece of Timber, ſtanding in her Stern or ſternmoſt Part. Some great Ships require two; then the next the Main-maſt, is the *Main-miſſen*; and that next the Poop, the *Bonaventure-miſſen*. But when at Sea, they uſe the Word *Miſſen* alone, they always mean the Sail, and not the Maſt. And to the Sail theſe ſeveral Terms of Art following belong: *Set the Miſſen*; *i. e.* Set the *Miſſen-ſail* right, as ſhe ought to ſtand. *Change the Miſſen*; *i. e.* Bring the *Miſſen-yard* over to the other ſide of the Maſt. *Peek the Miſſen*; *i. e.* Put the *Miſſen-yard* right up and down the Maſt. *Spell the Miſſen*, *i. e.* Let go the Sheet; and withal, *Peek up the Yard*. The Uſe of this *Miſſen* is to keep a Ship cloſe to a Wind: Wherefore, if a Ship be apt to *Gripe* too much (as they call it) they uſe no *Miſſen*. A *Miſſen* is made uſe of often when a Ship rides at Anchor, *to back her a-Stern*, ſo that ſhe may not foul her Anchor on the turning of the Tide. Sometimes alſo they *Lie a-Try* with their *Miſſen* only. The Length of the *Miſſen* is the ſame with the Height of the Main-top-maſt from the Quarter-deck, and the Miſſen-top-maſt half that.

MISSES. See *Miſe*.

MITTELLA, is the Surgeons Term for the Swath that holds up the Arm when it is hurt or wounded.

MITTENDO *manuſcriptum pedis finis*, is a Writ Judicial, directed to the Treaſurer and Chamberlain of the *Exchequer*, to ſearch and tranſmit the Foot of a Fine, acknowledged before *Juſtices in Eyre*, into the *Common-Pleas*, &c.

MITTIMUS, is a Writ by which Records are transferred from one Court to another, ſometimes immediately:

immediately: As, out of the *King's-Bench* into the *Exchequer*; and ſometimes by a *Certiorari*, into the *Chancery*; and from thence, by a *Mittimus*, into another Court. This Word is alſo uſed for the Precept that is directed by a Juſtice of Peace to a Gaoler, for the receiving and ſafe-keeping a Felon, or other Offender, by him committed to the Gaol.

MITRALES, are two Valves at the Orifice of the *Vena pulmonaris*, in the Left Ventricle of the Heart; and are ſo called, becauſe, when they are joined together, they ſomething reſemble a Mitre: They are broader than the other Valves; they are ſituated ſo as to look inwards, and do very little differ in Bigneſs and Form from the *Tricuſpides* in the right Ventricle. Their Uſe is to hinder the Reflux of the Blood brought into the Left Ventricle of the Heart by the *Vena pulmonaris*, back towards the Lungs again.

MIVA, in Pharmacy, is the Fleſh or Pulp of a Quince boiled up with Sugar into a thick Conſiſtence.

MIXT, *i. e.* a *Mixt Body*: By which in Chymiſtry and Natural Philoſophy, is underſtood a Body not mixt or compounded by Art, but by Nature; ſuch as Minerals, Vegetables and Animals, from whom by Chymiſtry different Subſtances can be ſeparated.

MIXT *Figures in Geometry.* ſee *Figures.*

MIXT *Number*, is one that is part Integer or whole Number, and part Fraction; as, $4\frac{3}{5}$, $10\frac{1}{2}$, *&c.*

MIXT *Reaſon* or *Proportion*, is when the Sum of the Antecedent and Conſequent is compared with the Difference between Antecedent and Conſequent: As, if $\overset{3}{a} : \overset{4}{b} :: \overset{12}{c} : \overset{16}{d}$. Then $\overset{7}{a+b} \cdot \overset{1}{a} \circ\circ \overset{28}{b} \cdot\cdot \overset{4}{c+d} \cdot c \circ d$.

MOAT, in Fortification, is a hollow Space or Ditch dug round a Town or Fortreſs which is to be defended; whereof the Length and Breadth often depends upon the Nature of the Soil, according as it is Marſhy or Rocky. But *Moats* in general may be from 16 to 22 Fathom broad, and from 15 to 25 Foot deep.

Dry Moat, is that which is deſtitute of Water, and ought to be deeper than one that is full of Water.

Lined Moat, is that whoſe Scarp and Counterſcarp are cas'd with a Wall of Maſons-Work lying in *Talus* or a-ſloap.

Flat-bottom'd Moat, is that which hath no ſloaping, its Corners being ſomewhat rounded. All Moats muſt be well flanked, and in general ſo wide, as that no Ladder, Tree, *&c.* can reach acroſs it. If the Ditch be dry, or has but little Water, there is uſually another ſmall Trench cut quite along the middle of it.

MODEL *in Architecture.* See *Module.*

MODERATA *Miſericordia*, is a Writ for him that is amerced in a *Court Baron*, or other being not of Record, for any Tranſgreſſion or Offence beyond the Quality of a Fault. It is directed to the Lord of the Court, or his Bayliff, commanding them to take a *moderate Amerciament* of the Party, and is founded upon *Magna Charta*, cap. 14. *Quod nullus liber homo amercietur niſi ſecundum qualitatem delicti*, &c.

MODES *in Muſick.* See *Mood.*

MODILLONS, or *Modillions*, in Architecture, are little Brackets which are often ſet under the Cornices, more-eſpecially in the *Corinthian* and *Compoſit* Order, and ſerve to ſupport the Projecture of the *Larmier* or *Drip*. The Word comes from the Italian *Modiglion*, ſignifying a little Model or Meaſure; but this Part muſt be diſtinguiſhed from the great Model, which is the Diameter of the Pillar: For as the Proportion of an Edifice in general depends on the Diameter of the Pillar, ſo the Size and Number of the *Modillons*, as alſo the Interval between them ought to have due Relation to the whole Fabrick.

MODIOLUS, *Trepanum*, or *Anabaptiſton*, is an Inſtrument which they uſe in profound Corruptions, Contuſions, Cuts, and Fractures of the Bones of the Head, not to be applied; unleſs, 1. The Chips and Prominences of the Bones prick. 2. When the Upper Table is entire, but depreſs'd; and the Lower broken. 3. When the extravaſated Blood would choak a Man with Corruption. The manner of *Trepanning*, or opening the Skull, is thus: When the Hairs are ſhaven off, the Skin is to be cut to the *Pericranium*, avoiding, as carefully as may be, the Muſcles of the Temples, and the Sutures of the Skull; and for this time the Wound is to be bound up, unleſs there be ſo little Blood ſpilt, that the Membrane, called *Pericranium*, may at the ſame time be pulled off from the Skull. Then after a few Hours you may ſtop the Ears of the Patient, take one of theſe Inſtruments, called a *Maſculine Modiolus*, whoſe Point is to be fixed in the Skull, but ſo far off the Fracture, that it touch it not, much leſs the Suture, with its Teeth; tho' ſome Surgeons never avoid the Sutures, and aſſure us that they have perforated them as ſucceſsfully as any other Part: Then hold the Inſtrument faſt with the Left Hand, and turn it round with the Right, 'till you have cut a pretty deep Hole: After this take a *Feminine Modiolus*, (which has no Point in the middle) and turn it round, as before. In the mean time take away the Duſt or Chips that proceed from the Perforation, and moiſten the Inſtrument in Oyl and Water, to make it cool and ſlippery. The Blood that appears, will ſhew that you are now gone as deep as the ſecond Table, *i. e.* beyond the Skull, to the *Meninx*; and then you muſt preſs very gently, leſt the Membrane of the Brain be unadviſedly hurt. When the Bone begins to wag, put ſomething in betwixt the ſides of the Wound; looſen it, and take it out with a pair of Surgeon's Pincers. *Blanchard.*

MODO *&* *Forma*, are Words of Art in Proceſs and Pleadings; and namely, in the Anſwer of the Defendant; whereby he denieth himſelf to have done the Thing laid to his Charge, *Modo & forma declarata*: It ſignifies as much as that Clauſe in the Civil Law, *negat allegata prout allegantur, eſſe vera*; where *modo & forma* are of the Subſtance of the Iſſue, and were but Words of courſe.

MODULE, or *Model*, in Architecture, is a certain Meaſure invented by *Vignola*, and made uſe of to regulate the Proportion of the whole Building. It is generally half the Diameter of a Pillar at the lower end, in the *Tuſcan* and in the *Dorick* Order; but in others, the whole Diameter. This Diameter is divided into 12 equal Parts; and into 18 for the *Ionick*, *Corinthian*, and *Compoſit* Orders. And this *Module* or *Model* is a kind of Univerſal Meaſure, which helps us

to

to get rid of the great Uncertainties there are in the Feet and Inches of divers Nations, and at divers Times.

MODUS *Decimandi*, is when either Land, a Sum of Money, or Yearly Penſion, is given to the Parſon, *&c.* by Compoſition, as Satisfaction for his Tythes in kind.

MOINEAU, is a Name the *French*, and ſome Modern Writers of Fortification, give to a little *Plat-Baſtion*, which is raiſed before a Curtain that is too long, and which hath two other Baſtions at the ends of it; for they being out of Musket-ſhot one of the other, muſt be defended by ſome ſuch thing as this *Moineau* or *Plat-Baſtion*. Sometimes the *Moineau* joins to the Curtain, and ſometimes is disjoined from it by a Moat.

MOLA *Genu*, *Patella*, or *Rotula*, is a round and broad Bone, placed at the jointing of the Thigh and Leg, to preſerve the Knee from ſlipping out, and to defend the Juncture from External Injuries.

MOLA *Carnea*, is a Fleſhy and ſometimes a Spongy Subſtance, without Bones or Bowels: It is often black, like concreted Blood; and ſometimes extream hard; preternaturally brought into the World inſtead of a *Fœtus*.

MOLARES, or *Maxillares Dentes*. See *Dentes*.

MOLINE. The Heralds Term for one of their Croſſes of this Figure. The *Field Azure*, a *Croſs Moline*, or, by the Name of *Molineux*. *Guillim* ſaith this Croſs repreſenteth a Mill-Rind, or the Form of the Ink of a Mill.

MOLOSSUS, is the Foot of a Latin Verſe, conſiſting of Three Syllables, when they are all long.

MOMENTS, are ſometimes taken for the leaſt and moſt inſenſible Parts of Time; as when we ſay, ſuch a thing was done in a Moment.

In Mathematicks, *Moments* are ſuch indeterminate and inſtable Parts of Quantity, as are ſuppoſed to be in perpetual Flux, *i. e.* either continually decreaſing or increaſing; which latter are taken for Affirmative and Poſitive Moments, and the former for Negative or Subtractible ones; And theſe continually increaſing or decreaſing Particles are ſuppoſed to be infinitely ſmall; for as ſoon as ever they come to be of any finite Magnitude, they ceaſe to be *Moments*. *Moments* therefore are to be look'd upon as the generative Principles of finite Magnitudes; and are here ſuppoſed to have no Magnitude, but to be *Inceptive* only of it, to uſe Dr. *Wallis* his Word.

And becauſe 'tis the ſame thing, if in the room of theſe Moments, the Velocities of their Increaſes or Decreaſes be made uſe of, or the finite Quantities proportionable to ſuch Velocities; this Method of proceeding, which conſiders the Motions, Changings, or Fluxions of Quantities, hath come to be called *Fluxions*.

Moments alſo in a Phyſical Senſe, as they are uſed in reference to the Laws of Motion, ſignifie the *Quantities of Motion* in any moving Bodies; and ſometimes, ſimply, the Motion it ſelf; and they define it to be the *Vis inſita*, or *Power* by which any moving Bodies do continually change their Places.

And in comparing the Motions of Bodies, the *Ratio* of theſe Moments is always compounded of the Quantity of Matter in, and the Celerity of the moving Body: So that the *Moment* of any moving Body may be conſidered as a *Rectangle under the Quantity of Matter into the Celerity*. And ſince 'tis certain that all equal Rectangles have their Sides reciprocally proportionable, (14. *è*. 6. *Eucl.*) therefore if the *Moments* of any Moveables are equal, the Quantity of Matter in one, to that of the other, will be reciprocally : : as the Celerity of the Latter to the Celerity of the Former: And *vice verſa*, if the Quantities of Matter are reciprocally proportionable to the Celerities, the *Moments* or Quantities of Motion in each will be equal.

The *Moment* of any moving Body may be conſidered alſo as the Aggregate or Sum of all the Moments of the Parts of that Body; and therefore where the Magnitudes and Number of any Particles are the ſame, and where they are moved with the ſame Celerity, there will be the ſame *Moments* of the Wholes.

MONADES. See *Digits*.

MONKS-*Seam*. So the Sailors call ſewing the Edges or Selvedges of the Sails together, one over another; and 'tis ſew'd on both ſides, to make it the ſtronger.

MONOCHORD, a kind of Inſtrument anciently of ſingular Uſe for the Regulating of Sounds; but ſome appropriate the Name of *Monochord* to an Inſtrument that hath only one ſingle String, as the *Trumpet Marine*.

The Ancients made uſe of the *Monochord* to determine the Proportion of Sounds to one another: When the *Chord* was divided into two equal Parts, ſo that the Terms were as 1 and 1, they called them *Uniſons*; but if they were as 2 to 1, they called them *Octaves* or *Diapaſons*; when they were as 3 to 2, they called them *Fifths*, or *Diapentes*; if they were as 4 to 3, they called them *Fourths*, or *Diateſſerons*; if the Terms were as 5 to 4, they call it *Diton*, or a *Tierce major*; but if the Terms were as 6 to 5, then they called it a *Demi-diton*, or a *Tierce minor*; and laſtly, if the Terms were as 24 to 25, they called it a *Demiton* or *Dieze*.

The *Monochord* being thus divided, was properly that which they called a *Syſtem*, of which there were many kinds, according to the different Diviſions of the *Monochord*.

MONOCOLUM, is the Gut *Cæcum*.

MONOPETALOUS *Flowers*, (in Botany) are ſuch, as, tho' they may be ſeemingly cut into four or five ſmall *Petala* or Leaves, are yet all of one piece, and which falling off all together, have their Flower in one piece. See *Petala*.

MONOPOLY, in Law, is a Grant to any Perſon or Perſons, of or for the ſole buying, ſelling, making, working, or uſing any Commodity.

MONOTRIGLYPH, a Term in Architecture, ſignifying the Space of one *Triglyph* between two *Pilaſters*, or two *Columns*.

MONSTRANS *De droit*, in a Legal Senſe, ſignifies a Suit in *Chancery*, for the Subject to be reſtored to Lands and Tenements, which he ſhews to be his Right, tho' by Office found to be in the Poſſeſſion of another lately dead; by which Office the King is entituled to a Chattel, Free-hold, or Inheritance in the ſaid Lands.

MONSTRANS *De faitt ou Records, ſhewing of Deeds or Records*, is thus: Upon an Action of Debt brought upon an Obligation, after the Plaintiff hath declared, he ought to ſhew his Obligation; and ſo it is of *Records*. And the Difference between *Monſtrans de faits* and *Oyer de faits*, is this: He that pleads the *Deed* or *Records*, or declares upon it, ought to ſhew the ſame; and the other, againſt whom ſuch *Deed* or *Record* is pleaded, may demand *Oyer* of the ſame.

MONSTRAVERUNT, is a Writ that lies for the Tenants in *Ancient Demeſne*, being diſtrained for the Payment of any Toll or Impoſition, contrary to their Liberty which they do or ſhould enjoy.

MONT *Pagnote*, or the *Poſt of the Invulnerable*, is an Eminence choſen out of Cannon-ſhot of a Place beſieged; where curious and wary Perſons place themſelves to ſee the Attack and the manner of the Siege.

MONTH, properly ſpeaking, is the Time in which the Moon runs through the Zodiack, and therefore is accounted by the Motion of the Moon; and therefore the Lunar Month is either *Periodical*, which is the Time of the Moon's Motion from any one Point of the Zodiack to the ſame again, and is ſomething leſs than 27 Days and 8 Hours; or elſe *Synodical*, which is the Time between New Moon and New Moon, and is ſomething more than 29 Days and an half.

There is alſo a *Solar Month*, which is the Time that the Sun takes up in running through one of the Signs of the Zodiack, and is almoſt 30 Days and half.

And both theſe *Solar* and *Lunar Months* are either *Aſtronomical*, like thoſe above-mentioned; or *Civil*, which are various, according to the Uſage of accounting in different Places, Cities and Nations.

The *Egyptians* accounted by *Solar Months*, each of 30 Days; and to compleat their Year, after 12 ſuch Months, they added 5 Days, which the odd Hours made up.

But moſt of the Ancient Nations accounted by the *Lunar Synodical Month*; as the *Jews*, *Greeks*, and the *Romans*, 'till *J. Cæſar*'s Time; and as the *Mahometans* do to this Day. And becauſe theſe Months did not contain an exact Number of Days, to adapt them to *Civil* Computation, they accounted alternately one Month to have 30, and the next 31 Days; and by this means they made two ſuch *Civil* Months to be equal to two *Lunar* ones of 29 Days and half; and they brought it to paſs, that the New Month, for a Run of many Years, did not much deviate from the Firſt Day of the *Civil* Month.

MOODS in *Grammar*, determine the Signification of *Verbs*, as to the Manner and Circumſtances of the Affirmation; and are in Number Six, *viz.* The *Indicative*, the *Imperative*, the *Optative*, the *Subjunctive*, and the *Infinitive Mood*; which ſee.

MOOD in *Muſick*, ſignifies certain Proportions of the *Time*, or Meaſure of Notes. Theſe *Moods* or *Modes* of meaſuring Notes, were formerly Four in Number, *viz.*

1. *The Perfect of the More*, in which a *Large* contain'd three *Longs*, a *Long* three *Breves*, a *Breve* three *Semi-breves*, and a *Semi-breve* three *Minims*.

2. *The Perfect of the Leſs*, wherein a *Large* comprehended two *Longs*, a *Long* two *Breves*, a *Breve* three *Semi-breves*, and a *Semi-breve* two *Minims*.

3. *The Imperfect of the More*, in which a *Large* contained two *Longs*, a *Long* two *Breves*, a *Breve* two *Semi-breves*, and a *Semi-breve* three *Minims*.

4. *The Imperfect of the Leſs*, is the ſame with that which we call the *Common Mood*, the other three being now altogether out of Uſe; altho' the Meaſure of our *Common Triple-time* is the ſame with the *Mood Imperfect of the More*, except that we reckon but two *Minims* to a *Semi-breve*, which in that *Mood* comprehend three.

In our *Common Mood*, two *Longs* make one *Large*, two *Breves* a *Long*, two *Semi-breves* a *Breve*, &c. proceeding in the ſame Order to the laſt or ſhorteſt Note: So that a *Large* contains two *Longs*, four *Breves*, eight *Semi-breves*, ſixteen *Minims*, thirty two *Crotchets*, ſixty four *Quavers*, &c.

Beſides theſe *Moods of Time*, Five others relating to Tune, were in Uſe among the Ancient *Grecians*, which were termed *Tones* or *Tunes* by the *Latins*; the Deſign of either being to ſhew in what Key a Song was ſet, and how the different Keys had relation one to another.

Theſe ſorts of *Moods* were diſtinguiſh'd by the Names of the ſeveral Provinces of *Greece*, where they were firſt invented; as the *Dorick*, *Lydian*, *Ionick*, *Phrygian*, and *Æolick*.

Dorick Mood conſiſted of ſlow-run'd Notes, and was proper for the exciting Perſons to Sobriety and Piety.

Lydian Mood was likewiſe uſed in Solemn Grave Muſick; and the Deſcant or Compoſition was of ſlow Time, adapted to Sacred Hymns or Anthems.

Ionick Mood was for more light and ſoft Muſick; ſuch as pleaſant amorous Songs, Sarabands, Corants, Jiggs, &c.

Phrygian Mood was a Warlike kind of Muſick, fit for Trumpets, Hautboys, and other Inſtruments of the like Nature; whereby the Minds of Men were animated to undertake Military Atchievements, or Martial Exerciſes.

Æolick Mood, being of a more airy, ſoft, and delightful Sound, ſuch as our *Madrigals*, ſerved to allay the Paſſions by the means of its grateful Variety and melodious Harmony.

Theſe *Moods* or *Tones* were diſtinguiſhed into *Authentick* and *Plagal*, with reſpect to the dividing of the *Octave* into its Fifth and Fourth: The Former was when the Fifth Poſſeſſed the Lower Place, according to the Harmonical Diviſion of an *Octave*; and the other was when it ſtood in the Upper Place, according to the Arithmetical Diviſion of the ſame *Octave*.

MOON. The Periodical Revolution of the Moon, in reference to the Fixed Stars, is 27 Days, 7 Hours, 43 Minutes: And in the ſame Space of Time, by a ſtrange Correſpondence and Harmony of the two Motions, it revolves the ſame way about its own Axis; whereby (one Motion as much converting it to, as the other turns it from the Earth) the ſame ſide is always expoſed to our Sight. See Vol. II.

The Librations of the Moon's Body, which occaſion that the ſame Hemiſphere exactly is not always expoſed to our Sight, ariſe from the Eccentricity of the Moon's Orbit, from the Perturbations by the Sun's Attraction, and from the Obliquity of the Axis of the Diurnal Rotation of the Moon's own Orbit; without the Knowledge of which Circumſtances, her *Phænomena* were inexplicable, but by the Conſideration of them are very demonſtrable.

The mean Horary Motion of the Moon, in reſpect of the Fixed Stars, is 32 minutes, 56 ſeconds, 27 thirds, 12 fourths and an half.

The Moon is diſtant from the Earth, according to moſt Aſtronomers, 59; according to *Vindeline*, 60; *Copernicus* 60 $\frac{1}{3}$; *Kircher*, 62 $\frac{1}{2}$; and according to *Tycho*, 56 $\frac{1}{2}$ Semi-diameters of the Earth. Sir *Iſaac Newton* thinks the Diſtance ought to be eſteemed about 61: Therefore the mean Diſtance may be reckoned 60. But if the Earth and Moon move both round the Sun, with their common Centre of Gravity, that admirable Aſtronomer demonſtrates, that the Diſtance between the Centres of the Earth and Moon, will be 60 $\frac{1}{2}$ of the Earth's Semi-diameter, *Prop.* 60. *Lib.* 1. *Princip.*

She is nearer the Earth at her *Syzygy*, than in the Quadrature, by $\frac{1}{87}$ Part of the Diſtance.

According to M. *Caſſini*, the Moon's greateſt Diſtance from the Earth is 61, the mean Diſtance 56, and the leaſt Diſtance 52 Semi-diameters of the Earth.

The Power of the Moon's Influence as to the Tides, is to that of the Sun as 6 $\frac{1}{3}$ to one. Sir *Iſaac Newton.*

As to the Inequality of the Moon's Motion, (which proceeds from the Action of the Sun, diſturbing the Motion of the Secondary Planets) ſhe moves ſwifter, and deſcribes (by a Radius drawn from it to the Earth) a greater Area in proportion to the Time, hath an Orbit leſs curved, and by that means comes nearer to the Earth in her *Syzygies* or Conjunctions, than in the Quadratures, unleſs the Motion of her Eccentricity hinder it: Which Eccentricity is greateſt, when the Apogeum of the Moon happens in the Conjunctions; and is leaſt, when the Apogeum happens at the Quadratures. And therefore the Moon is ſwifter as well as nearer to us in her Perigeum, and more remote and ſlower in her Apogeum at the Conjunctions, than at the Quadratures; and her Motion is ſwifter alſo in the Earth's Aphelion, than in its Perihelion. The Apogeum alſo goes forward ſwifter in the Conjunctions, and goes ſlower at the Quadratures: But her Nodes are at reſt in the Conjunctions, and do recede moſt ſwiftly in the Quadratures.

The Moon alſo perpetually changes the Figure of her Orbit, or the Species of the Ellipſe ſhe moves in.

There are alſo ſome other Inequalities in the Motions of this Planet, which cant hardly be reduced to any certain Rule: As, That the Velocities or Horary Motions of the Apogeum and Nodes, and their Equations, and the Difference between the greateſt Eccentricity in the Conjunctions, and the leaſt in the Quadratures; and that Inequality which is called the *Variation of the Moon:* All theſe do increaſe and decreaſe annually, in a triplicate Ratio of the apparent Diameter of the Sun: And this *Variation* is increaſed and diminiſhed in a duplicate Ratio of the Time between the Quadratures; as Sir *Iſaac Newton* proves in many places of his *Principia.*

That Curious Perſon found the Apogeum in the Moon's *Syzygies* to go forward 23 min. each Day, in reſpect of the Fixed Stars; and to go backward 16 min. $\frac{1}{3}$ each Day in the Quadratures: And therefore the middle Annual Motions he eſtimates at 40 deg.

This differs ſomething from Mr. *Flamſteed*'s Aſtronomical Tables; where the Diurnal Progreſſion of the Moon's Apogeum is 24 min. 28 ſeconds in the *Syzygies*, and the Receſſion 20 min. 12 ſeconds in the Quadratures. See the Words *Secondary Planets.*

That the Cauſe of the *Secondary Light of the Moon*, as they call it; that is, the obſcure Part of her, appearing like kindled Aſhes, juſt before and after the Change or New Moon, is the Sun's Rays reflected from the bright Hemiſphere of the Earth to thoſe dark Parts of the Moon, and thence again reflected to the Earth deſtitute of the Sun's Light; ſee proved in *Zucchius Philoſoph. Optic. Nov.* from p. 247, to p. 260. And alſo in *Tacquet*'s *Opera Geometrica.*

The Excellent Sir *Iſaac Newton* makes it a Propoſition to inquire into the Figure of the Moon; and ſuppoſing it, at its firſt Original, to have been a Fluid, like to our Sea, he calculates, that the Attraction of our Earth would raiſe the Water there to near 90 Foot high, as the Attraction of the Moon raiſeth our Water to 12 Foot: Whence the Figure of the Moon muſt be a *Spheroid*, whoſe greateſt Diameter extended, will paſs through the Centre of our Earth; and will be longer than the other Diameter perpendicular to it, by 180 Feet. And from hence it comes to paſs, that we ſee always the ſame Face of the Moon: For ſhe cannot reſt in any other Poſition, but will continually endeavour to conform her ſelf to this Situation. *Prop.* 38. *Lib.* 3.

The Moon hath properly no Atmoſphere, ſuch as our Earth hath, abounding with Clouds, Winds, Thunder or Lightning; becauſe her Face always, when our Air is clear, appears diſtinct and clear; and by our Teleſcopes we can ſee the Sun's Light paſs regularly and uniformly from one mountainous Place to another.

Mr. *Flamſteed* in *Philoſoph Tranſact.* N. 154. ſaith, That the beſt Tables of the Moon's Motions do err 12 minutes, or more, in her apparent Place; which cauſes a Fault of Half an Hour, or 7 $\frac{1}{2}$ Degrees of the Longitude of Places endeavoured to be found out by her.

M. *Azout* ſays, That this Planet's Diameter never appear'd to him above 33 min. and never leſs than 24 min. 45 ſeconds.

Sir *Iſaac Newton* reckons the mean Diameter of the Moon to be 32 minutes, 12 ſeconds, as the Sun's is 31 minutes, 27 ſeconds.

The Denſity of the Moon he concludes to be to that of the Earth, as 9 to 5 nearly: And that

the Mass or Quantity of Matter in the Moon to that of the Earth, is as 1 to 26 nearly.

The famous Dr. *Wallis* agrees with *Des Cartes* in the Solution of that Difficulty, Why the Moon appears to our common Sight so much bigger when near the Horizon, than she doth when near the Meridian; though she be (nearly) one Semidiameter of the Earth nigher to us in the latter Case, than in the former: Which is, That the Horizontal Moon is capable of being compared with many intervening Objects, interposed Hills, &c. but the Meridional Moon hath nothing to be compared withal; and therefore the Distance between us and her, is judged to be vastly greater, than when she is in the Horizon. He says, It cannot be at all from the Refraction of Vapours near the Horizon, because that can only increase the Altitude of her, but not her Azimuth or Breadth; for the Horizon, in the whole, will always be but a Circle. *Philos. Transf.* N 187.

The Plane of the Moon's Orbit is inclined to that of the Ecliptick, and makes with it an Angle of about 5 Degrees. *Greg. Astron.* And this Declination varies; and is greatest when the Moon is in the Quadratures, and least when she is in her Syzygies.

By means of the Spots in the Moon (which *Hevelius*, *Grimaldus* and *Ricciolus* gave Names to) the *Lunar Eclipses* are more accurately observed than formerly, to the great Advancement of *Geography* and *Navigation*, in settling the Longitudes of Places: For the Immersions and Emersions of these Spots from the Shadow of the Earth, are most nicely determined.

Although the Moon's Period round the Earth be in 27 Days, 7 Hours, $\frac{3}{4}$ of an Hour, (which is the *Periodical Month*) yet because in the Space of a Periodical Month, the Earth also with its Satellite, the Moon, is moved on almost an intire Sign, *in Consequentia*; therefore the Point of the Moon's Orbit, in the last Conjunction, or New Moon, will be gotten too far to the Westward: And therefore the Moon cannot come yet to a new Conjunction with the Sun, but wants of it 2 Days and 5 Hours; which must be past before the intire Lunation will be over, and before the Moon hath exhibited all her *Phases*. These 2 Days and 5 Hours therefore being added to the Periodical Month, make the Synodical one, which consists of 29 Days, 12 Hours, and $\frac{3}{4}$ of an Hour.

Mr. *Flamsteed* makes the Lunar Periodical Month to be 27 days, 7 hours, 43 minutes, 7 seconds; as, on Enquiry, he assured me.

The other secondary Planets move swifter round their Axes than the Moon; for her (as the Earth's) uniform Revolution round her Axis, is just the Time of her Periodical Month above-mentioned: Which is the Reason that she always obverts the same Face towards us, allowing a little for that Motion of hers which they call her *Libration*. See *Evection* and *Libration*.

The Axis of this Motion is always parallel to its self, and therefore cannot be at Right Angles with the Plane of the Moon's Orbit, (for this, by reason of the Sun's Perturbation of her Motion, is continually changing) but is inclined to it, and is almost at Right Angles with the unchangeable Plane of the Ecliptick.

Tho' the Moon, as well as the Earth, and probably all the Planets, be of a Figure *Oblately Spheroidical*, (that is, having its Diameter at the Equator longer than its Axis) yet the Excess of the Equatorial Diameter in her, is so inconsiderable, that she may well enough pass for a Globe; and perhaps this nearly Spherical Figure of the Moon, may be the Result of her slow Motion round her Axis: For *Jupiter*, which moves the swiftest of any round its Axis, is of a Figure more *Oblate* than any other Planet.

If an Eye were placed in the Moon, it would judge, that the Sun, the Earth, and the other Planets, together with the Fixed Stars, did move from East to West on the Poles of the Ecliptick in a Periodical Month, because in that Space of Time, the Moon turns round her Axis; and these Poles of the Ecliptick would be very remarkable and conspicuous; for the North Pole would be near a Star of the fourth Light, in the third Flexure of *Draco*, which would be but three Degrees distance from the true Pole of the Ecliptick, and the *Southern* would be distinguished by the four Stars in *Xiphia Pisces*, one of which is nearer that Pole of the Ecliptick, than the Pole-star is to the Arctick Pole: And it would be yet more remarkable by the Nearness of the *Nubecula major*.

The apparent Revolution of the Sun (to a Lunar Spectator) about the Moon seemingly at rest, would seem longer than really it is, because of the Moon's being carried along with the Earth round the Sun *in Consequentia*: So that the Natural Day in the Moon would be an intire Synodical Month; wherefore there the Sun will appear to rise but 12 times, but the Fixed Stars 13. And more exactly, in 19 Years the Sun will rise 235 times, and the Fixed Stars 254: And the rising Sun will always be almost an whole Sign forwarder than he was the Day before.

The Lunar Natural Day would appear to be near equally divided into Light and Darkness, because the Axis of the Moon's Revolution is nearly at Right Angles with the Plane of her Orbit round the Sun; so that she enjoys a perpetual Equinox: And there can be no *Twilight*, because this Planet hath no Atmosphere. In one half of the Moon's Surface (except just near the Edge of the other Hemisphere) the Earth cannot be seen by our Spectator; whereas in the other half it will be always visible, and seem fix'd in the Heavens like a Star.

The Famous Sir ISAAC NEWTON's Theory *of the* MOON.

This *Theory* hath been long expected by all the true Lovers of *Astronomy*, was communicated from Sir *Isaac Newton*, to Dr. *Gregory*, *Astron. Professor* at *Oxford*, and by him published in his *Astron. Elem. Philos. & Geomet.* p. 336. From whence, as it was lately translated into *English*, I thought fit to insert it here.

By this Theory, what by all Astronomers was thought most difficult and almost impossible to be done, the Excellent Sir *Isaac Newton* hath now effected; *viz.* To determine the Moon's Place even in her Quadratures, and all other Parts of her Orbit, besides the Syzygies, so accurately by Calculation, that the Difference between that and her true Place in the Heavens, shall scarce be two Minutes, and is usually so small, that it may well enough

enough be reckon'd only as a Defect in the Obſervation. And this Sir *Iſ. Newton* experienced by comparing it with very many Places of the Moon, obſerv'd by Mr. *Flamſteed*, and communicated to him.

The Royal Obſervatory at *Greenwich*, is to the Weſtof the Meridian of *Paris* 2 deg. 19 min. Of *Urainburgh* 12 deg. 51 min. 30 ſeconds. And of *Gedanum* 18 deg. 48 minutes.

The mean Motions of the Sun and Moon, accounted from the Vernal Equinox at the Meridian of *Greenwich*, I make to be as followeth.

The laſt Day of *December* 1680, at Noon *(Old Stile)* the mean Motion of the Sun was 9 Signs 20 deg. 34 min. 46 ſeconds. Of the Sun's Apogeum, was 3 S. 7 deg. 23. min. 30 ſec.

The mean Motion of the Moon at that time, was 6 S. 1 deg. 35 min. 45 ſeconds. And of her Apogee, 8 S. 4 deg. 28 min. 5 ſeconds. Of the Aſcending Node of the Moon's Orbit, 5 S. 24 deg. 14 min. 35 ſeconds, *&c.*

And on the laſt Day of *December* 1700, at Noon, the mean Motion of the Sun, was 9 S. 20 deg. 43. min. 50 ſeconds. Of the Sun's Apogee, 3 S. 7 deg. 44 min. 30 ſeconds. The mean Motion of the Moon was 10 S. 15 deg. 19 min. 50 ſeconds. Of the Moon's Apogee, 11 S. 8 deg. 18 min. 20 ſeconds. And of her Aſcending Node, 4 S. 27 deg. 24 min. 20 ſeconds. For in 20 *Julian* Years, or 7305 Days, the Sun's Motion is 20 Revolut. 0 S. 0 deg. 9 min. 4 ſeconds. And the Motion of the Sun's Apogee, 21 min. 0 ſeconds.

The Motion of the Moon in the ſame time, is 247 Revolut. 4 S. 13 deg. 34 min. 5 ſeconds. And the Motion of the Lunar Apogee, is 2 Revolut. 3 S. 3 deg. 50 min. 15 ſeconds. And the Motion of her Node, 1 Revolut. 0 S. 26 deg. 50 min, 15 ſeconds.

All which Motions are accounted from the Vernal Equinox: Wherefore if from them there be ſubſtracted the Receſſion or Motion of the Equinoctial Point, *in Antecedentia*, during that ſpace, which is 16 min. 0 ſec. there will remain the Motions in reference to the Fix'd Stars in 20 *Julian* Years, *viz.* the Sun's 19 Revol. 11 S. 29 deg. 52 min. 24 ſeconds. Of his Apogee, 4 min. 20 ſeconds. And the Moon's 247 Revol. 4 S. 13 deg. 17 min. 25 ſeconds. Of her Apogee, 2 Revol. 3 S. 3 deg. 33 min. 35 ſeconds. And of the Node of the Moon, 1 Revol. 0 S. 27 deg. 6 min. 55 ſeconds.

According to this Computation the *Tropical Year* is 365 Days, 5 Hours, 48 Minutes, 57 Seconds. And the *Syderal Year* is 365 Days, 6 Hours, 9 Minutes, 14 ſeconds.

Theſe mean Motions of the Luminaries are affected with various Inequalities: Of which,

1. There are the Annual Equations of the aforeſaid mean Motions of the Sun and Moon, and of the Apogee, and Node of the Moon.

The Annual Equation of the mean Motion of the Sun, depends on the Eccentricity of the Earth's Orbit round the Sun, which is $16\frac{11}{12}$ of ſuch Parts, as that the Earth's mean Diſtance from the Sun ſhall be 1000: Whence 'tis called the *Equation of the Centre*; and is when greateſt 1 deg. 56 min. 20 ſeconds.

The greateſt Annual Equation of the Moon's mean Motion, is 11 deg. 49 ſeconds; of her Apogee, 20 min. and of her Node 9 minutes 30 ſeconds.

And theſe four Annual Equations are always mutually proportional one to another: Wherefore when any of them is at the greateſt, the other three will alſo be greateſt; and when any one leſſens, the other three will alſo be diminiſhed in the ſame *Ratio*.

The Annual Equation of the Sun's Centre being given, the three other correſponding Annual Equations will be alſo given; and therefore a Table of *that* will ſerve for all. For if the Annual Equation of the Sun's Centre be taken from thence, for any Time, and be called P, and let $\frac{1}{10}$ P = Q, Q + $\frac{1}{20}$ Q = R, $\frac{1}{2}$ P = D, D + $\frac{1}{30}$ D = E, and D − $\frac{1}{30}$ D = 2 F; then ſhall the Annual Equation of the Moon's mean Motion for that time be R, that of the Apogee of the Moon will be E, and that of the Node F.

Only obſerve here, That if the Equation of the Sun's Centre be required to be added; then the Equation of the Moon's mean Motion muſt be ſubſtracted, that of her Apogee muſt be added, and that of the Node ſubducted. And on the contrary, if the Equation of the Sun's Centre were to be ſubducted, the Moon's Equation muſt be added, the Equation of her Apogee ſubducted, and that of her Node added.

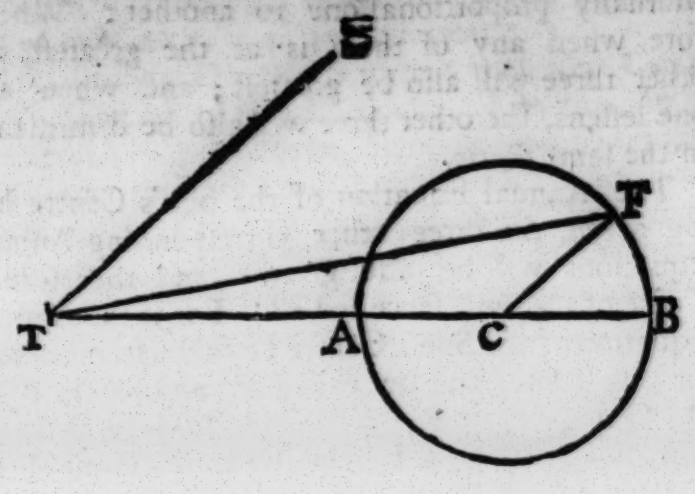
There is alſo an *Equation of the Moon's mean Motion*, depending on the Situation of her Apogee, in reſpect of the Sun; which is greateſt when the Moon's Apogee is in an Octant with the Sun, and is nothing at all when it is in the Quadratures or Syzygies. This Equation, when greateſt, and the Sun in *Perigæo*, is 3 min. 56 ſeconds. But if the Sun be *in Apogæo*, it will never be above 3 min. 34 ſeconds. At other Diſtances of the Sun from the Earth, this Equation, when greateſt, is reciprocally as the Cube of ſuch Diſtance. But when the Moon's Apogee is any where but in the *Octants*, this Equation grows leſs, and is moſtly at the ſame Diſtance between the Earth and Sun, as the Sine of the double Diſtance of the Moon's Apogee, from the next Quadrature or Syzygy, to the Radius.

This is to be added to the Moon's Motion, while her Apogee paſſes from a Quadrature with the Sun to a Syzygy; but this is to be ſubſtracted from it, while the Apogee moves from the Syzygy to the Quadrature.

There is moreover another *Equation of the Moon's Motion*, which depends on the Aſpect of the Nodes of the Moon's Orbit with the Sun: And this is greateſt, when her Nodes are in *Octants* to the Sun, and vaniſhes quite, when they come to their Quadratures or Syzygies. This Equation is proportional to the Sine of the double Diſtance of the Node from the next Syzygy, or Quadrature; and at greateſt, is but 47 ſeconds. This muſt be added to the Moon's mean Motion, while the Nodes are paſſing from their Syzygies with the Sun to their Quadratures with him; but ſubſtracted while they paſs from the Quadratures to the Syzygies.

From the Sun's true Place take the equated mean Motion of the Lunar Apogee, as was above ſhewed, the Remainder will be the Annual Argument of the ſaid Apogee. From whence the *Eccentricity of the Moon*, and the *ſecond Equation* of her Apogee may be compared after the manner following *(which takes place alſo in the Computation of any other Intermediate Equations.)*

For



Let T repreſent the Earth, T S a Right Line joining the Earth and Sun, T A C B a Right Line drawn from the Earth to the middle or mean Place of the Moon's Apogee, equated as above: Let the Angle S T A be the Annual Argument of the aforeſaid Apogee, T A the leaſt Eccentricity of the Moon's Orbit, T B the greateſt. Biſſect A B in C; and on the Centre C, with the Diſtance A C deſcribe a Circle A F B, and make the Angle B C F = to the double of the Annual Argument. Draw the Right Line T F, that ſhall be the Eccentricity of the Moon's Orbit; and the Angle B T F, is the ſecond Equation of the Moon's Apogee required.

In order to whoſe Determination, let the mean Diſtance of the Earth from the Moon, or the Semidiameter of the Moon's Orbit, be 1000000; then ſhall its greateſt Eccentricity T A be 66782 ſuch Parts; and the leaſt T A, 43319. So that the greateſt Equation of the Orbit, *viz.* when the Apogee is in the Syzygies, will be 7 deg. 39 min. 30 ſeconds, or perhaps 7 deg. 40 min. (for I ſuſpect there will be ſome Alteration according to the Poſition of the Apogee in *Cancer* or *Capricorn*). But when it is in Quadrate to the Sun, the greateſt Equation aforeſaid will be 4 deg. 57 min. 56 ſeconds; and the greateſt Equation of the Apogee 12 deg. 15 min. 4 ſeconds.

Having from theſe Principles made a Table of the Equation of the Moon's Apogee, and of the Eccentricities of her Orbit to each Degree of the Annual Argument, from whence the Eccentricity T F, and the Angle B T F (*viz.* the ſecond and principal Equation of the Apogee) may eaſily be had for any Time required; let the Equation thus found be added to the firſt Equated Place of the Moon's Apogee, if the Annual Argument be leſs than 90 Degrees, or greater than 180 Degrees, and leſs than 270; otherwiſe it muſt be ſubducted from it; and the Sum or Difference ſhall be the Place of the Lunar Apogee ſecondarily equated; which being taken from the Moon's Place equated a third time, ſhall leave the mean Anomaly of the Moon correſponding to any given Time. Moreover, from this mean Anomaly of the Moon, and the before-found Eccentricity of her Orbit, may be found (by means of a Table of Equations of the Moon's Centre made to every Degree of the mean Anomaly, and ſome Eccentricities, *viz.* 45000, 50000, 55000, 60000 and 65000) the *Proſtaphæreſis* or Equation of the Moon's Centre, as in the common way: And this being taken from the former Semi-circle of the middle Anomaly, and added in the latter to the Moon's Place thus thrice equated, will produce the Place of the Moon a fourth time equated.

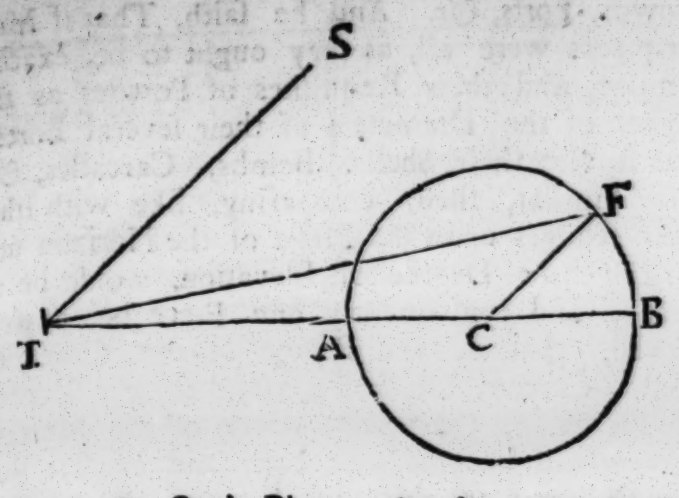
The greateſt Variation of the Moon (*viz.* that which happens when the Moon is in an Octant with the Sun) is nearly, reciprocally as the Cube of the Diſtance of the Sun from the Earth. Let that be taken 37 min. 25 ſeconds, when the Sun is *in Perigæo*, and 33 min. 40 ſeconds, when he is *in Apogæo*: and let the Differences of this Variation in the Octants be made reciprocally as the Cubes of the Diſtances of the Sun from the Earth; and ſo let a Table be made of the aforeſaid Variation of the Moon in her Octants (or its Logarithms) to every Tenth, Sixth or Fifth Diſtance of the mean Anomaly: and for the Variation out of the Octants, make, as Radius to the Sine of the double Diſtance of the Moon from the next Syzygy or Quadrature : : ſo let the afore-found Variation in the Octant be to the Variation congruous to any other Aſpect; and this added to the Moon's Place before-found in the firſt and third Quadrant (accounting from the Sun) or ſubducted from it in the ſecond and fourth, will give the Moon's Place equated a fifth time.

Again, as Radius to the Sine of the Sum of the Diſtances of the Moon from the Sun, and of her Apogee from the Sun's Apogee (or the Sine of the Exceſs of that Sum above 360 deg) : : ſo is 2 min. 10 ſeconds, to a ſixth Equation of the Moon's Place, which muſt be ſubtracted, if the aforeſaid Sum or Exceſs be leſs than a Semi-Circle, but added, if it be greater. Let it be made alſo, as Radius to the Sine of the Moon's Diſtance from the Sun : : ſo 2 deg. 20 ſeconds to a ſeventh Equation: which, when the Moon's Light is increaſing, add; but when decreaſing, ſubtract; and the Moon's Place will be equated a ſeventh time, and this is her Place *in her proper Orbit*.

Note here, The Equation thus produced by the mean Quantity 2 degrees 20 ſeconds, is not always of the ſame Magnitude, but is increaſed and diminiſhed according to the Poſition of the Lunar Apogee. For if the Moon's Apogee be in Conjunction with the Sun's, the aforeſaid Equation is about 54 ſeconds greater: But when the Apogees are in Oppoſition, 'tis about as much leſs; and it librates between its greateſt Quantity 3 minutes 14 ſeconds, and its leaſt 1 minute 26 ſeconds. And this is when the Lunar Apogee is in Conjunction or Oppoſition with the Sun's: But in the Quadratures, the aforeſaid Equation is to be leſſen'd about 50 ſeconds, or one minute, when the Apogees of the Sun and Moon are in Conjunction; but if they are in Oppoſition, for want of a ſufficient Number of Obſervations, I cannot determine whether it is to be leſſen'd or increas'd. And even as to the Augment or Decrement of the Equation, 2 minutes 20 ſeconds above mentioned, I dare determine nothing certain, for the ſame Reaſon, *viz.* the want of Obſervation accurately made.

If the ſixth and ſeventh Equations are augmented or diminiſhed in a reciprocal *Ratio* of the Diſtance of the Moon from the Earth, *i. e.* in a direct *Ratio* of the Moon's Horizontal Parallax; they will become more accurate: And this may readily be done, if Tables are firſt made to each Minute of the ſaid Parallax, and to every ſixth or fifth Degree of the Augment of the ſixth Equation for the ſixth, as of the Diſtance of the Moon from the Sun, for the ſeventh Equation.

From



From the Sun's Place, take the mean Motion of the Moon's aſcending Node, equated as above; the Remainder ſhall be the Annual Argument of the Node, whence its ſecond Equation may be computed after the following manner in the preceding Figure.

Let T, as before, repreſent the Earth; T S a Right Line conjoining the Earth and Sun: Let alſo the Line T A C B, be drawn to the Place of the Aſcending Node of the Moon, as above equated; and let S T A be the Annual Argument of the Node. Take T A from a Scale, and let it be to A B :: as 56 to 3, or as 11 $\frac{2}{3}$ to 1. Then biſſect B A in C, and on C as a Centre, with the Diſtance C A, deſcribe a Circle as A F B, and make the Angle B C F, equal to double the Annual Argument of the Node before found: So ſhall the Angle B T F, be the ſecond Equation of the Aſcending Node: Which muſt be added when the Node is paſſing from the Quadrature to a Syzygy with the Sun, and ſubducted when the Node moves from a Syzygy towards a Quadrature. By which means the true Place of the Node of the Lunar Orbit will be gained: Whence from Tables made after the common way, the *Moon's Latitude, and the Reduction of her Orbit to the Ecliptick*, may be computed, ſuppoſing the Inclination of the Moon's Orbit to the Ecliptick, to be 4 deg. 59 min. 35 ſeconds, when the Nodes are in Quadrature with the Sun; and 5 deg. 17 min. 20 ſeconds, when they are in the Syzygies.

And from the Longitude and Latitude thus found, and the given Obliquity of the Ecliptick, 23 degrees 29 minutes, to the Right Aſcenſion and Declination of the Moon will be found.

The Horizontal Parallax of the Moon, when ſhe is in the Syzygies at a mean Diſtance from the Earth, I make to be 57 min. 30 ſeconds, and her Horary Motion 33 min. 32 ſeconds, 32 thirds; and her apparent Diameter 31 min. 30 ſeconds. But in her Quadratures, at a mean Diſtance from the Earth, I make the Horizontal Parallax of the Moon to be 59 min. 40 ſeconds, her Horary Motion 32 min. 12 ſeconds, 2 thirds, and her apparent Diameter 31 min. 3 ſeconds. The Moon in an Octant to the Sun, and at a mean Diſtance, hath her Centre diſtant from the Centre of the Earth about 60 $\frac{1}{2}$. of the Earth's Semidiameters.

The Sun's Horizontal Parallax I make to be 10 ſeconds, and its apparent Diameter at a mean Diſtance from the Earth, I make 32 minutes, 15 ſeconds.

The Atmoſphere of the Earth, by diſperſing and refracting the Sun's Light, caſts a Shadow as if it were an Opake Body, at leaſt to the height of 40 or 50 Geographical Miles (by a Geographical Mile, I mean the ſixtieth part of a Degree of a great Circle, on the Earth's Surface.) This Shadow falling upon the Moon in a Lunar Eclipſe, makes the Earth's Shadow be the larger or broader. And to each Mile of the Earth's Atmoſphere, is correſpondent a Second in the Moon's Disk, ſo that the Semi-diameter of the Earth's Shadow projected upon the Disk of the Moon, is to be encreaſed about 50 ſeconds: Or which is all one, in a Lunar Eclipſe, the Horizontal Parallax of the Moon is to be encreaſed in the Ratio of about 70 to 69.

Thus far the Theory of this Incomparable Mathematician. And if we had many Places of the Moon accurately obſerved, eſpecially about her Quadratures, and theſe well compared with her Places at the ſame time calculated according to this Theory; it would then appear whether there yet remain any other ſenſible Equations, which, when accounted for, might ſerve to improve and enlarge this Theory.

Dr. *Greg. Aſtr. Elem. Phyſ. & Geom. pag.* 336.

MOOR at Sea, ſignifies the laying out the Anchors of a Ship ſo, as is beſt and ſafeſt for her Riding. There are ſeveral ways of *Mooring* a Ship. Sometimes they *Moor her a Thwart*, by laying one Anchor on one ſide of a River, and another right againſt it on the other ſide; in order to make both the Cables bear together, as well at Tide of Ebb, as at Flood.

To Moor Alongſt, is to lay one Anchor right in the middle of the Stream, and another right a head of the Ship, which is done when they are in danger of driving aſhoar; for by this Means both her Anchors do bear together, and ſo will ſave her from falling on either Shore.

To Moor Water-ſhot, is to Moor a Ship in the middle between the two former ways, quartering as it were, neither acroſs the Tide, nor alongſt it, but between both. When a Ship comes into a Place of Riding, the Maſter and his Mates obſerve on what Point of the Compaſs the Wind is likelieſt to endanger the Ship, and there they lay out an Anchor; and this is called *Mooring for Eaſt, North*, &c. according to the Point ſhe is Moored upon. They don't ſay a Ship is *Moored*, unleſs ſhe have at leaſt two Anchor's out; except in one Caſe, and that is, when, tho' ſhe have but one Anchor out, yet there is a Hawſer aſhoar; and then they ſay ſhe is Moored with her Head to the Shoar.

MOORSHEAD, is the Head of a Copper, or Glaſs-Still, or Alembick, which is luted on to the Body, or Cucurbit; and hath a Beak, Noſe, or Pipe, to let the raiſed Spirit run down into the Receiver.

MOOT, is a Term well underſtood in the Inns of Court, to be that Exerciſe or Arguing of Caſes, which young Students perform at appointed times, the better to enable them for Practice, and Defence of Clients Cauſes. In the Inns of Court, there is a *Bayliff*, or *Surveyor of the Inns*, yearly choſen by the Bench, to appoint the *Mootmen* for the Inns of *Chancery*, and to keep account of Performance of Exerciſes, both there and in the Houſe.

MOOT-MEN, are thoſe that argue Reader's Caſes (or Moot-Caſes) in the Houſes of *Chancery*, both in Term-time, and alſo in Vacations.

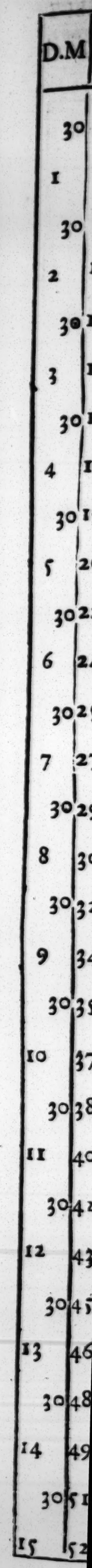
MORAL *Quantity*. See *Quantity*.

MORATUR or *Demoratur in Lege*, ſignifies as much as *He demurs*, becauſe the Party goes not forward in Pleading, but reſts upon the Judgment of the Court in the Point, who deliberate, and take time to argue and adviſe thereupon.

MORBUS *Regius*, the ſame that *Iterus*.

MORTAR-PIECE, is a kind of very ſhort piece of Cannon, or Ordnance, thick and wide, proper for the diſcharging of Bombs, Carcaſſes, Stones, *&c.* It is uſually mounted on a Carriage, the Wheels whereof are very low. Mr. *Anderſon*, in his Book of the Gun, ſaith, That 70 or 80 Degrees of Elevation, is the beſt for rendring Mortars ſerviceable, to caſt Shells into Towns, Forts, *&c.* And he ſaith, That if Mortar-pieces were all, as they ought to be, exactly Similar, and their Requiſites of Powder as the Cubes of the Diameters of their ſeveral Bores; and if alſo their Shells, Bombs, Carcaſſes, *&c.* were Similar, then, comparing, like with like, their Ranges upon the Plane of the Horizon under the ſame Degree of Elevation, would be equal; and conſequently one Piece being well proved, that is, the Range of the Granado, Bomb, Carcaſs, *&c.* being found to any Degree of Elevation, the whole Work of the Mortar-piece would become very eaſie and exact: But ſince Mortars are not thus Similar, there is required the Range of the Piece at any convenient degree of Elevation, with its requiſite of Powder; and then you muſt work by the Tables.

A TABLE



A TABLE of Horizontal DISTANCES.

D.M	Nu.	Diff.	D.M	Nu.	Diff.	D.M	Nu.	Diff.	D.M	Nu.	Diff.	D.M	Nu.	Diff.	D.M	Nu.	Diff.
		521			145			82			4			89			151
30	521		30	5406		30	8851		30	9996		30	8523		30	4806	
		190			144			79			7			92			152
1	711		16	5550		31	8930		46	9989		61	8431		76	4656	
		181			142			76			10			94			154
30	892		30	5692		30	9006		30	9979		30	8337		30	4502	
		177			140			73			13			97			155
2	1069		17	5832		32	9079		47	9966		62	8240		77	4347	
		175			138			71			16			99			157
30	1244		30	5970		30	9150		30	9950		30	8141		30	4190	
		173			137			69			19			101			157
3	1417		18	6107		33	9219		48	9931		63	8040		78	4033	
		172			135			65			22			103			159
30	1589		30	6242		30	9284		30	9909		30	7937		30	4876	
		170			133			62			25			107			160
4	1759		19	6375		34	9346		49	9884		64	7830		79	3714	
		170			131			61			28			110			161
30	1929		30	6506		30	9407		30	9856		30	7720		30	3553	
		168			129			57			31			111			162
5	2097		20	6635		35	9464		50	9825		65	7609		80	3391	
		167			128			54			34			113			163
30	2264		30	6763		30	9518		30	9791		30	7496		30	3228	
		167			126			51			36			116			165
6	2431		21	6889		36	9569		51	9755		66	7380		81	3063	
		166			123			49			40			118			165
30	2597		30	7012		30	9618		30	9715		30	7262		30	2898	
		166			122			46			42			120			166
7	2763		22	7134		37	9664		52	9673		67	7142		82	2732	
		164			119			43			45			121			166
30	2927		30	7253		30	9707		30	9628		30	7021		30	2566	
		163			117			40			49			125			168
8	3090		23	7370		38	9747		53	9579		68	6896		83	2398	
		163			115			37			51			126			168
30	3253		30	7485		30	9784		30	9528		30	6770		30	2230	
		162			113			34			53			128			169
9	3415		24	7598		39	9818		54	9475		69	6642		84	2061	
		160			111			32			58			131			170
30	3575		30	7709		30	9850		30	9417		30	6511		30	1891	
		159			108			28			59			132			170
10	3734		25	7817		40	9878		55	9358		70	6379		85	1721	
		158			106			26			63			134			171
30	3892		30	7923		30	9904		30	9295		30	6245		30	1550	
		158			104			22			65			136			171
11	4050		26	8027		41	9926		56	9230		71	6109		86	1379	
		156			102			20			68			138			171
30	4206		30	8129		30	9946		30	9162		30	5971		30	1208	
		155			98			16			71			139			172
12	4361		27	8227		42	9962		57	9091		72	5832		87	1036	
		153			96			14			73			141			172
30	4514		30	8323		30	9976		30	9018		30	5691		30	864	
		151			95			11			76			144			173
13	4665		28	8418		43	9987		58	8942		73	5547		88	691	
		151			92			8			78			144			172
30	4816		30	8510		30	9995		30	8864		30	5403		30	519	
		150			89			4			82			146			173
14	4966		29	8599		44	9999		59	8782		74	5257		89	346	
		148			87			2			84			148			173
30	5114		30	8686		30	10001		30	8698		30	5109		30	173	
		147			83			1			86			150			173
15	5261		30	8769		45	10000		60	8612		75	4959		90	000	

The Uſe of which Table of Horizontal Diſtances, *is this, in* Anderſon's *Words.*

I. Any degree of Elevation under 45 degrees, being given; What degree above 45 degrees, will hit the ſame Horizontal Diſtance? Suppoſe 12 degrees: I look againſt 12 in the Table, and find 4361, which I look for beyond 45 degrees, and find it againſt 76 degrees 57 minutes. So I conclude, a Piece charged with the ſame quantity of the ſame Powder, and the ſame Ball put to either 12 degrees, or 76 degrees 57 minutes of Elevation, will range the Shot to the ſame Horizontal Diſtance.

Here Note, Suppoſe a Piece be charged with 1, 2, 3, and 4 Parts of Powder, and the ſame Ball, and put to thoſe degrees of Elevation, if the upper and lower Ranges be equal, there is no ſenſible Reſiſtance of the Medium.

II. *June* the 5th. 1677. on *Wimbleton-Heath*, I charged the Mortar-piece with 4 Ounces of Powder, and put it to 15 degrees of Elevation; it ranged the Ball to the Horizontal Diſtance of 659 Paces; with that, I would hit a Mark with the ſame Piece, Ball, and quantity of Powder, at the Horizontal Diſtance of 1000 Paces: Then as 659 is to 1000, ſo is 5261 the Tabular Number of 15 degrees to 7983, which gives in the Table 25 degrees 47 minutes, and 63 degrees 16 minutes, to hit a Mark at the Horizontal Diſtance of 1000 Paces.

III. *Feb.* the 12th. $167\frac{7}{8}$. on *Wimbleton-Heath*, a Piece whoſe Length of its Chaſe is 18 Inches, and Diameter of Bore 3 Inches, charged with 8 Ounces of Powder, and laid to 10 degrees of Elevation, ranged its Shot to the Horizontal Diſtance of 805 Paces: With that I would hit a Mark at the Horizontal Diſtance of 2112 Paces; that is, 2 *Engliſh* Miles. Then as 805 is to 2112, ſo is 3734, the Tabular Number at 10 degrees, to 9797, which gives in the Table 38 degrees 41 minutes, and 50 degrees 25 minutes, to hit a Mark at the Horizontal Diſtance of 2112 Paces, *viz.* 2 *Engliſh* Miles.

N. B. Since this, our Excellent Mathematical Inſtrument-maker, Mr. *John Rowley*, (whoſe Shop is by St. *Dunſtan*'s Church in *Fleet-ſtreet*) hath contrived this Table on a Scale of Box, where, by ſliding only a fiducial Edge of Braſs over the Diagonals of the Diſtance required, both the Elevations, upper and lower, are ſhewn at the ſame time.

Mr. *Anderſon* gives us alſo the following TABLE *of the Requiſite Weight of Powder for all Mortars, from 6 to 20 Inches Diameter.*

Inc.	*Docim.*	*Pounds.*	*Ounces.*
6.	0		13
6.	5	1.	01
7.	0	1.	05
7.	5	1.	10
8.	0	2.	00
8.	5	2.	06
9.	0	2.	14
9.	5	3.	06
10.	0	3.	$14\frac{1}{2}$
10.	5	4.	08
11.	0	5.	03
11.	5	5.	15
12.	0	6.	12
12.	5	7.	10
13.	0	8.	09
13.	5	9.	10
14.	0	10.	$11\frac{1}{2}$
14.	5	11.	14
15.	0	13.	03
15.	5	14.	09
16.	0	16.	16
16.	5	17.	09
17.	0	19.	03
17.	5	20.	15
18.	0	22.	$12\frac{1}{2}$
18.	5	24.	11
19.	0	26.	13
19.	5	28.	14
20.	0	31.	04

The Uſe of this TABLE *is Plain and Eaſie.*

If you would know the Quantity of Powder requiſite to load a Mortar of 15 Inches Diameter; againſt 15 Inches you have 13 Pounds 3 Ounces, and that is the true Weight of Powder required.

MORTGAGE, in Law, ſignifies a Pawn of Land, or Tenements, or any thing moveable, laid or bound for Money borrowed, to be the Creditors for ever, if the Money be not paid at the Day agreed upon: And the Creditor holding Land, or Tenement upon this Bargain, is called Tenant in Mortgage. He that pledgeth this Pawn or Gage, is called the Mortgager, and he that taketh it, the Mortgagee.

MORTIFY. The Chymiſts ſay a Thing is Mortify'd, when its outward Form is altered or deſtroyed, as particularly when *Mercury*, or any other Metal is diſſolved in an *Acid Menſtruum*. Sometimes they ſay alſo, that Spirits are Mortified, when they are mix'd with ſuch Things as deſtroy their Strength, and hinder their Operation.

MORT-

MORTMAINE, a Term in Law, ſignifying an Alienation of Lands and Tenements to any Guild, Corporation, or Fraternity, their Succeſſors, as Biſhops, Parſons, Vicars, &c. which may not be done without the King's Licence, and the Lord of the Manor, or of the King alone, if it be immediately holden of him.

MORTUARY, is a Gift left by a Man at his Death, to his Pariſh-Church, for the recompence of his Perſonal Tythes and Offerings, not duly paid in his Life-time. A *Mortuary* is not properly and originally due to an Eccleſiaſtical Incumbent from any, but thoſe only of his own Pariſh. But by Cuſtom in ſome Places of this Kingdom, they are paid to the Parſons of other Pariſhes, as the Corps paſſes through them.

MOSAICK *Work*, was anciently uſed only in Pavements, and began in *Rome* about *Sylla*'s time; who made a Pavement of *Moſaick* Work at *Preneſte* in the Temple of *Fortune*, about 170 Years before Chriſt. It was called *Lithoſtrcton*, in *Greek* only a Stone Pavement; but it is underſtood of Figures made or repreſented by inlaying of ſmall Stones, or rather pieces of Stone of different Colours; by the variety of which, many Curious Figures may be wrought. Afterward it came to be in Faſhion for the Inſides of the Walls of Rooms; and now adays they work it with Shells, or ſmall Pieces of Glaſs variouſly Colour'd and Figured: 'Tis a very pleaſant and a laſting Ornament, when 'tis curiouſly and excellently done.

MOTHER *Tongues*, in *Latin*, *Matrices Linguæ*, are ſuch Languages as ſeem to have no Dependance upon, Derivation from, or Affinity with one another. 'Tis a Conjecture commonly received, That at the Confuſion of Languages at the Tower of *Babel*, there were formed 70, or 72 ſeverally diſtinct Languages: But Biſhop *Wilkins* thinks 'tis probable there were not ſo many, and that at the firſt Diſperſion, Men did not divide into ſo many Colonies. But now the Languages uſed in the World, do far exceed that Number: If you will believe *Pliny* and *Strabo*, there was a Town in *Colchos* called *Dioſcuria*, to which Men of three hundred Nations, and as many ſeveral Languages, did reſort for Trading. Some of the *American* Hiſtorians relate, That in every 80 Miles of that vaſt Country, and alſo in almoſt every particular Valley of *Peru*, the Inhabitants had a diſtinct Language or Mother-Tongue by themſelves. And *Purchas* tells us, *Pilgr.* Lib. 8. Sect. 4. Cap. 1. That by Converſe and Enquiry, in the Northern Parts of *America*, about *Florida*, he found more than 1000 different Languages amongſt the Inhabitants of thoſe Places.

Joſeph Scaliger affirms there are no more than Eleven Mother-Tongues uſed in *Europe*; of which Four are of more general and large Extent, and the other Seven of a narrower Compaſs and Uſe.

1. The *Greek*, which was anciently of very great Extent, not only in *Europe*, but in *Aſia* and *Africk* too, where ſeveral Colonies of that Nation were planted; by which Diſperſion, and Mixture with other People, it did degenerate into ſeveral *Dialects*. Beſides thoſe Four that are commonly noted, the *Doric*, *Ionic*, *Æolic*, *Attic*, *Herodotus* doth mention Four ſeveral Dialects of the *Ionic*. The Inhabitants of *Rhodes*, *Cyprus*, *Crete* had each of them ſome Peculiarity in their Language: And the preſent *Coptic* or *Ægyptian* ſeems, both from the *Words* and the *Character*, to be a Branch of this Family, and was probably ſpread amongſt that People in the Days of *Alexander the Great*, upon his conquering of them; tho' ſome conceive that there were at leaſt 30000 Families of *Greeks* planted in that Country long before his Time.

2. The *Latin*, tho' this be much of it a Derivation from the *Greek*, (of which the now *French*, *Spaniſh*, and *Italian*, are ſeveral Off-ſprings and Derivations) had anciently Four ſeveral Dialects, as *Petrus Crinitus* ſhews out of *Varro*.

3. The *Teutonic* or *German*, is now diſtinguiſhed into *Upper* and *Lower*. The *Upper* hath two notable Dialects: 1. The *Daniſh*, *Scandian*, or perhaps the *Gothic*; to which belongs the Language uſed in *Denmark*, *Norway*, *Swedeland*, and *Iſland*. 2. The *Saxon*, to which appertain the ſeveral Languages of the *Engliſh*, the *Scotch*, the *Friſians*, and thoſe on the North of *Elve*.

4. The *Sclavonic* is extended, tho' with ſome Variation, through many large Territories, *Muſcovia*, *Poland*, *Bohemia*, *Vandalia*, *Croatia*, *Lithuania*, *Dalmatia*; and is ſaid to be the Vulgar Language uſed amongſt Sixty ſeveral Nations.

The Languages of leſſer Extent, are,

1. The *Albaneſe*, or Old *Epirotic*, now uſed in the Mountainous Parts of *Epirus*.

2. The *Europæan Tartar*, or *Scythian*, from which ſome conceive our *Iriſh* to have had its Original.

As for the *Turkiſh* Tongue, that is originally no other but the *Aſiatick Tartar* mixed with *Armenian* and *Perſian*, ſome *Greek*, and much *Arabic*.

3. The *Hungarian*, uſed in the greateſt Part of that Kingdom.

4. The *Finnic* uſed in *Finland* and *Lapland*.

5. The *Cantabrian*, uſed amongſt the *Biſcainers* who live near the Ocean on the *Pyrene* Hills, bordering both upon *France* and *Spain*.

6. The *Iriſh*, in *Ireland*, and from thence brought over into ſome Parts of *Scotland*; tho' Mr. *Camden* would have this to be a Derivation from the *Welſh*.

7. The Old *Gauliſh* or *Britiſh*, which is yet preſerved in *Wales*, *Cornwal*, and *Britain* in *France*.

To this Number Mr. *Brerewood* doth add Four others, *viz.*

1. The *Arabick*, now uſed in the ſteep Mountains of *Granata*; which yet is a Dialect from the *Hebrew*, and not a Mother-Tongue.

2. The *Cauchian*, in *Eaſt-Frieſland*.

3. The *Illyrian*, in the Iſle of *Veggia*.

4. The *Jazygian*, on the North-ſide of *Hungary*.

MOTION, is a continual and ſucceſſive Mutation or Change of Place. All Motion may be conſider'd either *Abſolutely* or *Relatively*. *Abſolute Motion* is the Change of the *Locus Abſolutus* of any moving Body, and therefore its Celerity will be meaſured by the Quantity of the *Abſolute Space*, which the Moveable hath run through. But *Relative Motion* is a Mutation of the *Relative* or *Vulgar Place* of the moving Body, and ſo hath its Celerity accounted or meaſured by the Quantity of *Relative Space* which the Moveable runs over.

All Motion is of it ſelf rectilinear, or made according to ſtrait Lines, with the ſame conſtant uniform Velocity, if no external Cauſe make any Alteration in its Direction.

If a Body, moving uniformly, and with the ſame Degree of Velocity, paſs over two Spaces, the Times of the Motions will be as the Spaces; as is very plain to him that will conſider it.

If a Body move through two Spaces in equal Times, thoſe Spaces will be to one another as the Velocities of the Motions.

If two Bodies move uniformly, but with unequal Velocities, through the ſame Space, the Times will be as the Velocities.

If two Bodies, moving uniformly, go with unequal Velocities, the Spaces which will be paſt over by them in unequal Times, will be to one another in a Ratio compounded of that of the Velocities and that of the Times. *Galilæus, de Motu Local. Dial.* 3. *Giorn. terza.*

If any Bodies are impelled upwards by different Forces, they will be raiſed to different Heights; which Heights will be to one another as the Squares of their Velocities.

And if Bodies fall from different Altitudes, the Celerities will be to one another as the Squares of ſuch Altitudes.

MOTION; *Its Laws.*

The Incomparable Sir *Iſaac Newton* gives but theſe Three Laws of Motion, which may be truly called *Laws of Nature.*

1. That every Body will continue in its State, either of Reſt, or Motion uniformly forward in a Right Line, unleſs it be made to change that State by ſome Force impreſſed upon it.

2. That the Change of Motion is proportionable to the moving Force impreſſed; and is always according to the Direction of that Right Line in which the Force is impreſſed.

3. That *Reaction* is always equal and contrary to Action; or, which is all one, the mutual Actions of two Bodies one upon another are equal, and directed towards contrary Parts: As when one Body preſſes and draws another, 'tis as much preſſed or drawn by that Body.

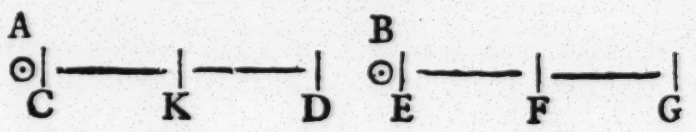
The Quantity of any Motion is diſcoverable by the joint Conſideration of the Quantity of Matter in, and the Velocity of the moving Body: For the Motion of any Whole, is the Sum of the Motions of all the Parts. And conſequently if a Body be twice as great as another, and be moved with an equal Degree of Velocity, the Quantity of the Motion is *double* in the Former; but if the Velocity be alſo double, then the Quantity of the Motion is *Quadruple* of that of the latter. *Newton's Princip.*

The Quantity of Motion, which is found by taking either the Sum of Motions made the ſame way, or the Difference of thoſe which are made contrary ways, is not at all changed by the Action of Bodies one upon another. For Action and Reaction are always equal, (by *Law* 3.) wherefore (by *Law* 2.) they muſt needs produce equal Changes in the Motions towards contrary Parts: Wherefore, if the Motions be both according to the ſame Direction, whatſoever is added to the Body to be moved, or which is forced to give place, is ſubducted from the Body which moves, or drives away the other; ſo that the Sum remains the ſame as before. But if the Bodies meet with contrary Directions, there muſt be an equal Subſtraction of the Motion of each, and conſequently the *Difference* of the Motions made towards the contrary parts, will remain the ſame. Suppoſe the Spherical Body A to be thrice as big as B, and of the like Figure. Let A have two Degrees of Velocity, and B purſue it with ten Degrees of Velocity: Wherefore the Quantity of the Motion of A to B, is as 6 to 10; therefore the Sum of the Motions of both is 16. Suppoſe then B to overtake A, and to give it 3, 4, or 5 Degrees of Velocity; 'tis plain it muſt loſe juſt as much it ſelf: Wherefore A will go on with 9, 10, 11 Parts of Velocity; and B will follow after with 7, 6, or 5. So that the Sum will ſtill be 16; and thus will it always be. *Idem.*

Mr. *Keil*, in his *Lectiones Phyſicæ*, proves this diſtinctly, by branching of it into two Theorems. See *p.* 127.

Which THEOREMS are theſe.

I. *If one Body ſtrike againſt another, whether at reſt, or moving more ſlowly, according to the ſame Direction with the Former; then will the Sum of the Motion in both Bodies towards the ſame Parts, remain the very ſame as before ſuch ſtriking one againſt another.*



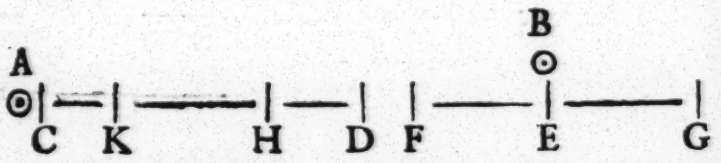
Let the Body A move according to the Direction C D, and in its way ſtrike againſt the Body B; which ſuppoſe to be either at reſt, or moving on more ſlowly than A, and according to the ſame Direction with it: I ſay, the Sum of the Motions in both Bodies, towards the ſame Parts, that is from C towards D, will be the ſame as before. Let C D expreſs the Motion of A from C to D; and if B be in Motion too, let E F expreſs its Motion the ſame way. Then will the Sum of both Motions be expreſſed by C D + E F. But becauſe Action and Reaction are always equal, and towards Contrary Parts; if F G expreſs the Motion impreſſed on B by the Stroak of A; D K, equal to it, muſt expreſs the Motion impreſſed on A by the Stroak of B, with a contrary Direction from D towards C. Wherefore ſince D K = F G, C K will expreſs the Motion of the Body A after the Shock, and E G the Motion of B; and therefore the Sum of

of both will be C K + E G. But ſince F G is ſuppoſed = K D, if you add C K and E F to both, E G + C K muſt be equal to C D + E F. Wherefore the Sum of the Motions of both is the ſame as at firſt.

And if F G be equal to C D, the Points K and C muſt be coincident; that is, C K will be = 0, and conſequently the Body A, after the Occurſe or Shock, will be quite at reſt. But if F G be greater than C D, the Point K muſt be found ſomewhere beyond or to the Left Hand of C; and the Motion of A will become changed towards the contrary Parts, and the Sum of the Motions towards G will be as E G — C K: And becauſe F G = C K, add to both E F — C K, and it will be that E F + F G — C K, (*i. e.*) E G — C K = E F + D K — C K, (*i. e.*) E F + C D. From whence 'tis plain that the Sum of the Motions towards the ſame Parts (which in this Caſe is their Difference towards contrary Parts) continues the ſame after the Shock as before.

COR. After the ſame manner it will appear, if *many Bodies*, moving with the ſame Direction, ſhould ſtrike againſt one another, the Sum of their Motion, after that, will be the ſame as before.

II. *If Two Bodies move towards each other with exactly contrary Directions, the Sum of their Motions towards the ſame Parts (which is all one as the Difference of them towards contrary Parts) will continue the ſame after the Shock as before it.*



Let the Body A move from C towards D, and let C D expreſs its Line of Motion; and let the Body B be moving at the ſame time with a quite contrary Direction from E to F, and let E F expreſs its Motion. Let D H be ſuppoſed equal to E F; ſo ſhall C H, which is the Difference of their Motion towards contrary Parts, expreſs the Sum of the Motions made towards G. I ſay then, that the ſame C H is the Sum of their Motions towards G, as well after the Shock as before it: For after the Shock, ſuppoſe the Motion of B to be changed, and to be now towards G, and let the Line E G repreſent it; wherefore the Force impreſſed upon B after the Shock, and which carries it towards G, will be equal to the Sum of the Motions E F and G F, and conſequently be expreſſed by F G: For in that Right Line, the Motion E F, towards F, is deſtroyed; and the new one, E G, towards G, produced. But now ſince the impulſive Force in both Bodies acts equally towards contrary Parts, if D K be made equal to F G, this ſhall repreſent the Force impreſſed on the Body A, and carry it in a contrary Direction to its former Motion: So that if the Line of Motion D K, be taken from the Line C D, there will remain C K repreſenting the true Motion of A towards G. But becauſe D K = F G, and D H = F E; D K — D H (*i. e.* K H) = F G — F E (*i. e.*) E G: And conſequently ſince K H = E G, K H will repreſent the Motion of the Body B, after the Shock; but C K repreſents the Motion of A after it: Wherefore C A is the Sum of the Motion in both Bodies towards G.

If F G had been equal to C D, then the Points, K and C would be coincident, and the Motion of A will be quite deſtroyed, (*i. e.*) after the Shock A will be perfectly at reſt, and C A will be equal to E G.

But if F G be greater than C D, the Point K will fall to the Left Hand of C, and the Motion of the Body A will be from C towards K. But (becauſe F G = D K, and F E = D H) K H = E G; wherefore taking C K from both, C H muſt be equal to E G — C K; which repreſents the Sum of the Motions made towards the ſame Parts, and their Difference towards contrary ones after the Shock: Wherefore the Sum of the Motions towards the ſame Parts remains the ſame after, as before the Shock.

Our Excellent Mathematician Dr. Wallis, *in a Letter to the Famous Mr.* Oldenburgh, *Secretary of the* Royal Society, *gives the following Short Account of the* Laws of Motion, Nov. 26. 1688. *And intimated, that they were made Publick Eight Months before, at the Meeting of the* Royal Society.

1. If any Agent, as A, produce any Effect, as E; then an Agent, as 2 A, will produce an Effect, as 2 E; 3 A, as 3 E, *&c. cæteris paribus.* And univerſally, if *m* be put for the Exponent of the Power, *m* A, as *m* E.

2. Wherefore if any Force, as V (which ſtands for *Vis*) move any Weight, Maſs, or Body, as P; the Force, which is as *m* V, ſhall move *m* P, *cæteris paribus*; *viz.* with the ſame Celerity, or through the ſame Space in the ſame Time.

3. If the Force in the given Time T, move any Weight thro' the Space or Length L, in the Time *n* T, it ſhall move it thro' the Space *n* L.

4. Wherefore if the Force V, in the Time T, move any Weight, as P thro' the Length or Space L, the Force *m* V in the Time *n* T, ſhall move *m* P thro' the Space *n* L: And conſequently as V T, (the Rectangle under the Force and Time) is to P L the Rectangle under the Weight and Diſtance:: So is *m n* V T, to *m n* P L.

5. Since the Degrees of Celerity are proportionable to the Lengths run over in the ſame Time, or, (which is the ſame thing) are proportionable to the Times taken up in paſſing over ſuch Lengths: Therefore it will be, as $\frac{L}{T}$. C :: $\frac{m}{n}\frac{L}{T}\cdot\frac{m}{n}$C. That is, the Degrees of Celerity will be in a *Ratio* compounded directly of the Lengths, and Reciprocally of the Times.

6. Since as V T. P L :: *m n* V T to *m n* P L, it will be as V. $\frac{P L}{T}$ :: *m* V. $\frac{m n P L}{n T}$. That is,

V. P C

V. P C : : m V. m P C = m P x by C ; or = P x by m C.

7. That is, if the Force V be able to move the Weight P, according to the Celerity C ; then will the Force m V, move the ſame Weight P, in the Celerity m C ; or with the bare Celerity C, the Weight m P : Or, in one word, it will be able to move any Weight with that Celerity, if the Product of the Weight multiplied by the Celerity, be m P C.

8. And on this depends the Reaſon of the Conſtruction of all manner of Engines and Machines, for facilitating of Motion, *viz.* That in whatever Proportion the Weight be encreaſed, the Celerity be decreaſed accordingly : From whence it comes that the Product of the Celerity multiplied by the Weight, for moving the ſame Force, is always the ſame, *viz.* V : P C : : N. m P + $\frac{1}{m}$ C : That is, P C.

9. If the Weight P, by the Force V, carried according to the Celerity C, ſtrike directly againſt the Weight m P ; which, tho' ſuppoſed at reſt, yet is capable of being moved ; both the Bodies after the ſtroak, will be carried with the Celerity $\frac{1 + m}{1}$ C. For, by reaſon the ſame Force is impelled to move the greater Body, the Celerity of it will be leſſened after the ſame *Ratio, viz.* V : P C : : V : $\frac{1 + m}{1}$ P x $\frac{1}{1 + m}$ C = P C. And therefore the Impetus, (or Product of the Weight multiplied by the Celerity) of the other will be $\frac{1}{1 + m}$ P C ; and of the Remaining one $\frac{1}{1 + m}$ m P C.

10. If againſt the Weight P, moved by the Force V, with the Celerity C, another Weight or Body ſhall ſtrike directly, moving the ſame way, but with greater Celerity : As ſuppoſe the Weight m P, with the Celerity n C, (which therefore will be carried forward with the Force m n V :) After this, they will both move forward with the Celerity $\frac{1 + m n}{1 + m}$ C.

For, V : P C : : m n V. m n P C : : V + m n V $\left(\frac{1 + m n \text{ V.}}{1}\right)$ $\frac{1 + m n}{1}$ P C : which is equal to $\frac{1 + m}{1}$ P x by $\frac{1 + m n}{1 + m}$ C.

And therefore the Impetus of the Preceeding Body will be $\frac{1 + m n}{1 + m}$ P C : and of the following, $\frac{1 + m n}{1 + m}$ m P C.

11. If the Weights or Bodies are carried contrary ways, they will meet, and mutually ſtrike againſt each other.

Suppoſe the Weight P, carried by the Force V, with the Celerity C, towards the Right Hand ; and the Weight m P with the Celerity n C, (and conſequently carried by the Force m n V) toward the Left Hand : Then may the Impetus, Direction, and Celerity of each be thus calculated.

The Body which moved towards the Right Hand, if the other had been at reſt, would have given it the Celerity $\frac{1}{1 + m}$ C, (by the 9th ;) and conſequently the Impetus $\frac{1}{1 + m}$ m C P, of moving to the Right Hand ; and would have retained to it ſelf the ſame Celerity, and the Impetus $\frac{1}{1 + m}$ m P C, alſo towards the Right Hand. And the other Body, carried toward the Left Hand, would, if the former had been at reſt, have given it the Celerity $\frac{m n}{1 + m}$ C ; and therefore the Impetus $\frac{m n}{1 + m}$ m P C, towards the Left Hand, by the ſame Reaſon ; and it would have retained to its ſelf the ſame Celerity, and therefore the Impetus $\frac{m n}{1 + m}$ m P C alſo toward the Left Hand.

Wherefore ſince the Motion was made both ways, the Aggregate of the Impetus of the former Body, will ariſe out of the Impetus $\frac{1}{1 + m}$ P C to the Right, and $\frac{m n}{1 + m}$ P C to the Left : And therefore in reality, it will move either to the Right or Left, according as that or this is greater, and by an Impetus, which is the Difference between thoſe 2 Impetus's. That is, Suppoſing + to ſignifie to the Right Hand, and — to the Left, the Impetus will be $\frac{1}{1 + m}$ P C — $\frac{m n}{1 + m}$ P C, which is equal to $\frac{1 - m n}{1 + m}$ P. And the Celerity will be $\frac{1 - m n}{1 + m}$ C, (and towards the Right or Left Hand, according as 1 or m n is the greater Quantity.)

And in like manner the Impetus of the other Body, which firſt moved towards the Left Hand, will be $\frac{1}{1 + m}$ m P C — $\frac{m n}{1 + m}$ m P C = to $\frac{m n}{1 + m}$ m P C. And the Celerity will be $\frac{1 - m n}{1 + m}$ C, and the Direction to the Right or Left Hand, according as 1, or m n, is the greater Quantity.

12. But if the Bodies neither move on in the ſame way directly, nor directly contrary to one another, but do encounter one another Obliquely ; then the preceeding Calculus muſt be moderated, according to the Meaſure of that Obliquity : And the Impetus of the Body ſtriking Obliquely, is to the Impetus it would have had, if it had gone directly : : as the Radius to the Secant of the Angle of the Obliquity.

Which Conſideration duly applied to the former Calculus, will determine with what Impetus, Celerity, and Direction, the Obliquely encountring Bodies ſhall move afterward.

And there is the very ſame *Ratio* of the Gravitation of heavy Bodies, which deſcend Obliquely

ly to their Gravitation, ſuppoſing them to have deſcended perpendicularly; as we elſewhere demonſtrate.

13. If the Bodies, which thus encounter or ſtrike one againſt another, are not infinitely hard (as hath hitherto been ſuppoſed) but do yield ſomething to the Stroke, but yet ſo as that by a Spring, or Elaſtick Force, they can recover their Figure or Poſition again: It may happen from hence, that thoſe Bodies may rebound back from one another mutually, which otherwiſe would have moved on together; (and this more or leſs, according to the Quantity of the Elaſticity) *viz.* if the Elaſtick Force exceed the Progreſſive.

In Motions which are accelerated and retarded, the Impetus in each Moment is to be eſteemed that which agrees to the degree of Celerity then acquired. But when the Motion is made in a Curve Line, that is to be accounted the Line of Direction of the Motion in each Moment, which is truly the Tangent to the Curve in that Point. And if when the Motion, being either accelerated or retarded, is made in a Curve Line (as in the Vibrations of a Pendulum) the Impetus is to be eſtimated in each Point, according to both the Degree of Acceleration, and the Obliquity of the Tangent there. *Philoſoph. Tranſact. N.* 40.

An Account of the Laws of Motion, in Bodies ſtriking one againſt another, you have alſo from the famous Mr. *Hugens*, in *Philoſ. Tranſact. N.* 46.

Mr. John Keil, *late of* Baliol-College *in* Oxon, *in his* Book *called*, Introductio ad veram Phyſicam, *gives the following* Theorems *about the Quantity of* Motion, *and the Spaces paſſed over by the* Moving Body, *and which he there plainly demonſtrates.*

1. In comparing the Motions of Bodies, if the Quantity of Matter be the ſame, the Moments, or Quantities of Motion, will always be as the Velocities, and *vice verſa*, if the Moments are as the Velocities, the Quantity of Matter in the Moving Bodies, is always the ſame.

2. If the Celerities are equal, the Moments, or Quantities of Motion, will be as the Qaantities of Matter; or if the Moving Bodies are Homogeneous, as their Magnitudes.

And if the Moments are as the Quantities of Matter, the Velocities will be equal.

3. In comparing the Motions of any Bodies, the *Ratio* of the Moments is compounded of the *Ratio*'s of the Quantities of Matter, and the Celerities. See the Word *Moment*.

4. In comparing the Motions of any Moving Bodies, the *Ratio* of the Celerities is compounded of the *Ratio* of their Moments directly, and of their Quantity of Matter reciprocally.

5. If the Celerities of any Moving Bodies are equal, the Spaces paſſed over, will be directly as the Times in which the Motions are made.

And conſequently, if the Times are as the Spaces, the Celerities muſt be equal.

6. If the Times are equal, the Spaces paſſed through, will be as the Velocities, and conſequently, if the Spaces are as the Velocities, the Times will be equal.

7. The Diſtances, or Lengths run, are in a *Ratio* compounded of the *Ratio*'s of the Times and Celerities; ſo that Spaces or Diſtances moved thro', may be conſider'd as Rectangles, under the Times and the Celerities.

Wherefore if the Spaces, or Diſtances run, be equal, the Rectangle under the Celerity and Time of one Moveable, will be equal to that under the Celerity and Time of the other: And therefore, becauſe equal Rectangles with unequal Sides, have their Sides reciprocally proportionable (14. *è* 6 *Euclid.*) as Celerity is to Celerity; ſo reciprocally ſhall Time be to Time; and conſequently, when the Spaces are equal, the Times will be reciprocally as the Celerities.

8. The *Ratio* of the Times is always compounded of the *Ratio* of the Spaces paſſed over, directly, and of the Celerities reciprocally.

The Incomparable Sir Isaac Newton, *thus expreſſes theſe Two laſt* Theorems.

When the Celerity is given, the Space paſſed through will be as the Time; and the Time being given, the Space is as the Celerity: Wherefore if neither be given, the Space will be as the Celerity and Time conjunctly.

When the Celerity is given, the Time is directly as the Space moved through; and the Space being given, the Time is reciprocally as the Celerity: Wherefore if neither be given, the Time is as the Space directly, and as the Celerity reciprocally.

Hence 'tis plain, the Motions of all Bodies are as the Rectangles under the Velocities, and the Quantities of Matter: wherefore the Matter and Celerity of Motion being given, the *Momentum* or Quantity of Motion is given: And if the *Moment* and *Matter* be given, the *Celerity* is given by dividing the *Moment* by the Quantity of *Matter*, *v. gr.* Let the Quantity of Matter be a, the Celerity c, and the Moment m: then will $c\,a = m$, and $c = \frac{m}{a}$ and $a = \frac{m}{c}$.

Alſo ſince the Space paſſed over, or through, is always proportional to the Rectangle under the Velocity and the Time; let the Space be $= S$, the Time $= T$, and the Celerity as before $= C$. Then will $S = C\,T$, and $C = \frac{S}{T}$, and $T = \frac{S}{C}$.

And ſince alſo $m = a\,c$, m will be equal to $\frac{a\,S}{T}$: Or, if T be given, $m = a\,S$.

Hence alſo may be concluded, That if two Bodies are moved with equal Velocities, the *Moments* will be as the Quantity of Matter in each; and *vice verſa*, the Quantity of Matter as the *Moments*: Wherefore if Bodies of equal Bulk are found to have unequal *Moments*, or Quantities

of

of Motion, the Quantities of Matter muſt be unequal; and conſequently, that which hath the leaſt *Moment*, muſt have more of *Pores* or *Vacuities* interſperſed than the other.

For Inſtance: If two Globes, one of Lead and the other of Cork, having equal Bulks, are moved with equal Swiftneſs; ſince the Quantity of Motion in the former, or its Force to move other Bodies, will be much greater than in the latter; it's plain there muſt be many more Pores or Vacuities in *this*, than in *that*.

Mr. Varignon's *Laws and Proportions about* Motion.

1. In all kind of *Motions* whatever, *Rowling*, *Sliding*, *Uniform*, *Accelerated*, or *Retarded*, in Right Lines, or in Curves, &c. *The Sum of the Forces which produce the Motion of all Parts of its Duration, is always proportionable to the Sum of the Paths, or Lines, which all the Points of the moving Body deſcribe.*

2. *There is more Force required to make a Body Rowl, or Revolve, (as ſuppoſe a truly Spherick Bowl on a mathematical Plane) than to make it Glide along with the ſame Celerity.*

3. In all Gliding or Sliding Motions, whether *Uniform*, *Accelerated*, or *Retarded*, &c. *The Force in the whole is always proportional to the Product of the Maſs (or Quantity of Matter) multiplied by the Path or Line deſcribed by the Centre of Gravity of the moving Body.*

4. *The Product of the Duration of all Uniform Motions, multiplied by the Force which began the Motion, is always proportionable to the Product made by the Path, or Line of Motion multiplied by the Maſs or Quantity of Matter in the moving Body.*

Let B, *b*. ſtand for the *Body* moved.
M, *m*. for the *Maſs*, or Quantity of Matter in it.
S, *s*. for *Space*, or Diſtance moved through.
T, *t*. for the *Time* in which the Motion is made.
F, *f*, for the *Force* producing the Motion.
C, *c*. for the *Celerity* of the Motion.

Then I ſay, $FT : ft :: MS : ms$. of any two Bodies in Motion. Then

5. $F : f :: MSt : msT.$
$T : t :: MSf : msF.$
$M : m :: FTs : ftS.$
$S : s :: FTm : ftM.$

6. If $F = f$, then ſhall

$T : t :: MS : ms.$
$M : m :: Ts : St.$
$S : s :: Tm : Mt.$

And reciprocally, Whenever Tt, Mm, Ss, are in any of theſe Proportions, *Then are the Forces which move the Bodies equal*; which is the General Principle of all *Des Cartes*'s *Staticks*.

7. If $T = t$, then ſhall

$F : f :: MS : ms$
$M : m :: Fs : fS$
$S : s :: Tm : tM$

And ſo reciprocally, If F, M, or S, be in the Proportions, *The Times will be equal.* And from this may the Laws of all Machines be demonſtrated after *Des Cartes* his manner.

8. If $M = m$, then will

$F : f :: St : sT$
$S : s :: Fm : fM$
$T : t :: Sf : sF$

And reciprocally, If theſe Proportions be diſcovered, *Then the Maſſes are equal.*

9. If $S = s$, then will

$F : f :: Mt : mT$
$M : m :: FT : ft$
$T : t :: Mf : mF$

And reciprocally, If ſuch Proportions are found, *The Spaces are equal.*

10. If $F : f :: \begin{cases} M : m \\ S : s \end{cases}$

Then will

$T : t :: \begin{cases} S : s \\ M : m \end{cases}$

And reciprocally,

If $T : t :: \begin{cases} S : s \\ M : m \end{cases}$

Then will

$F : f :: \begin{cases} M : m \\ S : s \end{cases}$

11. If $F : f :: T : t$. Then

$M : m :: FFs : ffS :: TTs : ttS$
$S : s :: FFm : ffM :: TTm : ttM$
$MS : ms :: FF : ff :: TT : tt$

And reciprocally, If the Maſſes of the Bodies moved, or the Spaces run through, or the Products of the Maſſes, by the Spaces, (that is, the Quantity of Motion in the Bodies B and *b*) are as in theſe Proportions, then are the Forces to one another as the Times.

And this obſerve alſo for a Principle to explain Machines and Engines, as above in Numbers 6 and 7.

12. If $M : m :: S : s$. Then

$F : f :: SSt : ssT :: MMt : mmT$
$T : t :: SSf : ssF :: MMf : mmF$
$FT : ft :: SS : ss :: MM : mm$

And

And Reciprocally, if the Forces, or the Times, or the Product of the Forces by the Times, are as in these Proportions; then the Masses are as the Spaces run thro'.

13. If $F : f :: m : M$. Then

$T : t :: M M S : m m s :: f f S : F F S.$
$S : s :: m m T : M M t :: F F T : f f t.$
$T s : t S :: M M : m m :: f f : F F.$

And Reciprocally, If the Times or the Spaces run thro', or the Products of the Times taken directly, by the Spaces taken Reciprocally, are as in these Proportions; then the Forces shall be to one another in a Reciprocal *Ratio* of the Masses.

14. If $F : f :: s : S$. Then

$T : t :: S S M : s s m :: f f M : s s m.$
$M : m :: F F T : f f t :: s s T : S S t.$
$t M : T m :: F F : f f :: s s : S S.$

And Reciprocally, If the Times, or the Masses, or the Products of the Masses taken directly, by the Times taken Reciprocally, are as in these Proportions; then the Forces shall be to one another in a Reciprocal *Ratio* of the Spaces run thro'.

15. If $T : t :: m : M$. Then

$F : f :: M M S : m m s :: t t S : T T s.$
$S : s :: F m m : f M M :: F T T : f t t.$
$S t : s F :: T T : t t :: m m : M M.$

And Reciprocally, If the moving Forces, or the Spaces run through, or the Product of the Spaces taken reciprocally by the Forces taken reciprocally, are as in these Proportions; the Time of the Motions shall be to one another in a Reciprocal *Ratio* of the Masses of the Bodies moved.

16. If $T : t :: s : S$. Then

$F : f :: S S M : S S m :: t t M : T T m.$
$M : m :: F s s : f S S :: F T T : f t t.$
$M f : m F :: T T : t t :: s s : S S.$

And Reciprocally, If the moving Forces, or the Masses of the Bodies moved, or the Products of the Masses taken reciprocally, by the Forces taken reciprocally, are as in these Proportions; then the Times shall be to one another in a Reciprocal *Ratio* of the Spaces run thro'.

17. If $F : f :: t : T$. Then shall
$M : m :: s : S.$

And Reciprocally,

If $M : m :: s : S$. Then will
$F : f :: t : T.$

So that in all Engines, or Machines, having always $t = T$, you'll have Reciprocally $F = f$. *viz.* An Equilibrium where $M : M :: s : S$, which is the known Property of the Balance.

As to the Celerities, observe the following Rules.

18. In general.

$$C : c :: \frac{S}{T} : \frac{s}{t} :: St : sT :: \frac{t}{s} : \frac{T}{S}.$$

19. Then also in the general.

$T : t :: c S : C s.$
$S : s :: C T : c t.$
$F : f :: M C : m c.$
$M : m :: F c : f C.$
$C : c :: F m : f M.$

20 If $\begin{cases} F = f \\ M = m \\ T = t \\ S = s \end{cases}$

Then shall

$$\left.\begin{matrix} m : M \\ F : f \\ S : s \\ t : T \end{matrix}\right\} :: C : c.$$

And Reciprocally, If these Proportions are true; the preceeding Equalities are so also.

And the Equilibrium will be found always in every Machine, where it is made; as $m : M :: C : c$. And this is that which *Galileus* took for the First Principle of *Staticks*. (See *Syst. Cosm. Dialog.* 2. *Pag.* 298, &c.

21. If $\left.\begin{matrix} M : m \\ T : t \\ f : F \\ s : S \end{matrix}\right\} :: C : c.$

Then

$F : f :: C C : c c.$
$S : s :: T T : t t.$
$M : m :: c c : C C.$
$T : t :: S S : s s.$

And Reciprocally, If these last Propositions are true, the first are so also.

22. If $\left.\begin{matrix} F : f :: M : m \\ \text{or,} \\ T : t :: S : s. \end{matrix}\right\}$ Then will $C = c.$

Or,

If $C = c$: Then shall $\left.\begin{matrix} F : f :: M : m. \\ \text{And} \\ T : t :: S : s. \end{matrix}\right\}$

23. If $\left.\begin{matrix} F : f :: S : s. \\ \text{Or,} \\ M : m :: T : t. \end{matrix}\right\}$

Then will

$C : c :: S m : M S :: F t : f T.$
$M : m :: S c : s C.$
$T : t :: F c : f C.$
$S : s :: M C : m c.$
$F : f :: T C : t c.$

And Reciprocally, If theſe laſt Proportions are true, the firſt are ſo alſo.

24. If F : *f* : : T : *t*. Then ſhall

C : *c* : : *m* T : M *t*.
T : *t* : : M C : *m c*.
M : *m* : : T *c* : *t* C.

And Reciprocally, If the Celerity, or the Maſſes, or the Times, or the Forces, are as in theſe Proportions, then the Forces ſhall be to one another as the Times; which was the Principle of *Galileus*, mentioned before in Number 20.

25. If M : *m* : : S : *s*. Then ſhall

C : *c* : : F *s* : *f* S.
F : *f* : : S C : *s c*.
S : *s* : : F *c* : *f* C.

And Reciprocally, If the Celerities, or the Forces, or the Maſſes, or the Spaces run thro', are as in theſe Proportions; then the Maſſes of the Bodies moved, are to one another as the Spaces run thro'.

26. If F : *f* : : *m* : : M. Then C : *c* : : { *m m* : M M / F F : *f f*.

And Reciprocally, If theſe laſt Proportions are true, the firſt muſt be ſo alſo.

27. If T : *t* : : *s* : S. Then C : *c* : : { S S : *s s*. / *t t* : T T.

And Reciprocally,

If C : *c* : : { S S : *s s* / *t t* : T T } Then ſhall T : *t* : : *s* : S.

28. If F : *f* : : *s* : S. Then

C : *c* : : *s m* : S M.
M : *m* : : *c s* : C S.
s : S : : C M : *c m*.

And Reciprocally, If the Celerities or the Maſſes, or the Forces, or the Spaces, are as in the laſt Proportions; then the Forces ſhall be Reciprocally as the Spaces.

29. If T : *t* : : *m* : M. Then

C : *c* : : F T : *f t*.
F : *f* : : *t* C : T *c*.
T : *t* : : *f* C : F *c*.

And Reciprocally, if the Celerity, or the Forces, or the Times, or the Maſſes, are as in the laſt Proportion; then the Times ſhall be to one another in a Reciprocal *Ratio* of the Maſſes.

30. If { F : *f* : : *t* : T. / Or, / M : *m* : : *s* : S. } Then

C : *c* : : F S : *f s* : : *t m* : M T.
F : *f* : : *s* C : S *c*.
t : T : : M C : *m c*.
M : *m* : : *t c* : T C.
s : S : : F *c* : *f* C.

And Reciprocally, If the Celerities, Forces, Times, Maſſes, or Spaces run thro', are in the laſt Proportions; then the Maſſes ſhall be in a Reciprocal *Ratio* of the Spaces, and the Forces Reciprocally as the Times: Which is alſo the ſame that Dr. *Cartes* took for his firſt Principle of *Staticks*. See the *Memoirs de la Mathematique & de la Phyſique*.

MOTION *of the Apogee*, in the *Ptolemaick* Syſtem, is an Ark of the Zodiack of the *Primum mobile*, contained between the Line of the *Apogee* and the Beginning of *Aries*.

MOTION *Compounded*. See *Compoſition of Motion*.

MOTORII, the Third Pair of Nerves which move the Eye.

MOTRIX *Viz*. See *Vis Motrix*.

MOVEABLE *Feaſts*, are thoſe Feſtivals which, tho' they are Celebrated on the ſame Day of the Week, have no Fixed Seat in the *Calender*, but in ſeveral Years happen on ſeveral Days of the Month; of which kind are *Eaſter* and *Whitſontide*, &c.

MOVEMENT, the ſame with what many do call an *Automaton*, and with us ſignifies all thoſe Parts of a Watch, Clock, or any ſuch Curious Engine which are in *Motion*, and which by that Motion carry on the Deſign, or anſwer the End of the Inſtrument.

The Numbers of the *Wheels*, *Pinions*, *Notches*, &c. in any Piece of Clock or Watch-work, are uſually thus written or expreſs'd: Where the uppermoſt Number above the Line is the Pinion of the Report 4, the Dial-wheel 36, and 9 the Turns of the Pinion of Report. The ſecond Number (under the Line) is 5 the Pinion, 55 is the great Wheel, and 11 the Turns of the Pinion it driveth. The third Numbers are the ſecond Wheel, *&c.* The fourth the Contrate-wheel, *&c.* And the ſingle Number 17, under all, is the Crown-wheel.

4) 36 (9
5) 55 (11
5) 45 (9
5) 40 (8
17

Theſe Numbers, by ſome, are alſo expreſs'd Fraction-wiſe, thus, $\frac{36}{4}$, $\frac{55}{5}$, $\frac{45}{5}$, $\frac{40}{5}$, 17 Notches in the Crown-wheel.

MOULINET, a *French* Term, ſignifying a *Turn-ſtile*: 'Tis uſed in Mechanicks, and ſignifies a *Roller*, which being croſs'd with two *Levers*, is uſually applied to *Cranes*, *Capſtans*, and other ſort of Engines of the like Nature, to draw Cords, and heave up Stones, Timber, *&c.* Alſo a kind of Turn-ſtile or Wooden Croſs, which turns horizontally upon a Stake fix'd in the Ground; and is uſually placed in Paſſages, to keep out Horſes, and to oblige Paſſengers to go or come one by one.

Theſe *Moulinets* are often ſet up near the Outworks of Fortified Places, at the ſide of the Barriers, through which People paſs on Foot.

MOUND. The Term in Heraldry for a Ball or Globe, with a Croſs upon it, ſuch as our Princes are uſually drawn or painted with, holding it in their Left Hand, as they do the Sceptre in their Right. *Mound* alſo ſignifies a Fence or Hedge.

MOYENAU (a *French* Term) in Fortification, is a ſmall flat Baſtion, commonly placed in the middle of an over-long Curtain, by which the Baſtions at the Extremities are not well defended from the Small-ſhot, by reaſon of their Diſtance; ſo that this Work is proper for placing in it a Body of Muſqueteers to fire upon the Enemy from all ſides.

MUCI-

MUCILAGE, in Pharmacy, is a viſcous Extraction made of Seeds, Gums, Roots, &c. with Water.

MUCILAGINOUS *Glands*, are a numerous ſort of Glands ſeated in the Joints, firſt, I think, particularly taken Notice of by Dr. *Havers*, in his *Oſteologia*: He ſaith, theſe are of two ſorts, ſome are ſmall, and in a manner miliary Glands, being Glandules placed all upon the ſame Surface of the Membrane, which lies over the Articulations. The other ſort are conglomerated, or many Glandules collected and planted one upon another, ſo as to make a Bulk, and appear conſpicuouſly, and are conſiderable Glands. In ſome of the Joints there are ſeveral of them; in others there is a ſingle Gland.

For the Structure of theſe large Glands, they conſiſt of ſmall Veſicles, which are not gathered into ſeveral Lobules or Bags of Glandules, but are diſpoſed upon ſeveral Membranes lying one over another; of which Membranes there are ſeveral in every one of theſe Glands, which appear evidently in them that are Hydropical.

They have their Blood-Veſſels, as other Glands, but their Veins have a particular Flexure in their Courſe for retarding the Return of the Blood from the Glands, that the mucilaginous Liquor, which is not ſeparated with the greateſt Expedition, may have Time to penetrate the ſecretory Pores of the Glandules.

The large Mucilaginous Glands are variouſly ſeated; ſome in a *Sinus*, formed in the Joint; others ſtand near or over-againſt the Interſtice, between the Articulated Bones; but in general they are ſo placed, as to be ſqueez'd gently, and lightly preſs'd in the Inflexion or Extenſion of the Joint, ſo as to ſeparate a Quantity of Mucilage proportionate to the Motion of the Part, and the preſent Occaſion, and yet without any Injury.

The Deſign of all theſe Glands is to ſeparate a mucilaginous kind of Liquor that ſerves principally to lubricate the Joints, to make them ſo ſlippery, as to be moved with the greateſt Facility imaginable. It ſerves likewiſe to preſerve the Ends of the Articulated Bones from Attrition, and an immoderate Incaleſcence. But all theſe Things it performs in Conjunction with the medullary Oyl; of which two Ingredients, is made a Compoſition admirably fitted for theſe Ends: For the Mucilage adds to the Lubricity of the Oyl, and the Oyl preſerves the Mucilage from growing too thick and viſcous.

The Doctor obſerves the ſame ſort of Glands to lie between the Muſcles and Tendons, and ſuppoſes that there is the ſame Mixture of an Oyly and Mucilaginous Subſtance; the one being that Fat which is found between the Muſcles, and is ſupply'd by the Adipoſe Glands; the other being ſeparated by the mucilaginous Glandules, of which the common Membrane of the Muſcles is every every where full. This Mixture in the Interſtices of the Muſcles, lubricates them and their Tendons, and preſerves them from ſhrinking, and from growing dry and rigid.

For the Generation of this Mucilage, he ſuppoſes that Nature has deſigned one large *Viſcus*, and that this is the Office of the Spleen; the Glandules of which he makes to have two ſecretory Pores; by one of which ſome Acid, and by the other, ſome Auſtere Particles are ſeparated; which meeting in the ſmall Cavities of the Glandules, they are converted into a Mucilaginous and Gummous Subſtance; he having obſerved, that Spirit of Vitriol mix'd with a Decoction of Galls, will produce a Gum.

After this, he gives an Account of Experiments made with the Mucilage; the moſt of which come to this, That all Acids do coagulate it, as all Auſteres and Auſtere Acids; but with this Difference, that the *Coagulum* or Curd made by Acids only, is tenderer than that which is produced by an Auſtere only, or an Auſtere Acid.

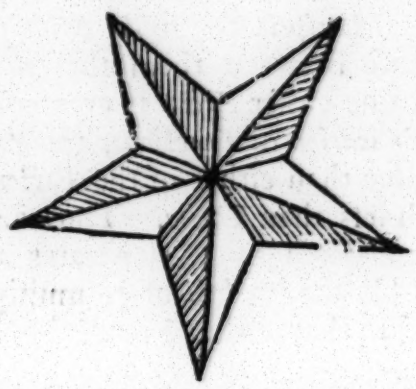
MUCRO *Cordis*, or *Apex*, is the lower pointed End of the Heart.

MUCRONATED, is whatever ends or terminates in a Point, like that of a Sword, &c.

MUCRONATUM *Os*: See *Enſiformis Cartilago*.

MUFFLE, in Chymiſtry, is the Cover of a *Teſt* or *Copper*, which is put over it in the Fire.

MULLET, the Term in Heraldry for a Star of Five Points, of this Figure; and is uſually the Difference or Diſtinguiſhing Mark for the Third Brother, or Houſe.



Though 'tis often alſo born as Coat-Armour; as here:

Ruby on a *Chief Pearl*, Two *Mullets Diamond*; being the Coat of the Famous Lord *Verulam*, firſt Sir *Francis Bacon*. The Heralds ſay, the *Mullet* repreſents a *Falling Star*; 'tis rarely born of Six Points.

MULTA, or *Multura Epiſcopi*, was a Fine given to the King, that the Biſhop might have Power to make his Laſt Will and Teſtament, and to have the Probate of other Mens, and the granting Adminiſtrations

MULTANGULAR *Figure*, is one that has many Sides and Angles.

For its Superficial Content, ſee *Area*.

MULTILATERAL, in Geometry, are thoſe Figures that have more than Four Sides.

MULTINOMIAL *Root*: See *Polynomial*.

MULTIPLE *Proportion*, is when the Antecedent being divided by the Conſequent, the Quotient is more than Unity: And the Reaſon of the Name is, becauſe the Conſequent muſt be multiplied by the Index, or Exponent of the Ratio, to make it equal to the Antecedent. Thus 12 is *multiple* in proportion to 4, becauſe, being divided by 4, the Quotient is 3, which is the Denominator of the Ratio: And the Conſequent 4 being multiplied by 3, makes the Antecedent 12; wherefore 3 is *Sub-multiple* of 12.

MULTIPLE *Super-particular Proportion*, is when one Number or Quantity contains another more than once, and ſuch an Aliquot Part more; of which ſee more under *Proportion*.

MULTIPLE *Super-partient Proportion*, is when one Number or Quantity contains another divers times, and ſome Parts thereof beſides.

MULTIPLICATION, is, in general, the taking or repeating of one Number or Quantity as often as there are ſuppoſed Unites in the other. The Number *multiplied*, is called the *Multiplicand*; the Number *multiplying*, the *Multiplicator*; and that which is found or produced, is called the *Product*.

Multiplication is only a *Compendious Addition*, effecting at once what in the ordinary way of *Addition* would require many Operations: For the *Multiplicand* is only added to it ſelf, or repeated, as often as the Unites of the *Multiplicator* do expreſs. Thus if 6 were to be multiplied by 4, the *Product* is 24, which is the Sum ariſing from the *Addition* of 6 four times to it ſelf.

In all *Multiplication*, as 1 is to the *Multiplicator*, ſo is the *Multiplicand* to the *Product*. Whence 'tis plain, that in *Multiplication* of *Integers*, the *Product* muſt be greater than either of the *Factors*, (for ſo the *Multiplicator* and *Multiplicand* are called, becauſe between them they *make* up the *Product*) becauſe either *Factor* is greater than *Unity*. But in *Multiplication* of *Fractions*, the *Product* muſt be leſs in Value than either of the *Factors*, becauſe they are both leſs than *Unity*. Thus 24, the *Product* of 6, multiplied by 4, is greater than either 6 or 4; but $\frac{12}{20}$, the *Product* of $\frac{3}{4}$, multiplied by $\frac{4}{5}$, is leſs in Value than either $\frac{3}{4}$ or $\frac{4}{5}$.

MULTIPLICATION in *Algebra* or *Species*.

The General Rule is, To conjoin the Quantities propoſed by the Sign (×); which Sign, when the Quantities to be multiplied are expreſs'd by but one or two Letters, is uſually omitted, and the Quantities written down like Letters in a Word. Thus $a\,e$ multiplied by $b\,d$, may be written $a\,e \times b\,d$, or, as is moſt uſual, $a\,e\,b\,d$.

And if the Signs + or —, prefixed before the Quantities to be multiplied, are *like*, the *Product* is +; if *unlike*, the *Product* is —.

N. B. *In* Algebraic Multiplication, *'tis moſt commodious to begin to multiply at the Left-Hand, becauſe we write that way.*

Particular RULES.

I. RULE.

When two or more ſingle Quantities, expreſs'd by Letters, whether like or unlike, are to be multiplied into one another, and have no Numbers prefix'd; join the Quantities together, like Letters in a Word, and 'tis done:

Thus, $\frac{d}{f}$ and $\frac{a\,b}{d\,c}$ and $\frac{m\,n\,o}{p\,q\,r}$

Product $= d\,f \quad a\,b\,d\,c \quad m\,n\,o\,p\,q\,r$

II. RULE.

If two Simple Quantities, whether like or unlike, are to be multiply'd, having Numbers or Co-efficients prefixed before them; firſt multiply the Co-efficients one into another, and to the *Product* annex the Letters of both Quantities; ſo this new Quantity is the *Product* ſought.

Thus 3 *a* multiplied by 4 *b*, produces 12 *a b*.

III. RULE.

The *Multiplication* of Compound Quantities, depends on the preceding Rules: For every Member of the one, muſt be multiplied into every Member of the other; reſpect being had to the Signs, by the Caution given in the General Rule.

Thus, $\begin{matrix} a & d - c \\ g - b & + f \end{matrix}$

$a\,g + g\,d - g\,c - b\,a + b\,c - b\,d \times f\,a + f\,d - f\,c$

IV. RULE.

Sometimes, when Compound Quantities are to be multiplied one by another, it is commodious to omit the Operation, and to ſet only the Word (*into*) or (×) between them; having firſt drawn a Line over each Compound Quantity, to ſhew that every Member of the One is to be multiplied by every Member of the Other.

Thus, To multiply $a\,a\,a + 3\,a\,a - 2\,a\,a + 1$ by $a\,a - 5\,a + 6$,

Write $a\,a\,a + 3\,a\,a - 2\,a\,a + 1$ × or into $a\,a - 5\,a + 6$.

That in *Algebraic Multiplication* Like Signs give +, and Unlike —, in the Product, may be thus demonſtrated:

1. Since *Multiplication* is the ſame thing as adding one *Factor* to it ſelf, or repeating it ſo oft as there are Unites in the other:

2. Therefore, + multiplying +, muſt produce +, ſince Poſitives added, will produce a Poſitive Sum.

3. *A Poſitive multiplying a Negative, muſt produce a Negative*: For 'tis only adding the Negative *Factor* to it ſelf, or repeating it ſo often as there are Unites in the other. Now many Defects added, muſt ſtill be Defects, or muſt have a Negative Sign, thus:

— 6 multiplied by + 2, produces — 12.

4. *Negatives multiplying Poſitives, muſt produce Negatives*: For when the *Multiplicator* is defective, (there being really no Unites in it) it muſt work on the *Multiplicand* by Subtraction; therefore, in this Caſe, the *Multiplicand* muſt be ſubtracted (or made Negative) as often as there are Negative Unites in the *Multiplicator*: But to take away Poſitives, is to add Negatives; therefore the Defect of the *Multiplicand* is to be added or repeated as often as the Caſe requires; and if

it ſo, the Product muſt be Negative (by the laſt) thus:

+6 multiplied by — 2, gives — 12 in the Product.

5. *Negatives multiplying Negatives, muſt produce Poſitives*: For ſince *Multiplication* by a Negative, is the ſame as Subtraction; and ſubtracting a Defect or Negative, the ſame as adding Poſitives, therefore 'tis clear, the Defect of the *Multiplicand* muſt be ſubtracted (that is, the Poſitive *Multiplicand* added) ſo often as there are ſeeming Unites in the *Multiplicator*; which muſt needs produce Poſitive, thus:

— 6 into — 2, produces + 12.

MULTIPLICATION *of* Integers, *in* Common Arithmetick, *is performed thus*:

Suppoſe 365, the Days in a Year, were to be multiplied by 24, the Hours in a Natural Day; write down the *Multiplicator* orderly under the *Multiplicand*, Unites being under Unites, Tens under Tens, *&c.* as you ſee here, and draw a Line under them. Then ſay, 4 times 5 is 20; I ſet down 0, and carry two Tens to the next Rank; therefore 4 times 6 is 24, and 2 I carried is 26: I ſet down 6, and carry 2 (that is 200) to the next Rank. Then I ſay, 4 times 3 is 12, and 2 I carried make 14; (*i. e.* 1400) which 14, becauſe I have now done with the firſt Figure 4, I ſet down as you ſee. Then I begin with 2, the ſecond Figure of the *Multiplicator*, which ſtands in the Place of Tens, and ſay, twice 5 is 10; I ſet down 0 under 6 (which is under 2, the Figure that I multiplied by, for that Rule muſt always be obſerved) and carry 1. Then twice 6 is 12, and 1 I carried is 13; I ſet down 3 on the Left-Hand of the laſt, and carry 1, as before. Laſtly, I ſay, twice 3 is 6, and 1 I carried makes 7; which 7 I ſet down, as you ſee. Then adding the two Products, thus found, together, you will have 8760 for the true Product.

365
24
1460
730
8760

N. B. *When there are Cyphers at the End of either Factor, or after both, multiply the ſignificant Figures one into another, and to the Right Hand affix as many Cyphers as were in both*; v. gr.

466000
4000
1164000000

When Cyphers are intermixed with the ſignificant Figures of the *Multiplicator*, the Operation of them may commodiouſly be omitted, regard being had to the due placing the Figures of the Product, as you ſee in this

Example.

26845
3004
107380
80535
80642380

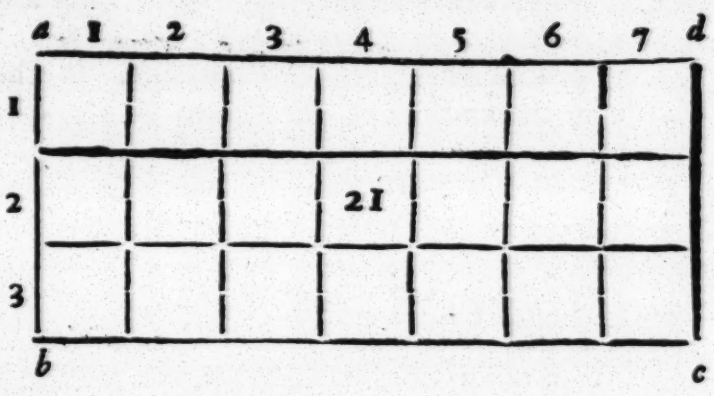
The *Proof of Multiplication* can only certainly be effected by *Diviſion*, the Common Method by caſting out the Nines, being falſe: For if you divide the *Product* by either *Factor*, the *Quotient*, if you have wrought truly, will be the other; for *Diviſion* deſtroys what *Multiplication* builds up. Thus,

If 8760 be divided by 365, it gives 24.

If divided by 24, it gives 365.

MULTIPLICATION *in* Geometry, *or in* Lines,

Is made by ſuppoſing a Right Line, as *a b*, to be moved in a perpendicular Poſture along another, as *b c*; in which Caſe, the Line *a b* is

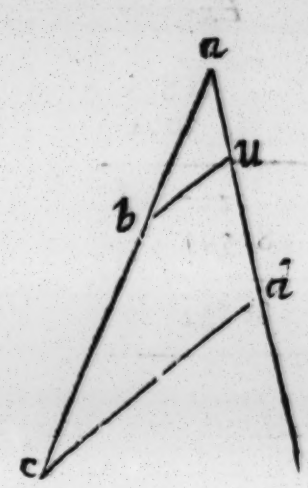


called the *Deſcribent*, and *b c* the *Dirigent*: For by this means the *Deſcribent a b*, will form the Rectangle *a d c b*; and if it be divided, together with the *Dirigent*, into any Number of equal Parts, it will by its Motion deſcribe as many little Rectangles, as the Unites in the *Deſcribent* and *Dirigent* will produce, by being multiplied into one another, *viz.* 21. For when the Line *a b* hath moved over one part of *a d*, it will, by its 3 Parts, have deſcribed the 3 little Rectangles in the firſt Column; when it comes to 2, it will have deſcribed 3 more, *&c.*

And this is the Reaſon why *Multiplication*, in the *Latin* Tongue, is uſually expreſſed by the Word *Ducta*; (and from hence alſo comes *Product*) as if *a b* were multiplied by *b c*; they ſay *a b ducta* in *b c*; becauſe the *Deſcribent* is *led*, as it were, or *carried* along in an erect Poſture upon the *Dirigent*, and by that means deſcribes the Rectangle: So that *Rectangle* and *Product* are all one in *Geometry*.

Since in all *Multiplication*, Unity is to one *Factor*, as the other is to the *Product*; therefore *Multiplication in Lines* may be performed *Geometrically* thus:

Let



Let *a b* be to be multiply'd by *a d*, make any Angle at pleaſure, and then on one of the Legs ſet off *u* = to Unity; and on the ſame Leg ſet off *u d*, the *Multiplicator* (3). Then ſet the *Multiplicand a b* (2) from *a* on the other Leg of the Angle; draw *u b*, and parallel to it, through *d*, draw *d c*. I ſay, *d c*, or 6, is the *Product*: For *a u* : *u d* :: *a b* : *b c*.

MULTIPLICATION of *Decimal Fractions*: See *Decimal*.

MULTIPLICATION of *Fractions*. See in *Fractions*.

MULTIPLICATION of *Logarithms*. See *Logarithms*, N. 6.

MULTIPLICATION by *Logarithms*. See *Logarithms*, N. 8.

MULTIPLICAND, in Arithmetick, is the Number to be *multiplied*. See more in *Multiplication*.

MULTIPLICATOR, in Arithmetick, is the Number by which you *multiply*, or the Number *multiplying*.

MULTIPLIER, the ſame with *Multiplicator*.

A MULTO *fortiori*, or *à Minori ad majus*, is an Argument often uſed by *Littleton*, and is fram'd thus: If it be ſo in a Feoffment paſſing a New Right, much more is it for the Reſtitution of an Ancient Right, *&c.*

MUNIMENTS, among the Lawyers, are taken for ſuch Authentick Deeds and Writings, as a Man can defend the Title to his Land or Eſtate by.

MURAGE, in Law, ſignifies a Toll or Tribute to be levied for building or repairing of Publick Walls; and is due either by Grant or Preſcription. It ſeems alſo to be a Liberty granted to a Town by the King, for the Collecting Money towards the Walling of the ſame.

MURDER, according to our Law, is a Wilful and Felonious Killing of another upon prepenſed Malice, whether ſecretly or openly, and whether *Engliſhman* or *Foreigner*, living under the King's Protection. And this prepenſed Malice is Twofold: 1. *Expreſs*, When it may be evidently proved that there was Ill-will; 2. *Implied*, When one killeth another ſuddenly, having nothing to defend himſelf, as going over a Stile, or ſuch like: For in ſuch a Caſe, or when a Man killeth a meer Stranger, the Law preſumeth that he had Malice againſt him, or elſe he would not do it without any manner of Provocation.

MURDERERS, are ſmall Pieces of Ordnance, either of Braſs or Iron, having *Chambers* (that is, Charges made of Braſs or Iron) put in at their Breeches: They are moſtly uſed at Sea, at the Bulk-heads of the Fore-caſtle, Half-deck, or Steerage, in order to clear the Decks when an Enemy boards the Ship; they are faſtned and traverſed by a Pintle, which is put into a Stock.

MUSCLE, the chief Inſtrument of Voluntary Motion in an Animal Body. The Parts of a *Muſcle* are Three; its *Head*, *Belly*, and *Tail*. The *Head* of a *Muſcle* is its Beginning, and, as it were, the Centre of its Motion; and this is always fixed to the moſt ſtable Part. The *Belly* of a *Muſcle* is its Middle Part, which is tumid, or extended, in all muſcular Motion. The *Tail* is the other End or Extreme, which is faſtned into the Part to be moved.

Muſcular Motion, or which way the Belly of a *Muſcle* comes to be ſwelled, and conſequently its Extremes brought nearer together, in order to move the Part required, is a very great Myſtery; as indeed many other Things are in an Human Body, which is *fearfully and wonderfully made*. There have been many *Hypotheſes* to ſolve this, which whether ſatisfactory or not, muſt be left to every one's Judgment to determine.

Dr. *Willis* ſuppoſes the Animal Spirits, brought by the Nerves, to be lodged in the *Tendons* of the *Muſcles*, and that meeting with other active Particles brought from the Blood, they make an *Effervеſcence*; by which the *Carnous Fibres* of the *Muſcle* are agitated, ſtuffed and ſwelled, and ſo the whole *Muſcle* is contracted in its Length.

Steno imagines the *carnous Fibres* of the *Muſcles*, as alſo the oppoſite *Tendons*, to be in their Conſtructure like to *Parallelograms*; by an Alteration of the Angles of which, the *Muſcle* is contracted, and the Head and Tail brought near together: And this he thinks may be done without the Acceſſion of any New Matter.

Dr. *Mayo* falls nearly in with Dr. *Willis* his Notion: He thinks the Contraction of the *Muſcle* is made by an *Effervеſcence*, ariſing from the Mixture of the *Sulphurous Saline* Particles of the Blood, with the *Nitro-aerious* ones brought by the Nerves, which blow up and diſtend the Belly of the *Muſcle*.

M. *Du Verney* fanſies this Intumeſcence may be made without *Fermentation*, by the Animal Spirits, and a Juice from the Arteries, running into the Tendons and carnous Fibres, and ſo extending themſelves, as Ropes and Cats-gut Strings ſwell in moiſt Weather.

Dr. *Croon* ſuppoſes every carnous Fibre to be made up of ſmall Globules or Bladders, all opening one into another, into which the *nutritious Juice*, and one or two other fine and active Liquors, entring, do, by means of the natural Heat, make an Ebullition or Effervеſcence; by which means the whole Body of the *Muſcle* becomes extended, and its Length contracted, *&c.*

Borelli takes the Fibres of a *Muſcle* to conſiſt of a Chain of divers *Rhombs* or *Lozenges*, whoſe *Areas* are capable of being inlarged or contracted, according as the nervous Juice, together with the *Lympha* and Blood, are let and forced into or out of them, *ad Imperium Animæ*.

The accurate Mr. *Cowper* ſeems to think the Blood to be the true *Pondus*, by which the *Action* of a *Muſcle* is compoſed: and that either by a Turgeſcence begun in the *Parietes* of the Cells of the Fleſhy Fibres, cauſed by the Liquor contained in the Nerves, agitated *ad Imperium Animæ*; or by the Conſtruction of the *Venous Ducts*, there becomes

comes a Repletion of their Cells, whereby the Length of the *Fibrillæ* is contracted.

Dr. *Chirac*, Profeſſor of Medicine at *Montpellier*, ſuppoſes, and thinks he can prove it analytically, That every Muſcle being compoſed of a vaſt Multitude of Fibres, like Threads, folded up all together within one Skin or Membrane, and every Fibre having its proper Vein, Artery, and Nerve, it hath alſo from Space to Space ſeveral little Cavities or Pores which are of an oblong Form, when the Muſcle is ſlack or flaccid; but the Blood circulating through the Muſcle, is continually deſpoſing into thoſe Pores a Sulphurous Recrement, abounding with *Alkali* Salts, which meeting with the Spirits that flow alſo by the Nerves into thoſe oval Pores, their *Nitro-aerial* Particles ferment in a moſt violent manner with the Saline ones of this Sulphurous Recrement, and thereby diſtend the Pores ſo, as to make them change their long oval Figure into a round one; and thus the Muſcle muſt be contracted.

MUSCLE *Vein*. This Vein is Two-fold, the *Superior* and the *Inferior*. The former ariſes from the Muſcles of the Neck, and the latter from the upper Muſcles of the Breaſt; and this ſometimes opens into the External Jugular.

MUSCULUS *Stapidis*, is a Muſcle of the Ear, which lies hid in a Bony Pipe, excavated in the *Os Petroſum*, almoſt at the bottom of the *Tympanum*, whence it takes its Origin. Its Belly is big and fleſhy, and ſuddenly forming a very thin Tendon, which deſcends to its Inſertion at the Head of the *Stapes*: When this acts, it draws the *Stapes* upwards, to the *Foramen Ovale*.

MUSCULUS *Nauticus*. See *Tibialis Poſticus*.

MUSICK is one of the Seven Sciences, commonly called *Liberal*, and comprehended alſo among the *Mathematical*; as having for its Object *Diſcrete Quantity* or *Number*, but not conſidering it in the Abſtract, like *Arithmetick*; but with relation to *Time* and *Sound*, in order to make a delightful Harmony.

This Science is alſo *Theorical*, which examineth the Nature and Properties of Concords and Diſcords, explaining the Proportions between them by Numbers: And *Practical*, which teacheth not only Compoſition, that is to ſay, the manner of Compoſing all ſorts of Tunes or Airs; but alſo the Art of ſinging with the Voice, or playing upon Muſical Inſtruments. See Vol. 2.

MUSKET-*Baskets*, in Fortification, are Baskets of about a Foot and half high, and 8 or 10 Inches Diameter at the Bottom, and a full Foot at the top: They are filled with Earth, and are ſet on low Parapets or Breaſt-works, or on ſuch as are beaten down, that the Muſqueteers may fire between them at the Enemy, and yet be tolerably well ſecured againſt their Fire.

MUTE. (A Term in Law) A Priſoner is ſaid to ſtand *Mute*, when he refuſes to plead to an Indictment.

MUTULE, in Architecture, is a kind of Square *Modillon*, ſet under the Cornice of the *Dorick* Order, and ſo called from the Word *Mutilus*, Maim'd, or Imperfect, becauſe they repreſent the ends of the Rafters which are crooked or bent; in like manner, as the Beams, or Joints are repreſented by the *Triglyphs* in the *Frize* of the ſame *Order*.

MYDRIASIS, is a too great Dilatation of the *Pupil* of the Eye, which makes the Sight Dim, becauſe too much Light is then admitted into the Eye.

MYELOS, the Marrow of the Bones, or of the Brain, or Spinal Marrow.

MYGLOSSUM, is a pair of Muſcles which ariſe about the backſide of the Grinding Teeth, and are inſerted into the Ligament of the Tongue, and are ſaid to turn the Tongue upwards. *Blanchard*.

Theſe from their Uſe, I ſuppoſe are the ſame which our Mr. *Cowper* calls *Styloglosſus*, a Muſcle, which ariſing ſharp and fleſhy from the *Proceſſus Styloides*, deſcends obliquely forward, and is inſerted to the Root of the Tongue immediately below the Implantation of the *Ceratogloſſus*: This puts the Tongue inward, and turns it upwards.

MYLOHOIDEUS, is a Muſcle which *Fallopius* makes double, but Mr. *Cowper* thinks it a ſingle one, not being to be divided without great Violence: It poſſeſſes all that Space which is between the Lower Jaw, and the *Os Hyoides*; ariſing fleſhy from both ſides of the *Mandible* Internally, near the *Dentes Molares*; whence marching with a double Order of fleſhy Fibres, the outwardmoſt of which paſs directly to their Implantation in the *Os Hyoides*; and the middle run Tranſverſely over the following Muſcles, being inſeparably joined to each other with a middle Line, as is well expreſt by *Bidloo*, (*Tab.* 14) Beſides the Uſes commonly aſcribed to this Muſcle in moving the *Os Hyoides*, Tongue, and *Larynx*, upwards, and forwards, and to either ſide; its laſt deſcribed Tranſverſe Order of Fibres, have ſtill a further uſe in Compreſſing the *Glandulæ Sublinguales*, which lie immediately under them on each ſide; whereby they haſten the Egreſs of the Spittle, from the Inferior Salival Ducts in the Mouth. Hence it is we imploy theſe Muſcles (as in the Action of *Deglutition*) when we want *Saliva* to moiſten the Mouth: And in that Action alſo they ſupply it with freſh *Saliva*, to join with thoſe Aliments where Maſtication is not required; which Artifice of Nature deſerves our Admiration. *Cowper*.

MYLPHA, according to ſome, the falling off of the Hairs of the Eye-lids; and with others Medicines againſt the falling off of the Hair. *Blanchard*.

MYOCEPHALON, is the falling off of a ſmall Portion of the *Tunica Uvea*, juſt begun, like the Head of a Fly; whence it has its Name. *Blanchard*.

MYODES *Platyſma*, is a broad Muſculous Expanſion in the Neck, proceeding there from a ſort of a fat Membrane. *Blanchard*.

MYOLOGIA is a Deſcription of the Muſcles of an Animal Body.

MYOPIA, *Purblindneſs*, is a certain Dimneſs or Confuſion of Sight in diſtant Objects, and yet a Perſpicacity in things near at hand: It is occaſioned by the Globe of the Eye's being too Convex, ſo as to unite the Rays before they come to the *Retina*: Wherefore ſince the *Diſtinct Baſe* falls not on the *Retina*, but perhaps in the *Vitreous Humour*, the Viſion in ſuch an Eye cannot be diſtinct, unleſs of Objects very near. But all ſuch Perſons may be helped by *Concave* Glaſſes, or Spectacles.

MYRACH, an *Arabian* Word, ſignifying the ſame with *Epigaſtrium*.

MYRINX, the ſame with *Tympanum*, or the Drum of the Ear.

MYRMECIA, is a ſort of Wart; they are harder and lower than thoſe fleſhy Tumours called *Thymi*, take deeper Root, and occaſion greater Pain; broad below, and ſmall at top, and emit leſs Blood. They are ſcarce ever bigger than a ſort of Pulſe called *Lupines*: They breed in the Palms of the Hand, or the Sole of the Foot. *Blanchard.*

NAAM in Common Law, ſignifies a Diſtreſs, or the taking another Man's Goods, and is either *Lawful*, or *Unlawful*; *Lawful Naam*, is a reaſonable Diſtreſs, proportionable to the Value of the thing Diſtrained for.

NADIR, is that Point of the Heavens ſeemingly under the Earth, which is Diametrically oppoſite to the Point directly over our Head, *viz.* the *Zenith*; ſo that they are both as it were the Poles of the Horizon, and diſtant from it on each ſide 90 Degrees, and conſequently fall upon the *Meridian*, one above, the other under the Earth; and whatever Diſtance one of them has from the Equator, and one of the Poles of the World; the ſame on the contrary, has the other from the oppoſite Pole, and adverſe part of the Equator.

NAIANT, or *Natant*, (*i. e.* Swimming) is the proper Term in Heraldry, to Blazon *Fiſhes* in an Eſcutcheon, when they are drawn in an Horizontal Poſture, *Feſs-wiſe*, or Tranſverſly acroſs the Eſcutcheon; but if they are Erect, 'tis called *Hauriant*.

NAILING *of Cannon*, is the driving of a Nail, or Iron Spike, by force into the Touch-hole of a Piece of Artillery, ſo as to render it uſeleſs to the Enemy.

NAISSANT, *i. e. Naſcent*, juſt new Born; the Herald's Term for a Lyon, or other Beaſt, appearing to be iſſuing or coming out of the *middle* of any *Feſſe*, or other Ordinary; for if it come out from the lower Line of the Ordinary, they call it *Iſſuant*.

NAKED *Fire*, a Term uſed by the Chymiſts, for an open Fire, or one not pent or cloſed up.

NAPIER's Bones. See *Neper's*.

NARCOSIS, is a privation of Senſe, as in a Palſie, &c. or in taking of *Opium*, &c. whence ſtrong Opiate Medicines are frequently called.

NARCOTICKS, or Narcotick Medicines.

NASALIA, the ſame that *Errhina*.

NASCALIA, are little Globular Bodies which on ſome Occaſions, are put into the Neck of the Matrix; they are made of the ſame Subſtance as the *Peſſaria*. See *Peſſaria*.

NASI *Os*, is a thin but ſolid Bone, which makes the upper part of the Noſe; it's upper end is join'd to the *Os Frontis* by the *Sutura Tranſverſalis*: One of its Sides joins its fellow, and its lower is joined to the *Os Maxillare*, upon its lower end the Cartilages of the Noſtrils are faſtned; externally it is ſmooth, but internally it is rough.

NATES *Cerebri*, are two round Prominences in the Brain, behind the Beds of the Optick Nerves, which grow to the upper part of the marrowy Subſtance; they are ſmall in Men, and larger in Brutes.

NATTA, is a great ſoft Tumor, with Pain and Colour, which grows moſt uſually in the Back, but ſometimes in the Shoulders; its Root is ſlender, yet it encreaſes ſo prodigiouſly, that it will grow as big as a Melon, or a Gourd; it is made of fat Matter, and therefore ought to be reckoned amongſt the *Steatomata*. See *Steatomata*. *Blanchard.*

NATURE: This Word has uſually theſe Significations.

Firſt, and more ſtrictly, it is taken for a peculiar Diſpoſition of *Parts* in ſome particular *Body*; as we ſay, it is the *Nature* of *Fiſhes* to live in the *Water*.

Secondly, It is taken more largely for the Univerſal Diſpoſition of all *Bodies*: And in this Senſe 'tis nothing elſe, but *the Divine Providence*; foraſmuch as it governs and directs all things by certain *Rules* and *Laws*, accommodated to the *Natures* of things.

Thirdly, It is taken for the *Eſſence* of any thing, not *Corporeal*, with the *Attributes* belonging to it: Thus we ſay, That it is the *Nature* of *God* to be *Good*, and the *Nature* of the *Soul* to *Think*.

NATURALIZATION, is when an *Alien* born Subject, is made the King's *Natural*; and this muſt be done by Act of Parliament. *Vide Denizons*.

NATURAL *Day*. See *Day*.

NATURAL *Horizon*, the ſame with *Senſible Horizon*. See *Horizon*.

NATURAL *Quantity*. See *Quantity*.

NATURAL *Philoſophy*, is the ſame with what is uſually call'd *Phyſicks*, *viz.* That Science which contemplates the Powers of Nature, the Properties of Natural Bodies, and their mutual Action one upon another.

NAVICULARE *Os*, called alſo *Cymbiforme*, is the third Bone in each Foot, in that Part of it which immediately ſucceeds the Leg.

NAVIGATION, is the Art of *Sailing*, whereby the Mariner is inſtructed how to guide a *Ship* from one Port to another, the ſhorteſt and ſafeſt way, and in the ſhorteſt Time: And this is twofold; either

Improper, Which is called Coaſting, in which the Places are at no great diſtance one from another, and the Ship ſails uſually in ſight of Land, and is within Soundings. Now for the Performance of this, there is required a good Knowledge of the Lands, the Uſe of the Compaſs, the Lead, or Sounding-Line, and ſuch Books as *Rutters*, &c.

Navigation Proper, is where the Voyage is perform'd in the vaſt Ocean, out of ſight of all Land; and here is neceſſary not only the Knowledge of the *Lead*, *Compaſs*, &c. but the Maſter muſt be a thro' *Sailor* or *Artiſt*, and underſtand well *Mercator's Charts*, *Azimuth* and *Amplitude Compaſs*, *Log-Line*,

Log-Line, and all good Inſtruments for *Celeſtial Obſervations* that can be uſed at *Sea*. And how to perform the ſeveral Parts and Caſes of this Art, you will find under the Word *Plain*, and *Mercator's Sailing*.

NAUSEOUSNESS, or *Nauſea*, Loathing, is an earneſt Endeavour to Vomit, with Sickneſs and Uneaſineſs.

NAUTICAL *Chart*. See *Chart*.

NAUTICAL *Compaſs*. See *Compaſs*.

NAUTICAL *Planiſphere*, is a Deſcription of the Terreſtrial Globe upon a Plane, for the Uſe of Mariners; and is either,

1. The *Plane Chart*, as they call it, where the *Parallels of Latitude* are all of the ſame Length with the *Meridians*; and which therefore is very erroneous, except in ſhort Voyages, and near the Equator: Or,

2. *Wright's*, commonly called *Mercator's Chart*, where the Meridians are increaſed in Proportion, as the Parallels ſhorten: That is, as the Secants of the Arks contained between the Point of Latitude, and the Equator.

NE *Admittas*, is a Writ directed to the Biſhop, at the Suit of one who is Patron of any Church, and he doubts that the Biſhop will Collate one his Clerk, or admit another Clerk preſented by another Man to the ſame Benefice: Then he that doubts it, ſhall have this Writ, to forbid the Biſhop to Collate or Admit any to that Church.

NEBULOSE, a Term in Heraldry, when the out-Line of any Bordure, Ordinary, &c. is of this Form, *i. e.* reſembling ſomething of the Figure of Clouds.

NEBULOUS *Stars*, are certain fixed Stars of a dull, pale, and obſcuriſh Light.

NECROSIS, is a black and blue Mark in any part of the Body.

NEEDLE. See *Box* and *Needle*.

NEGATIVE *Pregnant*, is when an Action, Information, or ſuch like, is brought againſt one, and the Defendant Pleads in Bar of the Action; or otherwiſe a *Negative Plea*, which is not ſo ſpecial an Anſwer to the Action, but that it includes alſo an Affirmative: As if a Man being impleaded to have done a thing on ſuch a Day, or in ſuch a Place, denieth that he did it *Modo & forma declamata*; which implieth nevertheleſs, That in ſome ſort he did it: Or, if a Man be ſaid to have alienated Land in Fee, and he ſaith, he hath not alienated in Fee, this is *Negative Pregnant*; for tho' it be true, that he hath not alienated in Fee, yet it may be, he hath made an Eſtate in Taile.

NEGATIVE Quantities in *Algebra*, are ſuch as have before them the

NEGATIVE *Sign* ——, and which are ſuppoſed to be leſs than nothing. Theſe are directly contrary to Poſitive, Affirmative, or Real Quantities.

NE *injuſte vexes*, is a Writ which lies for a Tenant that is Diſtrained by his Lord for other Services than he ought to make, and is a Prohibition to the Lord in it ſelf, commanding him not to Diſtrain.

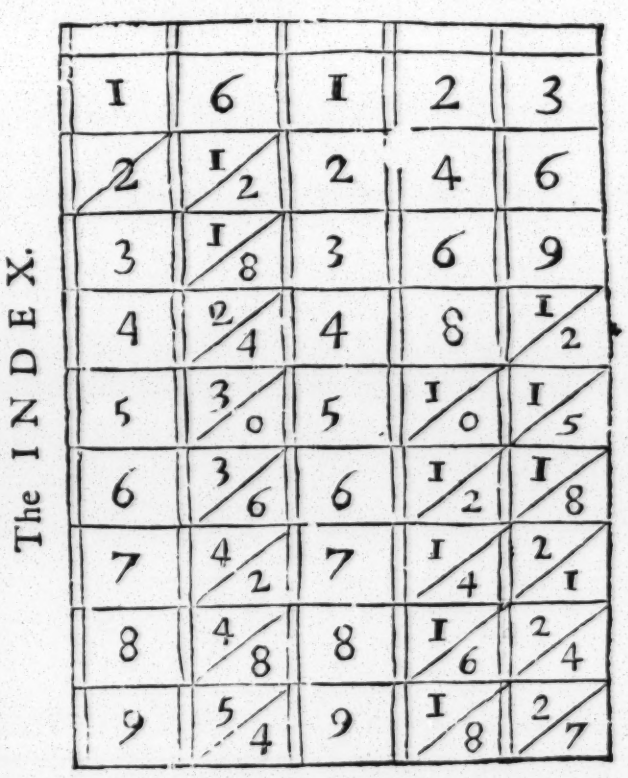
NEIPE TIDES, written alſo *Nepe* or *Neep* are thoſe Tides (when the Moon is in the middle of the ſecond and laſt Quarter) which are oppoſite to the *Spring-Tides*; and as the higheſt of the *Spring-Tides* is three Days after the Full or Change, ſo the loweſt of the *Neep* is four Days before the Full or Change; and then the Seamen ſay, that it is *Deep Neep*: Alſo when a Ship wants Water, ſo that ſhe cannot get out of a Harbour, off from the Ground, or out of the Dock, the Seamen ſay ſhe is *Neiped*.

NEOMENIUM, ſignifies only the *New Moon*, or *Change*.

NEPER's *Bones, or Rods*, are a kind of larger Multiplication Table, contrived by that Excellent Mathematician my Lord *Neper*, Baron of *Merchiſton* in *Scotland*, for the more eaſie multiplying, dividing, and extracting of Roots out of great Numbers.

Their Fabrick is very eaſie, as well as their Uſe: Both which follow.

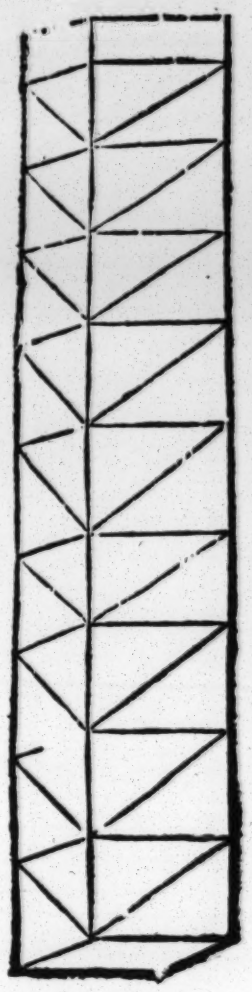
The Rods are beſt made of Wood or Ivory, four Square, having all the Digits on them, and their Multiplication to 9; being only *Pythagoras's* Table cut into pieces; they have an Index prefixed, ſhewing the Value of the Multiples to 9. The Complement. *viz.* Remainder to 9, is on the backſide of each Bone, the other Sides being diſpoſed in the moſt convenient form, the Figures repreſented being ſet on the Ends: But they are ſo common, and ſo well known, that there needs no further Deſcription of them.



Having any given Number to Tabulate, or to be laid down by the Rods: As ſuppoſe 6123.

From your Set of Rods, take as many of them as you have Numbers in your Figures, as here 4 Rods, having at the top of them the given Figures, which ſet in their reſpective Order as above; and the Product of the whole given Number into any of the Digits, you have right againſt that Digit, as the Index directs, taking the Sum of every Diagonal Square, and ſetting them down from the Right to the Left.

To Multiply by the Rods.


A Single ROD.

Set your Multiplicand down, or Tabulate it on the Rods, and take every ſeveral Product anſwering the Figures of your Multiplier; which, all added together, gives the Product: As if 6123 was to be multiplied by 356, having Tabulated the Multiplicand, (as you ſee above) the ſeveral Products thereof into each Figure of the Multiplier, you are directed to by the Index: Which being added together, (reſpect being had to the due placing, their Sum) is 2179788, which is the Product of 6123 by 356.

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  6123
   356
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 36738
 30615
 18369
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2179788
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Diviſion by Neper's *Bones.*

Tabulate your Diviſor, then you have it multiplied by all the Digits; out of which you may chooſe ſuch convenient Diviſors as will be next leſs to the Figures in the Dividend, and ſubſcribe the Index anſwering in the Quotient; and ſo continually, till the Work is done. Thus 2179788, divided by 6123, gives in the Quotient 356.

Having Tabulated the Diviſor 6123, then I ſee that 6123 cannot be had in 2179; therefore I take five Places, and on the Rods find a Number that is equal or next leſs to 21797, which is 18369, that is three times the Diviſor: I ſet 3 in the Quotient, and ſubtract 18369 from the Figures above, there reſts 3428; to which I add 8, the next Figure of the Dividend, and ſeek again on the Rods for it, or the next leſs, which I find to be 5 times; I ſet 5 in the Quotient, and ſubſtract 30615 from 34288, reſts 3673; to which I add 8, the laſt Figure in the Dividend, and finding it to be 6 times the Diviſor, ſet 6 in the Quotient.

```
6123 ) 2179788 ( 356
       ...
  18369
 -------
  34288
  30615
 -------
  36738
  36738
 -------
  00000
```

Of the Extraction of Roots by the Rods.

For the Eaſie and Expeditious Performance of which, there are two Rods on Purpoſe; one for the Square, and another for the Cube.

To Extract the Square Root.

As, ſuppoſe that of 571536.

Firſt, Point each other Figure, beginning with the laſt.

```
    . . .
571536 ( 756
  49
 ---
145) 815
     725
 ----
1506) 9036
      9036
 ----
 0000
```

2. Take the *Rod*, called the *Square Rod*, and ſet it to the Index, and ſeek for the Figures of the firſt Prick (57,) finding 49 the neareſt, ſet 7 in the Quotient, and ſubtract 49 from 57, there reſts 8.

3. To the Remainder (8) add the next two Figures to the next Prick (15) makes 815.

4. Double the Quotient 7, *viz.* 14, which Tabulate between the Index and the Square Rod each time after the Work; ſeek then upon the Rods for the next leſs or equal Number to the Figures 815, which I find to be 725, that is five times; ſet 5 in the Quotient, and after the Diviſor; then multiply and ſubſtract, and to the Remainder add the two Places to the next Point 36.

5. Double the Quotient 75, which is 150; this ſet betwixt the Index and the Square Rod, and work as before, you'll find the Root to be 756.

If your Root be not perfect, but ſomething remains after the laſt Subtraction, add a Cypher to the Square, and proceed.

To Extract the Cube Root by the Rods.

```
     . . .
91733851 (451
  64
 ---
 48) 27733
     24125
      300
 ----
6075)  608851
       607501
          135
 ----
  608851
```

1. Point

1. Point every third Figure from the laſt, ſet the Cube Rod to the Index; ſeek the next leſs Cube on the Rod, which in the foregoing Example is 64, that is 4 times; ſet 4 in the Quote, and ſubſtract, reſt 27; to which add the three Figures to the next Point, the Sum is 27733.

2. Square the Figure found in the Quotient, and triple that Square, (and this muſt be done each time for a Diviſor) which ſet betwixt the Index and the Cube Rod: Thus here the 4 in the Quote, ſquar'd, gives 16; then tripled is 48, which ſet between the Index and the Cube Rod for a Diviſor.

3. Seek a Quotient (5) which ſet down, and the Number anſwering 24125 place as in the Example; but before you ſubtract, you muſt triple the Quote 4, which is 12, and multiply it by the Square of the laſt Figure 5. *viz.* 25; now 25 by 12 = 300, which place under 24125, one place forward to the Left Hand, and ſubſtract, there reſts 608. This Work muſt be repeated for each Figure in the Quotient, *viz.* to 608 and 851 for a Reſolvend; ſquare 45, and triple that Square, it gives 6075 for a new Diviſor, which placed next before the Cube Rod, ſhews it will be but 1 for the Quotient, which anſwers to 607501, which ſet down; and tripling 45, and multiplying it by 1, makes 135: This ſet one ſhort, their Sum will be 608851; ſo that after Subſtraction nothing remains. But if there remains any thing, add three Cyphers to it, for every Decimal Place you would have in the Root, and proceed as before.

NEPHELÆ, are ſmall White Spots upon the Eyes; alſo little Clouds, as it were, that ſwim in the middle of the Urine; likewiſe little white Spots in the Surface of the Nails like little Clouds.

NEPHRITICKS, are Medicines againſt the Diſeaſes of the Reins.

NEPHRITIS, is a Pain in the Reins, proceeding either from an ill Diſpoſition, or an Inflammation, or from the Stone and Gravel, accompanied with Vomiting and Stretching of the Thigh. *Blanchard.*

NEPHROS, is a Kidney, one on each ſide of the *Abdomen*, placed about the Loins under the Liver and Spleen; it is ſhaped like a Kidney-Bean: Its Subſtance is made up of a great Company of little Pipes. On both ſides it receives the *Serum* from the Glandules which border upon the Arteries, and carries it to the little Bodies in the Reins called *Carunculæ Papillares*, (which ſee) that ſo it may be diſcharged by the *Pelvis*, the *Ureters*, the *Bladder*, &c. See *Renes.*

NERVE, is an Organical Similar Part of an Human Body, being alſo of a fibrous round, long, white porous Subſtance, and whoſe Uſe is to convey the Animal Spirits ſo, as to make the Parts of the Body moveable and ſenſible.

The Nerves are ſuppoſed to contain a Threefold Subſtance; the Innermoſt of which is white and medullary, and is thought to proceed from the *Medulla Cerebri*; the other two are ſuppoſed to ariſe from the *Meninges* of the Brain: Of which the middle and ſofter comes from the *Pia mater*, and the outer and harder from the *Dura mater.*

All the Nerves take their Riſe from the *Medulla oblongata cerebri*, either within the Skull, or from its Continuation, when it becomes the *Medulla ſpinalis. Diemerbroeck* reckons 39 *Pairs* or *Conjugations of Nerves*, beſides the *Nervus ſine pari*; and he reckons that Nine Pair of theſe ariſe within the Skull, and the other 30 he ſaith come from the *Medulla ſpinalis*, through the Perforations of the *Vertebræ*; which he ſubdivides into the Eight *Cervical Pairs*, the Twelve *Thoracical*, the Five that come from the Region of the Loins, and the other Five which come from the *Os ſacrum*; to which the *Nervus ſine pari* is to be added, which ariſes from the End of the Spinal Marrow, and which ſome have taken for a kind of Ligament.

The Nerves do ordinarily accompany the Arteries thro' all the Body, that by the Pulſe of the Arteries, the Animal Spirits may be kept warm and moving.

The Nerves have alſo Blood-Veſſels attending them, which are ſpread uſually on their Coats; and do alſo ſometimes run in among the Medullary Fibres, as may be ſeen in thoſe of the *Retina.*

Where-ever a Nerve ſends out a Branch, or receives one from another, there is commonly a *Ganglio* or *Plexus*, as you may ſee at the Origin of all the Nerves in the *Medulla ſpinalis*, and in many Places of the Body.

NERVUS, in Botanicks, ſignifies a long Filament or rigid String, which runs a-croſs or length ways in the Leaf of a Plant. And thus, becauſe there are Five ſuch Nerves or Filaments running long ways in the Leaves of one kind of *Plantane*, that Plant hath been called *Quinque nerva.*

NETTINGS, in a Ship, are a ſort of Grate made with ſmall Ropes, and ſeized together with Rope-yarn; and are laid in the Waſt of a Ship ſometimes, to ſerve inſtead of *Gratings.*

NEURODES, is a ſort of lingering Fever, ſo called by the Learned Dr. *Willis*; becauſe that the Nervous Juice, departing from its own right and natural Craſis, becomes the Occaſion of an *Atrophy.*

NEUROLOGY, is an accurate Deſcription of, or Diſcourſe on, the Nerves of an Human Body.

NEUROTICKS, are Remedies againſt the Diſeaſes of the Nerves.

NEUROTOMY, is an Anatomical Section of the Nerves, for the Benefit of the Patient; and ſometimes alſo a pricking of the Nerves by unskilful Bleeding, &c.

NEUTRAL. Mr. *Boyle* calls ſome kind of Spirits which he could diſtil from Tartar, and ſome ponderous Woods, by this Name of *Neutral Spirits*, as alſo *Adiaphorous* and *Anonymous*; becauſe he found them very different in Quality and Nature from either the *Acid*, *Vinous*, or *Urinous* Spirits. For the Way of making it, ſee *Adiaphorous.*

NICHE, in Architecture, is a Cavity left deſignedly in the Wall of a Building, to place a Statue in.

NICTITANS *Membrana*, is a thin Purpliſh or Reddiſh Membrane or Film, which ſeveral Beaſts and Birds have to cover or ſhield their Eyes from Duſt, &c. they can draw it over their Eyes at pleaſure, and 'tis ſo very much thinner

than the Eye-lid, that they can ſee pretty well thro' it.

NIENT *compriſe*, is an Exception taken to a Petition, as unjuſt, becauſe the thing deſired is not contained in that Act or Deed, whereon the Petition is grounded. For Example, One deſireth of the Court to be put into Poſſeſſion of a Houſe, formerly amongſt other Lands, *&c.* adjudged unto him: The adverſe Party pleadeth, That this Petition is not to be granted, becauſe tho' he had a Judgment for certain Lands and Houſes, yet the Houſe, into the Poſſeſſion whereof he deſireth to be put, is not contained amongſt thoſe for which he had Judgment.

NIHIL, or *Nichil*, is a Word which the Sheriff anſwers, that is oppoſed concerning Debts illeviable, and that are nothing worth, by reaſon of the inſufficiency of the Parties from whom they are due.

NIHIL *dicit*, is a failing to put in Anſwer to the Plea of the Plaintiff by the Day aſſigned, which if a Man omit, Judgment paſſeth againſt him of Courſe by *Nihil dicit*; that is, becauſe he ſays nothing in his own Defence, why it ſhould not.

Nihil capiat per Breve, is the Judgment given againſt the Plantiff, either in Bar of his Action, or in Abatement of his Writ.

Nihil capiat per Billam, the ſame with *Nihil capiat per Breve*.

NIPPERS, are ſmall Ropes in a Ship about a Fathom or two long, with a little Truck at one End, and ſometimes only a Wale-knot; their Uſe is to help *hold off* the Cable from the Main or Jeer Capſtan, when the Cable is ſo ſlimy, ſo wet, or ſo great, that they cannot ſtrain it to *hold it off* with their bare Hands.

NISI *Prius*, is a Writ Judicial, which lieth in Caſe, where the Jury is Impannell'd, and return'd before the Juſtices, the one Party or the other requeſting to have this Writ for the eaſe of the Country, whereby the Sheriff is willed to cauſe the Inqueſt to come before the Juſtices in the ſame County at their coming; and it is called a Writ of the *Niſi prius*, of theſe two Words, whereby the Sheriff is commanded to bring to *Weſtminſter* the Men Impannell'd at a certain Day, or before the Juſtices of the next Aſſizes, *Niſi die Lunæ apud talem locum* prius *venerint*, &c.

NITRE, the ſame with Salt Petre. Some are mighty fond of the Notion of a *Volatile Nitre*, which abounds in the Air; and they attribute abundance of *Phænomena* to the Operation of the Nitrous Particles in the Air.

That the Air abounds with Saline Particles, is moſt certain; for being filled continually with *Effluvia* from the Earth and Sea, it muſt needs have from both a great Quantity of Saline Corpuſcles; and theſe will be of different Kinds according to the Variety of thoſe Salts from whence they are derived. But why theſe ſhould be moſtly ſuppoſed of a *Nitrous Nature*, is not ſo eaſie to prove; for Salt Petre is by no means found in a greater Quantity than the other Salts (eſpecially common Salt; nor is it of a much more Volatile Nature than they, nor capable of being raiſed more eaſily, or by a leſſer heat. But ſince Soot, and that which produces it, Smoak, is found to abound very much with a truly Volatile Salt; and ſince ſuch a kind of Salt is produced frequently by the Putrefaction of Animal and Vegetable Bodies, there is good reaſon to ſuppoſe the Air may abound with Salts of this kind: As alſo with many decompounded ones, of very different Kinds and Natures, and to which no proper name can well be aſſigned; and therefore they have been called *Anonymous*, by Mr. *Boyle*, and many others.

NOCTAMBULO, or *Noctambulus*, is one who walks in his Sleep.

NOCTURNAL, is an Inſtrument made of Box, Ivory or Braſs, divided on both ſides, to take the Altitude or Depreſſion of the Pole-Star, in reſpect to the Pole it ſelf, in order to find the Latitude and nearly the Hour of the Night.

NOCTURNAL *Ark*, is that Space in the Heavens which the Sun, Moon, or Stars, run thro' from their Riſing to their Setting.

NOCTURNLABE, is an Inſtrument uſed to find how much the *North Star* is higher or lower than the *Pole* at all Hours of the Night.

NOCTILUCA, is one of the two kinds of *Phoſphorus*; the former of which, ſuch as the *Bolonian Stone*, *Hermetick Phoſphorus Balduini*, &c. will not ſhine, except firſt expoſed to the Sunbeams, but this kind of *Noctiluca*, is a ſelf-ſhining Subſtance, which requires the being expoſed to no Light to render it Luminous: As the *Phoſphorus* made of Urine, *&c.* which ſee in *Phoſphorus*.

Mr. *Boyle* in his Book of the *Aerial Noctiluca*, reckons three of theſe *Noctilucæ*.

1. The *Gummous*, Conſiſtent or Conſtant one, (as ſome *Germans* call it) which is in the Form of a Conſiſtent Body.

2. The *Liquid Noctiluca*, which probably is only the former diſſolved in a proper Liquor.

The *Aerial Noctiluca*, becauſe it would immediately begin to ſhine, on being expoſed to the open Air. See the Proceſs for this laſt, P. 105. of the afore-mentioned Book, which being much the ſame with that of the *Phoſphorus*, commonly made out of Humane Urine, I have omitted. See *Phoſphorus*.

NODES, in *Aſtronomy*, ſignifie the Points of Interſection of the Orbit of the Sun, or any Planet, with the Ecliptick, ſo that the Point where a Planet paſſes over the Ecliptick, out of Southern into Northern Latitude, is called the North *Node*: And where it deſcends from North to South, 'tis the South *Node*; which *Nodes* (according to ſome) change their Places in the Zodiack, like the Planets: But Sir *Iſ. Newton* proves *Prop.* 14. *Lib.* 3. that the *Nodes* of all the Planets Orbits (as well as their *Aphelia*) are at Reſt.

NODULUS, *Nodus*, is a Bag of ſuch ſuitable Ingredients as the Diſeaſe requires, put into Beer or Wine, the Tincture whereof the Patient is to drink.

NODUS or *Node*, in *Dialing*, in a certain Point in the Axis or Cock of the *Dial*, by the Shadow of which, either the Hour of the Day in Dials without Furniture, or the *Parallels of the Sun's Declination*, his *Place in the Ecliptick*, the *Italian* or *Babyloniſh Hours*, &c. are ſhown, in ſuch Dials as have Furniture.

'Tis an eaſie thing, and ſometimes of good Uſe, to make Dials which ſhall ſhew the Hour of the Day by an Hole or

NODUS. One Method of which, Mr. *Collins* at the End of his Sector on a Quadrant, gives as follows.

Firſt, Draw an Horizontal Dial for the Latitude propoſed: Then by the Help of the Sun's Azimuth (which may be found by a Quadrant) or by knowing the Hour of the Day by that Horizontal Dial, draw a true Meridian from the *Hole* or *Nodus* propoſed, both above in the Ceiling, and below on the Walls and Floor of the Room; ſo that if a Right Line were extended from the ſaid *Hole* or *Nodus* to any Point in any of thoſe Lines, it would be in the Meridian Circle of the World.

Next, Fix the End of a Thread in the Centre of the *Hole* or *Nodus*, and move the other End thereof up or down in the ſaid Meridian drawn on the Ceiling or Wall, until by applying the ſide of a Quadrant to that Thread, it is found to be elevated equal to the Latitude of the Place, then that Thread is directly ſituated parallel to the Axis of the World, and the Point where the End of that Thread toucheth the Meridian either on the Ceiling or Wall, is that Point in the direct Axis ſought for; wherein fix one End of the Thread, which Thread will be of preſent Uſe in projecting the Hour-Points in any place propoſed.

Then place the Centre of the Horizontal Dial in the Centre of the *Hole* or *Nodus*, and ſituate it exactly parallel to the Horizon, and its Meridian in the Meridian of the World, (which may eaſily be done, if at the Inſtant you know the true Hour of the Day) then take the Thread, whoſe End is fixed in a Point in the direct Axe, and move it to and fro, until the Thread doth interpoſe between your Eye, and the Hour Line on the Horizontal Dial, and keeping your Eye in that Poſition, make a Point or Mark where you pleaſe, ſo that the Thread may interpoſe between that Point and your Eye; which Point ſo found, will ſhew the true Time of the Day at that Hour all the Year long, the Sun ſhining thereon, ſo will the Point and the ſaid Thread ſerve to ſhew the Hour inſtead of an Hour-Line.

In like manner, the Thread fixed in the Axis, may be again moved to and fro, until the Thread doth interpoſe between the Eye and any other Hour-Line deſired on the Horizontal Dial, and then (as before) make another Point or Mark in any Place at pleaſure, by projecting a Point from the Eye, ſo that the Thread interpoſe between that Point to be made, and the Eye, ſo will that Point ſo found ſhew the true Time of the Day for the ſame Hour that the Hour-Line did on the Horizontal-Dial, which was ſhadow'd by the Thread.

Thus you may proceed (by the help of that Thread and the ſeveral Hour-Lines on the Horizontal Dial) to find the other Hour-Points, which muſt have the ſame Numbers ſet to them, as the Hour-Lines on the Horizontal Dial have.

Otherwiſe, to make a Dyal from a Hole in any Pane of Glaſs in the Window, and to graduate the Hour-Lines on the Ceiling, Floor, &c. that Hole is ſuppoſed to be the Centre of the Horizontal Dial, and being true placed, the Stile thereof, if ſuppoſed continued, will run into the Point in the Meridian of the Ceiling before found, where a Thread is to be fixed; then let one extend a Thread faſtened in the Centre of the Horizontal Dial, parallel to the Horizon over each reſpective Hour-Line, and holding it ſteady, let another extend the Thread faſtned in the Meridian in the Ceiling, along by the Edges of the Horizontal Thread, which will find divers Points on the Ground, thro' which, if Hour-Lines be drawn, the Sun ſhining thro' the Hole in the Pane of Glaſs, will ſhew the Time of the Day.

For the Points that will be thus found on the Beam or Tranſome, the Thread fixed in the Ceiling, or inſtead of it a piece of Tape there fixed muſt be moved ſo up and down, that the Spot of the Sun may ſhine upon it; and being extended to the Tranſome or Beam, graduated with the Hour-Lines, it there ſhews the Time of the Day.

Note, That 'twill be convenient to have that Pane of Glaſs darkned, through which that Spot is to ſhine.

In like manner may a Dial be made from a Nail-head, a Knot in a String tied any where acroſs, or from any Pin driven into the Bar of the Window, and the Hour-Lines graduated upon the Tranſome or Board underneath.

To make a Reflected Dial on the Ceiling of the Room, is only the contrary of this, by ſuppoſing the Horizontal Dial, with its Stile, to be turned downwards, and run into the true Meridian on the Ground, where the Thread is to be fixed, and to be extended along the former Horizontal Thread (held over the reſpective Hours) upward, to find divers Points in the Ceiling.

NOLI *me tangere*, is a ſort of Canker in the Face, eſpecially above the Chin; there ariſes a Tumour or Ulcer about the Mouth and Noſe, like an exulcerated Canker, which grows ſlowly at the beginning, like a little Pimple; it remains a whole Year, otherwiſe is leſs troubleſome than a Canker, which gnaws and eats more in one Day, than a *Noli me tangere*, doth in a Month.

NOMBRIL or Navel-*Point* in an Eſcutcheon: See the Word *Eſcutcheon*.

NOMÆ, are deep and putrid Ulcers in the Mouth. *Blanchard*.

NOME, in *Algebra*, is any Quantity with a Sign prefixed to it, and by which 'tis uſually connected with ſome other Quantity, and then the whole is called a *Binomial*, or *Trinomial*, &c. Thus $a+b$ is called a *Binomial*, whoſe Names are a and b; and $a+b+c$ is a *Trinomial*, whoſe Names are a, b, and c, &c.

NON-ABILITY, in Law is an Exception taken againſt the Plaintiff or Defendant, upon ſome Cauſe why he cannot commence Suit in Law, as *Præmunire*, *Outlawry*, *Profeſt in Religion*, *Excommunicate*, or a *Stranger born*, which laſt holds only in Actions real and mix'd, and not in Perſonal, except he be a Stranger and an Enemy. The *Civilians* ſay, That ſuch a Man hath not *Perſonam ſtandi in judicio*.

NON *admittas*. See *Ne admittas*.

NONAGE, a Term in Law, ſignifying all that Time of a Man's Age, under One and twenty Years in ſome Caſes, and Fourteen in others, as Marriage.

NONAGESIMAL *Degree*, is the higheſt Point, or 90th Degree of the Meridian.

NON-

NON-CLAIM, a Term in Law, ſignifying the Omiſſion or Neglect, of him that ought to challenge his Right within a time limited, by which Neglect he is either barr'd of his Right, as at this Day upon *Non-claim* within five Years after a Fine, and Right to him accrued; or of his *Entry* by his Deſcent, for want of *Claim*, within five Years after the *Diſſeiſin*.

NON *compos mentis*; That is, not of ſound Memory or Underſtanding; of ſuch in Common Law they reckon:

Firſt, An Ideot Born.

Secondly, He that by Accident wholly loſeth his Memory and Underſtanding.

Thirdly, A Lunatick, that hath *Lucida intervalla*; ſometimes has Underſtanding, and ſometimes not.

4. He that by his own Act for a Time depriveth himſelf of his right Senſes, as a Drunkard; but this laſt kind ſhall give no Privilege to him or his Heirs.

NON *diſtringendo*, is a Writ compriſing under it divers Particulars, according to divers Caſes. See Tab. of *Orig. Reg.* Verb. *non diſtringendo*.

NONES of a Month, are the next Days after the Kalends, which is the firſt Day. In *March*, *May*, *June* and *October*, the *Romans* accounted ſix Days of the *Nones*, but in all the reſt of the Months but four. They had this Name probably becauſe they were always 9 Days incluſively, from the firſt of the *Nones* to the *Ides*; *i. e.* reckoning incluſively both thoſe Days.

NON *eſt Culpabilis*, in Law, ſignifies the general Plea to an Action of Treſpaſs, whereby the Defendant doth abſolutely deny the Fact imputed to him by the Plaintiff; whereas in other Special Caſes the Defendant but alledgeth ſome reaſon in his own Defence.

NON *eſt factum*, is an Anſwer to a Declaration, whereby a Man denieth that to be his Deed, whereupon he is Impleaded.

NON *Implacitando aliquem de libero tenemento ſine brevi*, is a Writ to inhibit Bayliffs, *&c.* from diſtraining any Man without the King's Writ, touching his Free-hold.

NON *Intromittendo, quando breve de Præcipe in Capite ſubdole impetratur*, is a Writ directed to the Juſtices of the Bench, or in *Eyre*, willing them not to give one that hath, under colour of Intitling the King to Land, *&c.* as holding of him *in Capite*, deceitfully obtained the Writ called *Præcipe in Capite*, but to put him to his Writ of Right, if he think good to uſe it.

NON *Mercandizanda Victualia*, is a Writ directed to the *Juſtices of Aſſize*, commanding them to enquire, Whether the Officers of ſuch Towns do ſell Victuals in Groſs, or by Retail, during their Office, contrary to the Statute, and to puniſh them if they find it true.

NON *Moleſtando*, is a Writ that lieth for him which is *Moleſted*, contrary to the King's Protection granted him.

NON-*Natural Things*, or the *Non-Natural Cauſes of Diſeaſes*, as the Phyſicians reckon them are ſix, *viz.* The Air, Meat and Drink, Sleep and want of Sleep, the Motions and Repoſe of the Body, the Retention, or Evacuation of the Excrements and Recrements of it, and the Paſſions of the Mind.

NON-*Organical Part* of an Animal, is that whereto ſome Uſe is only appropriated, but no Action, as a Griſtle, Bone, Foot, *&c.*

NON *Obſtante*, is a Clauſe frequent in Statutes and Letters Patent; it ſignifies *Notwithſtanding*, and was firſt brought in by the *Pope*, and in the Reign of *Hen.* 3. was uſed by that King in his Grants, *&c.*

NON *omitt. propt. aliquam libertat.* is a Writ that lies where the Sheriff returns upon a Writ to him directed, that he hath ſent to the Bayliff of ſuch a Franchiſe which hath the return of Writs, and he hath not ſerved the Writ, then the Plaintiff ſhall have this Writ directed to the Sheriff to enter into the Franchiſe, and execute the King's Proceſs himſelf. Alſo the Sheriff ſhall warn the Bayliff, That he be before the Juſtices at the Day mentioned in the Writ, and if he come not, then all the *Judicial Writs*, during the ſame Plea, iſſuing, ſhall be Writs of *Non Omittas*, and the Sheriff ſhall execute the ſame.

NON *Ponendis in Aſſiſis & Juratis*, is a Writ founded upon the *Statute of Weſt.* 2 cap. 38. and *Articuli ſuper Chartas*, cap. 9. which is granted upon divers Cauſes to Men, for the freeing them from *Aſſizes* and *Jurors*.

NON *Procedendo ad Aſſiſam Rege inconſulto*, is a Writ to ſtop the Trial of a Cauſe appertaining unto one that is in the King's Service, *&c.* until the King's Pleaſure be further known.

NON *Reſidentia pro Clericis Regis*, is a Writ directed to the Ordinary, charging him not to moleſt a Clerk employed in the King's Service, by reaſon of his *Non-Reſidence*.

NON-*Reſidence*, in Law, is applied to ſuch Spiritual Perſons as are not Reſident on, but do abſent themſelves for the ſpace of a Month or two, at ſeveral times in one Year from their Benefices, for *Perſonal Reſidence* is required of Eccleſiaſtical Perſons upon their Cures.

NON *Sane Memory*, in Law, is an Exception taken to an Act declared by the Plaintiff or Demandant, to be done by another, whereupon he grounds his Plaint or Demands: And the Effect of it is, That the Party that did that Act was mad, or not well in his Wits when he did it. See *Non compos mentis*.

NON *Solvendo Pecuniam ad quam Clericus mulctatur pro non Reſidentia*, is a Writ prohibiting an Ordinary to take a Pecuniary Mulct impoſed upon a Clerk of the King, for *Non-Reſidence*.

NON-*Suit*, in Law, is Renouncing of the Suit by the Plaintiff or Demandant, moſt commonly upon the Diſcovery of ſome Error or Defect, when the Matter is ſo far proceeded in, as that the Jury is ready at the Bar to deliver their Verdict. The *Civilians* term it, *Litis renunciationem*. And in what Caſes a Man cannot be *Non-Suit*. See the Statute of 2 *H.* 4. *cap.* 7.

NON *Sum Informatus*. See *Informatus non Sum*.

NON *Tenure*, in Law, is an Exception to a Count, by ſaying, That he holdeth not the Land ſpecified in the Count, or at leaſt ſome part of: And 'tis either *Non tenure General*, or *Non tenure Special*: The *Special Tenure*. is an Exception, alledging that he was not Tenant the Day when the Writ was purchaſed. *Non tenure General*, is when one denies himſelf ever to have been Tenant to the Land in Queſtion.

NORMAL, the ſame with Perpendicular, or at Right Angles, and 'tis uſually ſpoken of a Line or a Plane that Interſects another Perpendicularly.

NORTHERN *Signs of the Ecliptick or Zodiack*, are thoſe Six which conſtitute that Semi-circle of the Ecliptick which inclines to the Northward from the Equator, as *Aries*, *Taurus*, *Gemini*, *Cancer*, *Leo*, *Virgo*.

NOSOCOMIUM, is an Hoſpital for Poor Sick People, where they are attended, and cured, if poſſible.

NOTES in Muſick, are certain Terms invented to diſtinguiſh the Degrees of Sound in Tuning, and the Proportion of Time thereto belonging: For in regard that a Voice doth expreſs a ſound beſt, when it pronounceth ſome Syllable or Word with it, ſix ſelect Syllables were formerly uſed to that Purpoſe, aſcending and deſcending in order, *viz. Ut*, *Re*, *Mi*, *Fa*, *Sol*, *La*; but four of them, *viz. Mi*, *Fa*, *Sol*, *La*, being found ſufficient for the right Tuning of all the Degrees or Sound, and leſs burthenſome to the Memory, the other two, *Ut* and *Re*, are generally now laid aſide as ſuperfluous. It is reported, That *Guido Aretinus*, having undertaken to reduce the *Greek* Scale of Muſick to a more regular form about *A. D.* 960, aſſumed for the Names of theſe ſix Notes as many Syllables taken out of the *Sapphick* Hymn of St. *John Baptiſt*, which began thus:

Ut *queant Laxis* RE*ſonare fibris*,
MI*ra Geſtorum* FA*muli tuorum*,
SOL*ve polluti* LA*bii reatum*.

As for other ſort of Notes relating to Time, they are Nine in Number, viz. *Large*, *Long*, *Breve*, *Semi-breve*, *Minim*, *Crotchet*, *Quaver*, *Semi-quaver*, and *Demi-ſemi-quaver*. The four firſt are uſually termed *Notes of Augmention, or Increaſe*, and the five laſt of *Diminution* or *Decreaſe*. The *Semi-breve* being the laſt of Augmentation, is commonly called the *Maſter-Note*, or *Meaſure-Note*, or *Time-Note*, becauſe it is of a certain determinate *Meaſure* or Length of *Time* by it ſelf; and all the other Notes both of *Augmentation* and *Diminution*, are meaſured by, or adjuſted to its value: But it ought to be obſerved, that the *Large* and *Long* are now of little uſe, as being too long for any Voice or Inſtrument (the *Organ* only excepted) to hold out to their full length; altho' their *Reſts* are ſtill very often uſed, more-eſpecially in Grave Muſick, and Songs of many Parts.

NOTHÆ *coſtæ*, are the five loweſt Ribs on each ſide, called Baſtard Ribs; ſo named, becauſe they do not join with the Breaſt-bone as the other Ribs do, nor are they as the others, Boney, but Cartilaginous.

Diſeaſes are likewiſe called *Nothi*, or Baſtard, when they agree not with the Ordinary and Common Rules, as *Tertian*, *Quartan*, and *Quotidian*, Baſtard Agues, *Baſtard Pleuriſies*, &c.

NOTIONAL *Quantity*. See *Quantity*.

NOVACULA, is a Chirurgeon's Knife, the Shape whereof differs according to the Difference of Operations.

NOVAL *Aſſignment*, in Law, is an *Aſſignment* of Time, Place, or the like, otherwiſe than as it was before *aſſigned*. See *Aſſignment*.

NOVEL *Diſſeiſin*. See *Aſſize of Novel Diſſeiſin*.

NOUNS (in *Grammar*) are ſuch Words as ſignifie the ſeveral Objects of our Thoughts.

NUBECULÆ are little light Particles which mutually, but looſely cloſe with one another, and ſwim upon the Urine.

NUCAMENTUM in *Phytology*, or *Botanicks*, is the ſame with *Julus*. Which ſee.

NUCHA is the hinder part, or Nape of the Neck, called alſo *Cervix*.

NUCIOSITAS: the ſame that *Myopia*.

NUCIFEROUS *Plants or Shrubs* are ſuch as bear Nuts.

NUCKIANÆ *Glandulæ*, are a ſort of Glands (firſt taken notice of by Dr. *Nuck*) ſeated in that Orbit of the Skull, wherein the Eye is placed betwixt the abducent Muſcle of the Eye, and the upper part of the *Os jugale*. Their Shape is various, in ſome Oblong, in others flattiſhly Round, in others Oval, and in others ſomewhat Triangular.

NUCLEUS is the Edible part of the Kernel of any Nut, which is contained within the Skin of the Kernel; and in a larger Senſe is by Botaniſts uſed for any Fruit or Seed contained within an Husk or Shell.

NUCLEUS alſo in an Aſtronomical Senſe is by *Hevelius* and others uſed for the Head of a *Comet*, and by others for the Central Parts of any Planets.

NUCLEUS, in Architecture, is the middle part of the Flooring of the Ancients, conſiſting of Cement, which they put betwixt a Lay or Bed of Pebbles cemented with Mortar made of Lime and Sand.

NUDE *Contract*, in Law, is a bare Promiſe of a thing, without any conſideration; and therefore 'tis ſaid, *Ex nudo pacto non oritur actio*.

NUDE *Matter*, in Common Law, is a naked Allegation of a thing done to be proved only by Witneſſes, and not either by Record or other Speciality in Writing under Seal.

NUMBER is Diſcrete Quantity, or a Collection of Unites, and is that which teacheth us to know *how many* any of the Objects of our Knowledge are.

Every Number in *Arithmetick* (which is the Art of Numbering truly) may be conſidered as compoſed of two Parts, of which one may be called the *Denominator*, and the other the *Numerator*.

Thus the Number 9, as it ſignifies the Thing Numbered, as the 9 Muſes, or 9 Men, 9 Pounds, *&c.* is a *Denominator*: But as it expreſſes how many of that thing are taken or accounted, it is a *Numerator*. Therefore when the *Denominator* ſignifies a whole thing, the Number is called an *Integer*; but if it ſignifie or ſtand for the Parts of any thing, then the Number is a *Fraction*.

Thus Nine Shillings, conſidered as diſtinct Things, are an *Integral Number*; but when you conſider them as $\frac{9}{20}$ Parts of a Pound *Sterling*, that Number is a *Fraction*: And the Knowledge of this will facilitate the Underſtanding of the *Doctrine of Fractions*, which appears difficult to Beginners, becauſe they do not conſider that as well *Integer Numbers* as *Fractions* have both Numerators and Denominators: The Difference lying chiefly here, That in *Integers* the *Ratio* of the Denominators is certain, one and the ſame; but in

in *Fractions* 'tis innumerable: For the *Ratio* of the Denominators in *Fractions* is as various as the Nature of the Parts into which any Whole may be divided, which in *Vulgar Fractions* is Infinite. *Well's Arithmetick.*

NUMERATION, in Arithmetick, is the true *Diſtinction, Eſtimation,* and *Pronunciation* of Numbers, or the Rule to read any Number, tho' never ſo great, and to have a diſtinct Idea of each Place or Figure of it; which may eaſily be done by this Method: Beginning at the Right Hand, make a Point or Prick under the Seventh Figure, and over it place the Figure 1, that is the Place of *Millions.* Now Seven Places any one can number or read, but they are apt to be puzled when they go farther; but 'tis as eaſie to read 700 Places as Seven, if you do but go in this Method; accounting in the Seventh Place, over which you put the Figure 1, tell on Seven Places more, and over *that* place the Figure 2. The Number under 2, ſtands in the place of *Millions of Millions,* which is better expreſſed by *Billions,* (i. e. *Bi-millions.*) Including the laſt Figure, tell on again Seven Figures more, and then place over the Seventh the Figure 3; this is the Place of *Trillions*; and the Seventh beyond that will be *Quartillions*; the next Seventh *Quinquillions,* &c. according as the Figures over every Seventh Place do ſhew. Thus, ſuppoſe this Number,

9 8 7 6 5 4
468790356789463250123897654320178960

3 2 1
7345321234567898765432100

After you have *diſtinguiſhed* it, as you ſee, by the Pricks under, and *eſtimated* it by the Figures over it; you will find the firſt Period, beginning at the Left Hand, and reading to the Point, to be 46 *thouſand* 879; and you cannot be ignorant of the Value of Nine, the laſt Figure, when you ſee the 9 ſtanding over it; for that ſhews you 'tis *Nonillions,* or the Place of a *Million* multiplied 9 times by it ſelf. The next Period is 35 *Thouſand* 678 *Octillions*; the next is 46 *Thouſand* 325 *Septillions*; and ſo on till you have read or pronounced them all: Only obſerving to expreſs at every Point the Value of the Figure over it, which the Figure on the top ſhews you readily how to do.

NUMERATOR of a Fraction, is that Part of it which ſhews or numbers how many of thoſe Parts which any Integer is ſuppoſed to be divided into, are expreſſed by the Fraction. Thus in $\frac{6}{8}$, 6 is the Numerator, (which ſtands always above the Line) and ſhews you, that if any Whole be divided into 8 Parts, you number and enumerate, or take 6 of them, *i. e.* Three quarters.

NUMERAL *Algebra,* is that which makes uſe of Numbers inſtead of the Letters of the Alphabet; which latter Method is called *Algebra in Species,* or *Specious Arithmetick.*

NUNCUPATIVE *Will.* See *Will.*

NUPER *Obiit,* is a Writ that lies for a Coheir, being deforced by her Co-parcencer of Lands or Tenements, whereof any of their Anceſtors died ſeized of an Eſtate in Fee-ſimple.

NUSANCE, a Term in Law, ſignifying not only a Thing done, whereby another Man is annoyed in his Free Lands or Tenements, but the Aſſiſe or Writ which lieth for the ſame; and now generally, inſtead of this, is brought in Actions of Treſpaſs.

NUTRITION, is a Natural Increaſe, whereby that which continually decays of any Corporeal Subſtance, is repaired by convenient Nouriſhment.

Dr. *Havers,* in his *Oſteologia,* will not have Nutrition to be any Reparation of the Loſs of the Subſtance of the Solid Parts ordinarily, but only a continual Succeſſion and Supply of Spirits, and of all thoſe Fluid Parts which fill the containing Parts, and keep them diſtended.

NUX, is a ſort of Pain in the Head, which afflicts a Place as big as a Nut; as an *Ovum* or *Clavus* is another ſort, where the Seat of the Pain is larger.

NYCHTHEMERON, is Four and twenty Hours Space, or an entire Day and Night.

NYCTALOPIA is Two-fold: The Firſt is a Dimneſs of the Sight in the Night, or in dark Places, without any Impediment in the Light. The other is Dimneſs in the Light, and clear Sight in the Night, or in ſhady Places.

NYMPHÆ, are little ſoft Pieces of Fleſh, ariſing from the Commiſſure of the *Os pubis* within the *Vagina*; ſo called, becauſe they ſtand near the Paſſage of the Water that comes out of the Bladder.

Alſo the Hollowneſs or void Space in the Nether Lip is ſo called.

NYMPHOMANIA, the ſame with *Furor Uterinus.*

NYMPHOTOMY, is a Cutting off the *Nymphæ,* the too great Protuberance whereof in Marriageable Virgins ſometimes hinders the *Coitus,* or at leaſt renders it difficult. The *Egyptians* cut them frequently, as *Galen* ſaith; but in our Parts of the World ſuch Inſtances have been very rare.

OAK

OAKHAM, (a Term uſed in the Yards for building Ships) is Old Ropes untwiſted and pulled again out fine, into looſe Hemp or Flax, with a Deſign to drive it into the Seams, Trennels, and Rends of a Ship, to ſtop or prevent a Leak.

OAZY, or *Oazie Ground:* So the Seamen call ſoft, ſlimy, muddy Ground. This is not good Anchorage, becauſe the Anchor cannot hold firm, but will *come home* (as they call it) in a Streſs of Weather; beſides it will rot their Cables, if a Ship ride long over ſuch Ground: But then it is good to bring a Ship a-ground upon, becauſe ſhe can there dock herſelf, and lie ſoft; but yet if ſhe lie long, ſhe will rot her Plank, and ſpoil the Oakham in her Seams.

OBELÆ, is the *Sagittalis Sutura* in the Skull, (ſee *Sagittalis*) which touches the *Coronal* Suture forward, and the *Lamdoidal* backward; for it is made of the Mutual Conjunction of the Bones of the Forehead. *Blanchard.*

OBELISK, is a magnificent high Piece of Solid Marble, or other fine Stone; having uſually Four Faces, and leſſening upwards by Degrees, till it ends in a Point like a Pyramid.

OBJECTIVE *Line.* See *Line Objective.*

OBJECT-*Glaſs*, of a Teleſcope or Microſcope, is that Glaſs which is placed at that End of the Tube which is next the Object.

OBLATA, is a Word uſed in the *Exchequer*, ſignifying old Debts brought together from precedent Years, and put to the preſent Sheriff's Charge.

OBLIGATION, is a Bond containing a Penalty, with a Condition annex'd, either for Payment of Money, Performance of Covenants, or the like; and ſo differs from a Bill that hath no Penalty nor Condition; and yet a Bill may be Obligatory.

OBLIGOR, is he that enters into ſuch an Obligation; and *Obligee*, the Perſon to whom it is entred into.

OBLIQUE *Aſcenſion*, is that Degree and Minute of the *Equinoctial* which riſeth with the Centre of the *Sun* or *Star*, or with any Point of the Heavens, in an Oblique Sphere.

To find the Sun's Oblique Aſcenſion *by the Globe.*

Bring the Sun's Place to the Horizon on the Eaſt-ſide; and the Number of Degrees intercepted between that Degree of the Equinoctial which is now come to the Horizon, and the Beginning of *Aries*, is the *Oblique Aſcenſion.*

To find the Oblique Aſcenſion, *having the* Right Aſcenſion *and* Aſcenſional Difference *given.*

1. If the Declination be North, the Difference between the *Right Aſcenſion* and the *Aſcenſional Difference*, is the *Oblique Aſcenſion* required.

2. If the Declination be South, the Sum of the *Right Aſcenſion*, and the *Aſcenſional Difference*, is the *Oblique Aſcenſion.*

OBL

To find the Oblique Deſcenſion.

1. If the Declination be North, the Sum of the *Right Aſcenſion*, and *Aſcenſional Difference*, is the *Oblique Deſcenſion.*

2. If the Declination be South, the Difference between the *Right Aſcenſion*, and the *Aſcenſional Difference*, is the *Oblique Deſcenſion.*

OBLIQUE *Angles.* See *Angles Oblique.*

OBLIQUE *Deſcenſion*, is that part of the *Equinoctial* which ſets with the *Sun* or *Star*, or with any Point of the Heavens, in an Oblique Sphere.

OBLIQUE *Plains*, in Dialing, are ſuch as *recline* from the *Zenith*, or *incline* to the *Horizon*: The Obliquity of which *Inclination* or *Reclination*, is eaſily found by a Quadrant: Being an Ark of ſome Azimuth or Vertical Circle intercepted between the Vertex of the Place and of that Plane; alſo obſerve, this Azimuth or Vertical Circle is always perpendicular to the Plane.

OBLIQUE *Sailing*, is when the Ship runneth upon ſome Rhumb between any of the Four Cardinal Points, making an Oblique Angle with the Meridian; and then ſhe changeth continually both Latitude and Longitude. There are Three kinds of *Oblique Sailing*, viz. *Plain Sailing*, *Mercator's* or *Wright's Sailing*, and *Great Circle Sailing*; which ſee.

The Seamen call alſo the Application of the Method of Calculating the Parts of Oblique Plane Triangles, in order to find the Diſtance of a Ship from any Cape, Head-Land, &c. *Oblique Sailing.*

OBLIQUE *Sphere*, is where the Pole is elevated any Number of Degrees leſs than 90 Degrees, and conſequently the Axis of the World, the Equator, and Parallels of Declination, will cut the Horizon obliquely; whence comes its Name.

OBLIQUUS *Superior*, a Muſcle of the Head, which ariſeth fleſhy from the back-part of the tranſverſe Proceſs of the Firſt *Vertebra* of the Neck, and in its ſomewhat oblique Aſcent becometh a fleſhy Belly, and leſſening it ſelf again, is inſerted to the *Os Occipitis*, laterally. By this together with its Partner, (they never acting ſeparately) the Head is moved backwards on the firſt *Vertebra.*

OBLIQUUS *Inferior*, is a Muſcle of the Head, ariſing fleſhy from the External Part of the Spinal Proceſs of the ſecond *Vertebra* of the Neck, cloſe by the Origination of the *Rectus Major*; and being dilated into a fleſhy Belly, paſſes obliquely to its Inſertion at the tranſverſe Proceſs of the Firſt, where the former Muſcle begins.

When this acts on either ſide, the tranſverſe Proceſs of the Firſt *Vertebra* of the Neck is moved towards the Spine of the Second; wherefore ſome Authors have reckoned it among the Muſcles of the Neck. But ſince the Head is alſo moved thereby, and the Face turned on that ſide on which it acteth, it is not improperly reckoned

amongſt the Muſcles that move the Head; it is aſſiſted by the *Maſtoidæus*.

OBLIQUUS *Superior*, or *Trochlearis*, is a Muſcle of the Eye, which receives its Firſt Denomination from its oblique Poſition and Courſe, in regard of the reſt of its Fellows. The Second, it derives from that Cartilaginous Ring ſuſpended near the Brink of the upper Part of the Orbit towards the Noſe, thro' which its Tendon paſſes, being reflected on it, as a Rope on a Pulley: Beſides which, it is called *Longiſſimus Oculi*, as exceeding the other in Length. Its Uſe is to help roll the Eye up and down.

It ariſes ſharp and fleſhy from the deepeſt part of the Orbit, near the Origination of the *Abducens*, and becoming a fleſhy Belly as it paſſes obliquely cloſe under its Superior Part, makes a round Tendon running thro' the *Trochlea*, (as above-mentioned) from whence reverting back, it is inſerted to the *Tunica Sclerotis*, in the Middle of the Diſtance between the Termination of the *Attollens* and Optick Nerve, towards the back-part of the Bulb of the Eye.

OBLIQUUS *Inferior*, is a Muſcle called alſo *Breviſſimus Oculi*, it being the ſhorteſt Muſcle of the Eye. This ſprings ſharp and fleſhy from immediately within the lower and almoſt outward Part of the *Orbit*, at the Juncture of the Firſt Bone of the upper Jaw, with the Fourth; and becoming thicker, aſcends obliquely over the *Deprimens*, growing tendinous at its Inſertion to the *Tunica Sclerotis*, near the Implantation of the former, directly betwixt the *Abducens* and Optick Nerves.

Its Uſe is to help roll the Eye to and fro, and therefore this and the former are by ſome called *Circumagentes* and *Amatorii*. Some alſo reckon Two other Muſcles belonging to the Eye, which are called by this Name *Oblique*, viz.

OBLIQUUS *Major*, a Muſcle that pulls the Eye forwards and obliquely downwards.

OBLIQUUS *Minor*, is a Muſcle that pulls the Eye forwards and obliquely upwards.

OBLIQUUS *Aſcendens ſive Acclivis*, one of the large Muſcles of the *Abdomen*, ſerving to compreſs the Belly, and by that means to help the Diſcharge of the Ordure and Urine; it alſo compreſſes and ſtraitens the Cavity of the *Thorax* in Exſpiration, and helps to turn the Trunk of our Body to either ſide, when our Feet ſtand ſtill; and ſo is a kind of *Antagoniſt* to the *Obliquus Deſcendens*, which ſee.

It ariſes fleſhy from the whole circular Edge of the *Os Ilium* and *Ligamentum Pubis*; and thence mounting with an Order of Fibres, inclining forwards, it forms a broad membranous thin Tendon, which is implanted into the whole Length of the *Linea Alba*, and the Cartilages of the 8th, 9th, 10th, and 12th Ribs.

OBLIQUUS *Deſcendens ſeu Declivis*, the Name of one of the large *Epigaſtrick Muſcles*, or Muſcles of the *Abdomen*: Beſides its Uſe, in common with the reſt, to compreſs the Inteſtines and Bladder, and to help exclude the *Fœtus*; Mr. *Cowper* aſſigns it another, not obſerved before by any one (except Dr. *Gliſſon*) which is to move our Body round to either ſide when our Feet ſtand ſtill. It ariſes with ſeveral acute Productions, partly fleſhy and partly tendinous, from the lower Margin of the Sixth, Seventh, and Eighth Ribs, where its ſeveral ſeparate Originations lie between the Indentations of the *Major Anticus*: Beſides theſe, it continues to derive more Heads from the Ninth, Tenth, Eleventh, and ſometimes from the Extremity of the loweſt Baſtard-Rib, where it is alſo indented with the *Serratus Inferior Poſticus*; thence its oblique deſcending fleſhy Part expands it ſelf into a broad membranous Tendon, before it marches over the *Rectus* to its Inſertion in the *Linea Alba* and the *Os Pubis*; after this deſcending, it ends partly tendinous in the *Ligamentum Pubis*, but chiefly fleſhy on the upper and fore-part of the circular Edge of the *Os Ilium*.

OBLIQUUS *Auris*, is a Muſcle of the Ear, which may be alſo called *Semi-circularis*, from its Poſition, it lying in the external Parts of the Bony Channel of the *Aquæduct*, whence marching ſomewhat upwards and backwards, it enters the *Tympanum* in a very oblique Sinuoſity excavated immediately above the Bone where the *Tympanum* is inchaſed, and is inſerted to the ſlender Proceſs of the *Malleus*. The Sinuoſity in which this Muſcle paſſes, is that which may be taken notice of in the upper Part of the Bony Circle of the *Fœtus*. This we don't find deſcribed any where, before *Du Verney*.

OBLONG, in Geometry, is the ſame with a Rectangle Parallellogram, whoſe Sides are unequal.

OBSCURA *Camera*, in Opticks, is a Room darkened, all but in one little Hole, in which is placed a Glaſs to tranſmit the Rays of Objects to a piece of Paper or white Cloth: But by it are made many uſeful Experiments in Opticks, ſerving to explain the Nature of Viſion; and among which, the following one deſerves a particular Deſcription.

To repreſent all outward Objects in their proper Colours, Diſtances and Proportions, on a White Wall, a Frame of Paper, or Sheet hung up for that purpoſe in a Darkened Room.

This moſt Wonderful and Glorious Experiment, tho' it be very common, will yet well deſerve to have a clear Account given of it here; for I don't remember to have read a plain and intelligible Deſcription of its *Apparatus* any where; neither is it ſo eaſie to do it with Advantage, as thoſe perhaps who never tried it may imagine; what follows therefore you may relie on as the Reſult of my own repeated Experience.

Procure a good Convex, or Plano-Convex Glaſs, ſuch an one as is made uſe of for the Object Glaſs of a Teleſcope; and if you have a good Teleſcope that draws about 6 Feet, you may unſcrew its Object Glaſs, and it will ſerve your Turn very well: And indeed a Glaſs that draws about that length (tho' 4 or 5 Foot will do pretty well) is the fitteſt on all Accounts to make this Experiment withal; for if you uſe a ſmall Glaſs whoſe Focus is not above a Foot, or thereabouts diſtant from the Hole, the Repreſentation of your Objects will be very ſmall, and the Figures hardly large enough to be diſtinguiſhed: To which likewiſe may be added, that not above one Spectator can come to look on it at a time, and even he not without ſome Trouble.

On the other hand, if you make uſe of a Glaſs which draws 15, 20, or 25 Foot, either your Hole

Hole muſt be very large, and then ſo much Light will come in as will hinder the Objects from being viſible on the Wall, Paper, &c. or if the Hole be but ſmall, ſo little Light will come in, that at the Diſtance of 15 or 20 Foot from the Window, you will have hardly Light enough to ſee the Repreſentation diſtinctly; ſuch large Glaſſes likewiſe are not eaſily had every where, nor are they every one's Money; but a Glaſs that draws about ſix Feet, is very proper to be made uſe on in this Caſe.

Having gotten ſuch a Glaſs, make Choice of ſome Room which hath a North-Window, tho' an Eaſt or Weſt may do well enough (but a South one will not, for a Reaſon to be given below) and let it be well darkened, ſo that no Light can come into it, but at the Hole where your Glaſs is placed, or at leaſt but very little. Then make a Hole in the Shutter of the North-Window of about an Inch, or an Inch and $\frac{1}{4}$ in Diameter, and leave open the Caſement, if there be one, for there muſt be no Glaſs without your Hole. Then faſten the Glaſs with its Centre in the Centre of the Hole, by ſome ſmall Tacks to the Shutter, ſo that no puff of Wind blow it down, and break it; and at the Diſtance that you know your Glaſs draws, hang up a white Sheet; or if you do not know exactly the Focus of the Glaſs, move the Sheet to and fro 'till you find the Objects are repreſented on it very diſtinctly, and then you may faſten it there by Nails to the Ceiling, &c. Then will whatever is without the Hole, and oppoſite to it, be repreſented on that Sheet with ſuch exquiſite Exactneſs, as far ſurpaſſes the utmoſt Skill of any Painter to expreſs. For if the Sun ſhine brightly on the Objects (as indeed this Experiment is never made well when it doth not) you will have the Colours of all Things there in their Natural Paint, and ſuch an admirable proportion of Light and Shadow, as is impoſſible to be imitated by Art; and I yet never ſaw any thing of that kind that comes near this Natural Landſcape. But if the Sun do not ſhine, the Colours will be hardly viſible, and all will look dirty, dark, and confuſed; therefore I adviſed a North-Window, that you may have the Meridian Sun ſhining on your Object in its greateſt Splendor, that ſo the Experiment may be in its greateſt Perfection: But you muſt by no means have the Sun ſhine on or near the Hole, for if it doth, all will be confuſed.

Another Thing in which this Repreſentation exceeds Painting, is, That here you have *Motion* expreſſed on your Cloth. If the Wind move the Trees, Plants or Flowers without, you have it within on your lively Picture; and nothing can be more pleaſant than to ſee how the Colours of the moving Parts will change as they do without, by their being in various Poſitions obverted to, or ſhaded from the Light. The Motion of any Flies or Birds, is painted alſo in the ſame Perfection: And the exact Lineaments of any Perſons walking at a due diſtance without the Glaſs, will be alſo expreſſed to the Life, and all their Motions, Poſtures and Geſtures, will as plainly appear on the Cloth, as they do to any one's Eye without.

In a Word, Nothing is wanring to render it one of the fineſt Sights in the World, but that all things are inverted, and the wrong End upwards. To remedy which, ſeveral Methods have been thought on, as double Convex-Glaſſes, &c. but none, in my Opinion, are ſo well, nor ſo eaſie, as to take a common Looking-Glaſs of about 12 or 14 Inches Square, and hold it under or near the Chin, with an acute Angle to your Breaſt: For if you do ſo, and look down into it, you will ſee all things upon the Sheet inverted in the Glaſs, *i. e.* in this caſe reſtored to their Natural and Erect Poſition; and this Reflection alſo from the Glaſs, gives it a Glaringneſs that is very ſurprizing, and makes it look like ſome Magical Proſpect, and the moving Images, like ſo many Spectrums or Phantaſms. And no doubt but there are many Perſons that might eaſily be impoſed upon with ſuch a Scene, and who would believe it to be no leſs than downright Conjuration.

And I have made uſe of this Experiment to convince ſome credulous Perſons, that thoſe are abuſed and impoſed upon, who ſee Faces in the Glaſſes of ſome cheating Knaves amongſt us, who ſet up for *Cunning-Men*, and Diſcoverers of Stollen Goods, &c. and have ſatisfied them, that much more may be done by this, and ſome other Optical Experiments, and that without the Help of the Devil too, than by any of the Clumſie Methods uſed by theſe Vermin.

If the Glaſs be placed in a Sphere or Globe of Wood (having an Hole as large as the Glaſs bored through it) which like the Eye of an Animal may be turned every way to receive the Rays coming from all Parts of the Objects, it will be of good Advantage to the Experiment; and ſuch, ready fitted, are now commonly ſold by Mr. *Marſhall*, at the *Archimedes* on *Ludgate-hill*, and are called *Scioptricks*.

And as by this Method any Image may be made appear in a darkened Room, Dr. *Hook*, in *Philoſoph. Tranſact.* N. 38. gives a way of doing the ſame thing in an Enlightened one, either by Day or Night. The Experiment I have tried my ſelf, and is as follows.

Oppoſite to the Wall, or Place where the Apparition is to be, let a Hole be made about a Foot in Diameter, or bigger; if there be an high Window that hath a Caſement in it, it will do better.

Without this Hole, or Caſement, ſo that the Company in the Room may not ſee what is done, place the Picture or Object you would repreſent inverted; and by means of Looking-Glaſſes placed behind, if the Picture be *Tranſparent*, reflect the Rays of the Sun, ſo that they may paſs through it towards the Place where it is to appear; and that no Rays may go beſides it, let the Picture be incompaſſed with a Board or Cloth on every ſide. If the Object be a Statue or ſome living Creature, then it muſt be the more inlightened by caſting the Sun-Beams on it by Reflection and Refraction both: Between this Object and the Wall, muſt be placed a broad Convex-Glaſs, ground of ſuch a Convexity, that it may repreſent the Object diſtinct on the Wall: And therefore, *'tis beſt to have a clean Linen Cloth inſtead of the Wall; which may be hung up any where, according to the Diſtance of the Glaſs's Focus.* The nearer the Glaſs is to the Object, the more will the Object be magnified on the Wall or Cloth; and the further off, the leſs; which alſo will depend on the Convexity of the Glaſs.

If the Object cannot be *Inverted* (as 'tis pretty difficult to do with *Living Animals, Candles*, &c.) then there muſt be two large Glaſſes of convenient Sphere, and they placed at their appropriated Diſtances (which are very eaſily found by Trials) ſo as to make the Repreſentation erect as well as the Object.

And if the whole Matter be well managed, ſo that the Spectators ſee nothing of the *Apparatus*, it will be a very ſurprizing thing to them to ſee an Image appear by ſo good a Light on a Plain in the midſt of a Room, where nothing can be diſcovered that ſhould occaſion any ſuch Apparition.

OBTUSE *Angles*. See *Angles*.

OBTUSE *Angular Section of a Cone*: So the Ancient Geometers, called that Conick Section, which ſince, by *Apollonius*, is called the *Hyperbole*, becauſe they conſidered it only in ſuch a Cone, whoſe Section by the Axe is a Triangle Obtuſe-angled at the Vertex.

OBTUSE-*angled Triangle*; ſee *Triangle*.

OBTURATOR *Externus*, is a Muſcle of the Thigh, ſo called from its Situation; and *Rotator Femoris Extrorſum*, from its Uſe: It hath a large fleſhy Beginning from the External Parts of the *Os Iſchium* and *Pubis*, and the Membrane that covers their *Foramen* externally, oppoſite to the Origination of the *Marſupialis* or *Obturator Internus*; and paſſing tranſverſly backwards, leſſens it ſelf, and becomes tendinous at its Inſertion to the Root of the great *Trochanter* of the Thigh-Bone, near the Termination of the laſt named Muſcle. This turns the Thigh outwards.

OBTURATOR *Internus*. See *Marſupialis*.

OBVENTIONS, ſignifies Rents or Revenues, properly of Spiritual Livings; as alſo Offerings.

OCCIDENT, is the Weſt Quarter of the Horizon; or 'tis that part of the Horizon where the Ecliptick, or the Sun therein deſcends into the lower Hemiſphere: In ſome Books you will meet with ſuch Terms as theſe;

OCCIDENT *Eſtival*, is that Point of the *Horizon*, where the Sun ſets at its Entrance into the Sign *Cancer*, when the Days are longeſt.

OCCIDENT *Hybernal*, is that Point of the *Horizon*, where the Sun Sets when it enters into the Sign of *Capricorn*, at which time the Days (with us) are ſhorteſt.

OCCIDENT *Equinoctial*, is that Point of the *Horizon*, where the Sun ſets when it enters *Aries* or *Libra*.

OCCIDENTAL (*i. e.* Weſtward) in *Aſtronomy*, a Planet is ſaid to be *Occidental* when it ſets after the *Sun*.

OCCIPITALIS, and its Partner, are Short, but Broad, Thin, Fleſhy Muſcles, ſituated on the *Occiput*, from whence they derive their Names; when theſe act, they pull the Hairy-Scalp backwards.

OCCIPITIS *Os*, is a Bone of the *Cranium*, that lies in the hind-part of the Head; it is almoſt like a Lozenge with its lower Angle turned inwards; it joins the *Oſſa Parietalia* and *Petroſa*, by the *Sutura Lambdoidalis*: It is thicker than any of the other Bones of the *Cranium*, yet it is very thin where the *Splenius*, *Complexus*, *Trapezius*, are inſerted. Externally it is rough, Internally it has two *Sinus's*, in which lie the Protuberances of the *Cerebellum*, and two large Furrows, in which lie the *Sinus Laterales*.

It has Seven Holes: The 1ſt two are common to it and the *Oſſa Petroſa*; the lateral *Sinus's* and the *Par vagum*, paſs thro' them. The Third is the great Hole thro' which the *Medulla Spinalis* paſſes. The Fourth and Fifth are the Holes thro' which the ninth pair of Nerves paſſes. The Sixth and Seventh are two Holes, thro' which there paſs two Veins, which bring the Blood from the External Teguments to the *Sinus Laterales*; ſometimes there is but one, and ſometimes none of theſe two; there are ſometimes two more thro' which the Vertebral Veins paſs.

This Bone has alſo two *Apophyſes*, one on each ſide of the great Hole; they are lined with a Cartilage, and articulated with the firſt *Vertebra* of the Neck. It has alſo a ſmall Protuberance in its middle, from which there goes a ſmall Ligament, which is inſerted into the firſt *Vertebra* of the Neck. It is longer in Beaſts than in Men.

OCCULTATION, in *Aſtronomy*, is the Time that a Star or Planet is hid from our Sight, when Eclipſed by the Interpoſition of the Body of the Moon, or ſome other Planet between it and us.

OCCUPANT. If Tenant *par terme de auter vie dies*, living *Ceſtuy que vie*; he that firſt enters ſhall hold the Land, during the other Man's Life, and he is in Law called an *Occupant*, becauſe his Title is by his firſt *Occupation*; and ſo if a Tenant for his own Life, grant over his Eſtate to another, if the Grantee dies, there ſhall be an *Occupant*.

OCCUPATION, ſignifies (in Law) the putting a Man out of his Free-hold in time of War, and is all one with the *Diſſeiſin* in time of Peace, only it is not ſo dangerous. 'Tis taken alſo for Uſe or Tenure, as when 'tis ſaid, ſuch Land is in the Tenure or *Occupation* of ſuch a Man, that is, in his Poſſeſſion.

OCCUPAVIT, is a Writ that lieth for him which is ejected out of his Land or Tenement in times of War, as a Writ of Novel *Diſſeiſin* lies for one ejected in time of Peace.

OCEAN, is by Geographers taken for that great Collection of Waters, or large Sea, which compaſſes in the whole Earth, and into which the other leſſer Seas do uſually run.

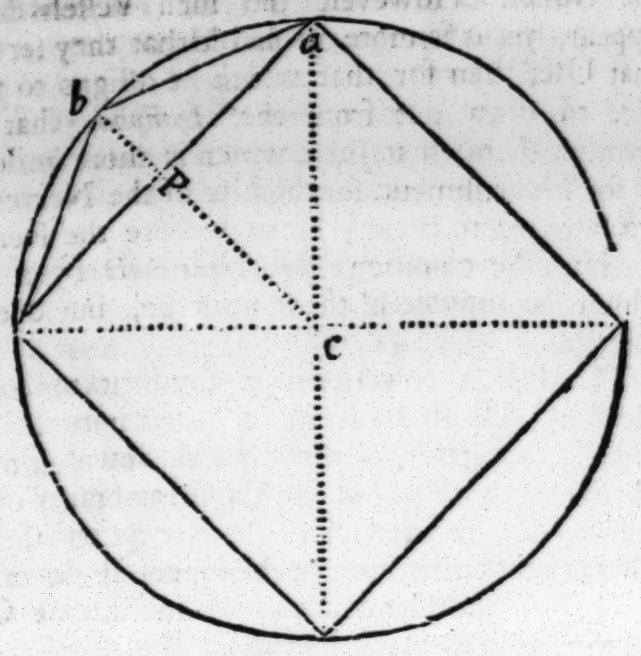
The Surface of the whole Ocean, or of all the Seas of the Globe, Mr. *Keil* computes (in his Examination of Dr. *Burnet's Theory of the Earth*) to be 85490506 ſquare Miles; and therefore ſuppoſing the Depth of the Ocean *Communibus Locis* to be $\frac{1}{4}$ of a Mile, the Quantity of Water in the whole is 21372626$\frac{1}{2}$ Cubick Miles.

OCHTHODES, are Ulcers whoſe ſides are Callous, or of the Nature of Warts, but not malignant. *Blanchard*.

OCTAGON, in *Geometry*, is a Figure of eight Sides and Angles. And this, when all the Sides and Angles are equal, is called a *Regular Octagon*; or which may be Inſcribed in a Circle.

PROPOSITION.

The Side of such a Regular Octagon (b a) *is equal in Power to half the Side of the Square* a p, *and to the Difference between that half side and the Radius*: (viz. b p,) *taken both together.*



DEMONSTRATION.

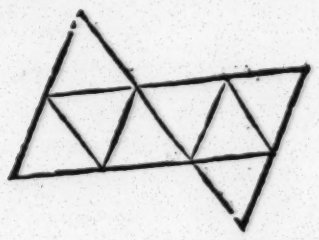
That $b\,a\,\square = b\,p\,\square + p\,a\,\square$ is plain from the 47 *è* 1 *Euclid.*

All therefore that is wanting to be proved, is that $b\,p$ is the Difference between the half side of the Square and the Radius; which will be very evident when you consider that $p\,c$ must be equal to $p\,a$, because the Angle *a* and *c* being both Semi-right, must be Equal.

OCTANT, or OCTILE, in *Astronomy*, signifies a Planets, *&c.* being in such an Aspect or Position to another, that their Places differ only an eighth part of a Circle, or 45 deg. from one another.

OCTAHEDRON; see *Regular Bodies.*

The following Figure being drawn on Past-board, half cut thro', and then folded up, will represent an Octahedron.



The *Octahedron* is two Pyramids put together at their Bases, therefore its Solidity is obtained by multiplying the Quadrangular Base of either (here they are both joined together in the middle of the Figure) by one third of the Perpendicular Height of one of them, and then doubling the Product.

OCTAVE, or *Eighth* in Musick, is an Interval of Eight Sounds; every Eighth Note in the Scale of the *Gam-ut*, being the same as far as the Compass of Musick requires. Tho' an Humane Voice can reach only to three of these *Octaves*, but the Tones of the Organ go as far as Eight.

OCTO *Tales*; see *Tales.*

OCULUS, in *Botany*, signifies the same with *Gemma*, or a *Budd* of a Tree, or any Plant.

OCULUS, the Eye, is the external Organ of the Sight; it is compounded of *Six Muscles*, to wit, of two direct, and as many Transverse ones; to which a seventh is added in Brutes. It has seven Tunicks, the *Adnata*, *Innominata*, *Cornea*, *Uvea*, *Retiformis*, *Chrystallina*, and *Vitrea*: It has also the *Optick Nerve*, the *Iris*, and the *Pupilla*. See them singly in their proper Places. *Blanchard.*

How Vision or Sight is made in the Eye. See *Vision* or *Eye.*

OCTOSTYLE, in *Architecture*, is the Face of an Edifice adorned with Eight Columns.

OCULORUM *Motores*, a pair of Nerves arising from the *Medulla oblongata*, on each side of the *Infundibulum*, and having the *Carotidal* Arteries lying between them: From thence passing thro' the *Foramina Lacera* of the *Os Sphænoides*, they give a Branch, which with a Branch of the fifth pair, forms a considerable *Plexus*, which sends out several Twigs that embrace the *Optick Nerve*, and are spent on the Tunicles of the Eye; they give a Branch to the Muscles called *Attollens*, *primens*, and *Obliquus Minor.*

ODAXISMUS is the Itching of the Gums when Children breed Teeth. *Blanchard.*

ODONTALGIA, the Tooth-ach.

ODONTOIDES, that which is like a Tooth, as the Tooth of the second *Vertebra*, and of other Bones. *Blanchard.*

ODOR, by this Word the Ancients did signifie sometimes the *Sense of Smelling*; but now 'tis generally and more properly used for those agreeable or disagreeable Effluvia, which are emitted by many Bodies which are called *Odorous*, and which excite in us the Sensation of *Smelling.*

ODOURS. That Odours depend very much on the Texture of Odorous Bodies, is plain from this Experiment, that that very Odorous Body *Camphire*, when dissolved in and mingled with Oyl of *Vitriol*, will in a manner quite lose its Scent; but as soon as ever a little Water is poured into the Solution, the proper Odour of the *Camphire* will be restored, and diffused all around.

OEDEMA, is sometimes taken in a large Sence, by *Hippocrates*, for any Tumour; but strictly, for a white, soft, insensible Tumour, proceeding from pituitous Matter heaped up together. It has no Pulse, and yields easily to the Fingers: it may proceed likewise in some measure from the *Lympha*, or Nutritious Juice extravasated and turned into a Jelly. *Blanchard.*

OESOPHAGEÆUS, or *Sphincter Gulæ*, seems to be a Continuation of the Muscle called *Pterigopharyngæus*, arising from each side of the Scutiformal Cartilage, and like it, passes to a middle Line on the back-part of the *Fauces.*

This do's not assist the *Pterigopharyngæus* in compressing the masticated Aliment into the *Gula*, but is thought by some to strengthen the *Scutiformis*, and render the Tone of the Voice more acute.

OESOPHAGUS, the Gullet, is the Pipe or Funnel that conveys the Meat into the Stomach. It is an Organical Part of the Body, round and hollow, beginning at the Root of the Tongue behind the *Larynx*, (which Part of it is called *Pharynx*)

and

and deſcendeth from thence directly, between the Windpipe and *Vertebræ* of the Neck, and the Four firſt *Vertebræ* of the *Thorax*, upon which it reſteth; but when it is come to the Fifth *Vertebra*, it giveth way to the deſcending Trunk of the great Artery, by bending a little to the Right ſide; afterward accompanying the Artery down to the Ninth *Vertebra*, there it turns a little to the Left again, and climbs upon the Artery; and by and by, about the Eleventh *Vertebra*, it paſſeth thro' the Midriff, a little on the Left ſide of its Nervous Centre, at a Hole diſtinct from that of the great Artery, and is inſerted or continued into the Left Orifice of the *Ventricle*.

It is compoſed of Three *Membranes*; the Outmoſt is common to it and the Stomach, and is very thin, being endowed only with membranous Fibres, and thoſe very ſlender. Some derive its Origin from the *Midriff*, ſome from the *Pleura*, and ſome from the Ligaments of the *Vertebræ* of the Neck and Breaſt, upon which it reſteth: All which Opinions (according to Dr. *Gliſſon*) may be true, if they be intended only of an Origin of Continuation or Connexion, ſeeing it is continued plainly to the Three firſt, and knit to the laſt; but none of them is true, if they be intended of a ſuſtaining or maintaining Origin, or of a Principle of Influence. The Second or Middle is fleſhy and thick, and conſiſts of Two Ranks of fleſhy Fibres, which aſcend and deſcend obliquely, (ſpiralwiſe) and do mutually intercuſſate or croſs one another, ſo as that the Fibre, which before it met with another to interſect, did lie underneath another, rides upon that which it interſects, and ſo continues uppermoſt, till it comes to a ſecond, and ſo on by Turns. The Third or Innermoſt is endued with ſlender ſtrait Fibres, and thoſe only, as Ancient Anatomiſts have taught; but Dr. *Willis* affirms it to have Fibres of divers kinds, and thoſe diverſly woven one with another. It is wholly nervous, ſaving a certain hoary or downy Subſtance that cloaths its Inſide. It is continued to that Membrane that covereth the Mouth, Jaws and Lips; and (according to Dr. *Willis*) it deſcends Three Fingers Breadth below the Mouth of the Stomach.

From its being thus common to the Mouth, Gullet, and upper Orifice of the Stomach, proceeds that great Conſent among theſe Parts in Vomiting, &c.

It hath *Veins* in the Neck from the Jugulars, in the *Thorax* from the *Vena ſine pari*; but where it is joined to the Stomach, it hath ſome Twigs from the *Ramus coronarius*, which is a Branch of the *Vena portæ*.

It hath *Arteries* in the Neck from the *Carotides*; in the *Thorax*, from the *Intercoſtals*; and in the *Abdomen*, from the *Ramus cæliacus coronarius*.

Nerves it hath, from the *Par vagum* or Eighth Pair.

It hath Four *Glandules*; Two in the Throat, which are called *Tonſillæ*, or Almonds, common to it and the *Larynx*, which ſeparate a mucous or pituitous Humour to moiſten them. Other Two it hath near its middle, on its out and back-ſide, about the Fifth *Vertebra* of the *Thorax*; namely, where it gives way to the Trunk of the *Aorta*, and turns ſomewhat to the Right ſide, or at the Place where the *Aſpera Arteria* is divided into two Branches. Theſe are as big, each of them, as a Kidney-bean, and of the ſame Shape; but ſometimes there are more than two, and then they are leſs: They are ſoft and fungous; and their Uſe hath been reckoned to be for the Separation of a Juice to moiſten the Gullet. But Dr. *Wharton* rejects this Opinion, becauſe there appears no excretory Veſſels that might convey the Liquor that is ſeparated in them to within the Gullet. However, tho' ſuch Veſſels do not appear, yet it is more probable that they ſerve for that Uſe, than for that which he aſſigns to them, *viz.* to draw out from the *Lympha*, that runs through them, that Juice which is more mild and fit for Nouriſhment, for the Uſe of the Nerves that are faſtened to them; or to depoſite the Remainder into the common *Chyliferous Duct* by a Pipe, which he ſuppoſeth there muſt be, but does not deſcribe.

The Gullet ſerveth as a Conduit to convey Meat and Drink by from the Mouth to the Stomach; for theſe being turned down into the Throat by the Tongue, all the Membranes of the *Pharynx* are relaxed for the Reception thereof, and preſently the ſame are ſqueezed down the Gullet, by the Conſtriction of its middle Coat, and the Muſcles of the *Pharynx*.

OFFA *Alba*. So *V. Helmont* calls a white Coagulation which will ariſe, if equal Parts of highly Rectified Spirits of Wine and Urine be mix'd and ſhaken together; but the Spirit of Urine muſt be diſtilled from well-fermented Urine, and it muſt be truly dephlegmated, or elſe it will not ſucceed.

OFFICE, ſignifies not only that Function, by Virtue whereof a Man hath ſome Employment in the Affairs of another; but alſo an Inquiſition made to the King's Uſe of any thing, by virtue of his *Office* who enquireth: And therefore we oftentimes read of an Office found, which is nothing elſe but ſuch a thing found by Inquiſition made *ex officio*. And 'tis uſed in this Sence in 33 *H.* 8. 20. and in *Stamf. Prærog.* Fol. 6. 61. Where *to traverſe an Office*, is to traverſe the Inquiſition taken of an *Office*. And in *Kitchin*, Fol. 177, *to return an Office*, is to return that which is found by virtue of the *Office*. And there be two ſorts of *Offices*, in this Signification, iſſuing out of the *Exchequer* by Commiſſion, *viz. An* Office *to entitle the King to the Thing enquired of*, and *An* Office *of Inſtruction*. *Office in Fee*, is that which a Man hath to himſelf and his Heirs.

OFFICIAL. This Word, by the Ancient Civil Law, ſignified him that was the Miniſter or Apparitor of a Magiſtrate or Judge. In the Canon Law it is ſpecially taken for him to whom any Biſhop doth generally commit the Charge of his Spiritual Juriſdiction: And in this Sence, one in every Dioceſs is *Officialis Principalis*, whom the Statutes and Laws of this Kingdom call *Chancellor*: The reſt, if there be more, are by the Canon Law called *Officiales Foranei*, but in Common Law *Commiſſioners*. The Difference of the Two Powers you'll find in *Linwood*, *Tit. De Sequeſtra poſſeſſ.* cap. 1. *verbo Officialis*. And this Word *Official*, in our Statutes and Common Law, ſignifies him whom the Arch-deacon ſubſtituteth in the executing of his Juriſdiction.

Officiatus non faciendis vel amovendis, is a Writ directed to the Magiſtrates of a Corporation, willing them not to make ſuch a Man an Officer, and to put him out of the Office he hath; until

Enquiry

Enquiry be made of his Manners, according to an Inquiſition formerly ordained.

OFFIN. So the Seamen call that Part of the Sea which is a good Diſtance from Shoar, where there is deep Water, and no need of a Pilot to conduct the Ship into the Port. Thus if a Ship from Shoar be ſeen ſailing out to Sea-ward, they ſay ſhe ſtands for the *Offin*; and if a Ship having the Shoar near her, have another good way without her, or towards the Sea, they ſay that Ship is in the *Offin*.

OFF-WARD. If a Ship, being a-ground by the Shore, doth heel towards the Water-ſide, they ſay ſhe heels to the *Off-ward*; ſo if ſhe lie with her Stern only to Sea-ward, they ſay ſhe lies with her Stern to the *Off-ward*, and her Head to Shoar-ward.

OGRESSES, a Term in Heraldry; the ſame with *Pellets*, which ſee.

OIL, which the Chymiſts call *Sulphur*, is the Second of their *Hypoſtatical* and of the true Five Chymical Principles. 'Tis an inflammable, unctuous, ſubtile Subſtance, which uſually ariſes after the Spirit. The Chymiſts attribute to this Principle all the Diverſity of Colours, and all the Beauty and Deformity of Bodies: Probably their various Odours do in a great meaſure ariſe from it. And it ſweetens the Acrimony of Salts; and by ſtopping or filling up the Pores of a mixt Body, keeps it longer from Corruption, where it abounds. And we find that the *Ever-greens*, ſuch as *Box*, *Holly*, &c. do abound more with Oil than other Plants.

There are two ſorts of Oils; One which ſeems to be mixt with Spirit, (for it can never be drawn pure) and which will ſwim upon Water; ſuch as Oil of Aniſeeds, Lavender, Roſemary, *&c.* which the Chymiſts call *Eſſential*, and is commonly drawn in a Limbeck with ſtore of Water. And another kind, which probably is mixt with Salts, and theſe will ſink in Water; ſuch as the Oils of ponderous Woods, as of Guaiacum, Box, Cloves, *&c.*

There are ſome things which are very improperly called Oils; as *Oil of Tartar per Deliquium*, which is only a Fixt Salt diſſolved. *Oil of Vitriol*, which is nothing but the moſt cauſtick and ſtrongeſt part of the Spirit of Vitriol. *Oil of Antimony*, which is only a Mixture of Antimony, and an acid Spirit.

Mr. *Boyle*, to ſhew the Producibleneſs of Chymical Principles, tells us, That by mixing carefully and gradually together an equal Weight of Oil of Vitrol, and truly rectified Spirit of Wine; and then, by a very wary Management of the Fire, drawing off what will come over, he could obtain (beſides a ſubtil odoriferous Spirit, and an acid and ſulphurous Liquor) a conſiderable Quantity of Chymical Oil, ſometimes deeply coloured, ſometimes pale like Water, and ſometimes exceeding fragrant, and without any Acidity in it at all; yet was ſo ponderous, as not only to ſink in Water, but even in the acid Spirit which was drawn off with it, and ſeems to be the Oil of Vitriol only altered and exalted; nor would this Anomalous Oil at all mingle with Water, tho' both the Oil and Spirit, from whence it was diſtilled, would readily do ſo.

OIL *of Philoſophers*. So the Vapouring Chymiſts call a Diſtillation in a Retort of pieces of Brick heated red hot, and then caſt (while ſo) into Oil of Olives, the Bricks will imbibe a good deal of Oil; which Oil being afterwards drawn from them again, is their *Oil of Bricks*, or *Oil of Philoſophers*; and they attribute great Vertues to it.

OIL *of Sulphur per Campanam*. See *Spirit of Sulphur*.

OIL *of Tartar per Deliquium*, is a Fixt Salt of Tartar diſſolved, by being expoſed to the Air in a cool moiſt Place.

OIL *of Vitriol*, improperly ſo called, is what remains in the Cucurbite after the Diſtillation of Vitriol is rectified, and the Sulphureous and Acid Spirit both drawn off; 'tis the more Fixt Part of the Spirit of Vitriol, rendered Cauſtick by a vaſt Degree and Continuance of Fire. 'Tis uſed in the Diſſolution of Metals, and ſometimes given inwardly, when in a ſmall Doſe, and duly diluted.

This Oil, if it be mingled either with Spirit of Vitriol, common Water, or any *Etherial Oil*, as the Chymiſts call Oil of Turpentine, *&c.* it will grow ſo very hot, as often to break the Viol that contains the Mixture.

OLEAGINOUS, Oily, or pertaining to the Nature of Oil: Thus in Soap, which is made of Oil, (or Greaſe) Salt and Water; we ſay there are ſome *Oleaginous*, ſome *Saline*, and ſome *Aqueous* Parts.

OLECRANUM, or *Ancon*, is the greater Proceſs of the firſt Bone of the Cubit called *Ulna*; alſo the upper part of the Shoulder. *Blanchard*.

OLIGOTROPHUS *(Cibus)* is Meat that nouriſhes little; to which is oppoſed *Polytrophus*, that which affords much Nouriſhment. *Blanchard*.

OLIGOTROPHY, is a Decreaſe of Nutrition; or a very ſmall one.

OLFACTORY *Nerves*, or thoſe which give us the Senſe of Smelling, are the firſt Pair of thoſe Ten which ariſe from the *Medulla oblongata*: They come from the Baſis of the *Corpora ſtriata*, and paſſing through the little Holes of the *Os Cribriforme*, they are ſpread upon the Membrane which covers the *Os ſpongioſum*.

OLIVARIA *Corpora*, are two Protuberances of the under part of the Brain, placed on each ſide of the *Corpora Pyramidalia*, towards the lower end; having their Name from their Figure, which is like that of an *Olive*.

OLOR. See *Cygnus*.

OLYMPIAD, a Term in Chronology, ſignifying the Space of Four Years, or Fifty Months, reckoning Thirty Days to a Month; from whence the Ancient *Grecians* derived their Account of Time. This kind of Computation took its Riſe from thoſe Famous *Olympick* Games which were celebrated every Fifth Year, in the Eſtival Solſtice, during Five Days, on the Banks of the River *Alpheus*, near the City *Olympia*, where the noted Temple of *Jupiter Olympicus* ſtood. The Firſt *Olympiad* began about 500 Years after the Deſtruction of *Troy*, in the 3938 Year of the *Julian Period*, *A. M.* 3174, and 766 Years before Chriſt.

OMENTUM, *Rete*, or *Reticulum*, the Cawl, is a double Membrane ariſing from the *Peritonæum*, or as ſome ſay, from the *Myſentery*, ſpread upon the Inteſtines or Guts, interwoven with fat and ſmall Veſſels like a Fiſher's Net, enriched alſo with two or three Glandules; on the Fore-part it is annexed to the Bottom of the Stomach

mach, to the Gut *Colon*, to the Spleen; and ſometimes to the *Pancreas*, and the round Lobe of the Liver.

Its Uſe is to cheriſh the Inteſtines with its Warmth, and to facilitate the Concoction of the Aliments in the Guts, as well as to knit looſely the Stomach, Spleen, Pancreas, Colon, &c. together.

It hath ſome Milky and Lymphatick Veſſels, as alſo a great many *Ductus*'s, and little Bags of Fat.

OMOPLATA, and *Homoplata*, the ſame with *Scapula*.

OMPHALMICUS, is a Branch of the Fifth Pair of Nerves which move the Eye.

OMPHALOCELE, is a Rupture about the Navel, to wit, when the Cawl or Inteſtines are Protuberant in that Part; which happens from a Relaxation, or burſting of the *Peritonæum*.

ONERANDO *pro rata portionis*, is a Writ that lies for a Joint-Tenant, or Tenant in Common, that is diſtrained for more Rent than his Proportion of the Land cometh to.

ONI. In the *Exchequer*, as ſoon as a Sheriff enters into his Accompts, for Iſſues, Amerciaments, and mean Profits, they ſet upon his Head this Mark, *Oni*, which denotes *Oneratur, niſi habet ſufficientem exonerationem*; and thereupon he forthwith becomes the King's Debtor, and a *Debt* is ſet upon his Head; and then the Parties *Peravayle* become Debtors to the Sheriff, and diſcharged againſt the King.

ONYX, the ſame with *Hypopyon*, a gathering of Matter under the *Tunica Cornea* of the Eye.

OPACOUS *Bodies*, are ſuch whoſe Pores (probably) lying in an oblique and crooked Poſition, the Rays of Light cannot freely permeate and paſs through them, as they do thro' tranſparent ones; wherefore if you hold them up againſt the Light, you cannot ſee through them.

OPEN *Flank*, in Fortification, is that part of the *Flank* which is covered by the *Shoulder* or *Orillion*.

OPERA, is a ſort of Solemn Entertainment of Muſick upon the Theatre or Stage, and is very common in *France* and *Italy*: It uſually begins with an *Ouverture*, which commonly ends with a *Fugue*; the reſt is compoſed of *Symphonys*, *Recitativo*'s, *Chacoons*, *Preludes*, &c. with all ſorts of Vocal and Inſtrumental Muſick.

OPHIASIS, is a Diſeaſe where the Hairs grow thin and fall off here and there, ſo that they leave the Head ſpotted like a Serpent. *Blanchard*.

OPHIUCUS, one of the Northern Conſtellations, the ſame with *Serpentarius*: It contains 30 Stars, of which, one in the Head of the Man holding the Serpent, is of the ſecond Light or Magnitude.

OPHTHALMICKS, are ſuch Medicines as are good for Diſeaſes in the Eyes.

OPIATES, are Medicines made of *Opium*, or ſomething of the ſame Nature with it, deſigned to cauſe Sleep, and to eaſe Pain: When they produce the latter Effect, they call them *Anodynes*; when the former, *Hypnoticks*; and when they cauſe a very great Sleep or Stupefaction, *Narcoticks*. The Foreign Phyſicians confound an *Opiate* and an *Electuary*; ſee *Blanchard* on the Word *Opiata*.

OPISTHOTONUS; ſee *Poſticum*.

OPISTHOTONUS, or *Tetanus*, is a kind of Cramp, or ſtretching of the Muſcles of the Neck backwards; which proceeds ſometimes from a Palſie of the Muſcles of the Neck, whereupon the Antagoniſts or oppoſite Muſcles move the intermediate Parts too much; or from a ſharp and ſerous Matter in the Tendons; or from the Animal Spirits which enter the Fleſhy Pipes more than uſual, and will not eaſily recede, ſo that the Parts are ſwelled and wrinkled up. *Blanchard*.

OPPOSITE *Angles*; ſee *Angles*.

OPPOSITE *Cones*, are two Similar Cones vertically oppoſite, and having the ſame common Axis. And

OPPOSITE *Sections* are the two *Hyperbola*'s made by a Plane cutting both thoſe Cones. See the Figure under the Word *Latus Tranſverſum*, where the Cones VAD and BVA are oppoſite, and the Sections ODO, OEO, are oppoſite *Hyperbola*'s.

OPPOSITION, is that Poſition or Aſpect of the Stars or Planets, when they are 6 Signs, or 180 Degrees diſtant from one another, and is marked thus ☍.

OPTATIVE *Mood*, (in Grammar) is the way of forming a Verb ſo, as that it may expreſs an ardent Deſire that ſuch a Thing may happen; and therefore there is uſually an Adverb of wiſhing connected with it, as *Utinam*, &c.

OPTHALMY, is an Inflammation of the Tunicks of the Eyes, proceeding from Arterious Blood, collected and extravaſated there, becauſe it cannot return by the Veins. *Blanchard*.

OPTICKS, is a Mathematical Science that treats of the *Sight* in general, and of every thing that is ſeen with *direct Rays*; and explains the ſeveral Properties and Effects of Viſion in general, and properly of that which is direct and ordinary: For when the Rays of Light are conſidered as reflected, the Science which teaches their Laws and Properties, is called *Catoptricks*; and when the Refraction of Rays is conſidered, and the Laws and Nature of it explained and demonſtrated, the Science is called *Dioptricks*. So that *Opticks* comprehends the Whole; of which *Catoptricks* and *Dioptricks*, are the two Parts.

OPTICK *Glaſſes*. Sir *Iſaac Newton*, in his *Philoſ. Natur. Princip. Math. Lib.* 1 *Schol. ad Prop.* 98, ſays, That for all *Optick* Uſes, *Spherick* Figures are the moſt commodious. If the Object-Glaſſes of *Teleſcopes* were compoſed of two *Spherick Glaſſes* containing Water between them, perhaps the Irregularity of the *Refractions* that are made on the Surfaces of the Glaſſes towards their Edges, may be accurately enough corrected by the Refractions of the Water. And ſuch Object-Glaſſes are preferable to *Elliptick* or *Hyperbolick* Glaſſes, not only becauſe they are eaſier and more accurately to be formed, but alſo becauſe they refract more accurately thoſe Pencils of Rays that are (*collateral*, or) out of the Glaſſes Axis. But the *different Refrangibility* of different Rays will for ever hinder us from perfecting *Opticks* by Glaſſes, either Spherick, or of any other Figures whatſoever: And unleſs we can correct the Errors that ariſe from hence, all our Labour is loſt in other Corrections.

Nor indeed is it poſſible, by whatever Figures, to render the Appearance of the *Collateral* Parts of an Object ſo diſtinct as the Direct; for the very Natural Eye does it not: And therefore we are

are forced to apply it ſucceſſively, *directly* before the Parts of any Object we deſign to view.

To know whether Optick-Glaſſes *be truly* Centered, *or not.*

Firſt Way.

Holding the Glaſſes at a due Diſtance from the Eye, obſerve the two reflected Images of a Candle; for where thoſe two Images *unite*, or *Coaleſce*, there is the *true Centre* of the *Glaſs*: And if this be in the *middle* or *central* Point of the *Glaſs*'s Breadth, the Glaſs is *truly centered.*

A Second Way is

By preſenting the Glaſs before the Sun, and making it reflect the Light on a Plane nighly parallel to its Surface, and at a proper Diſtance; for then you'll perceive two ſorts of Light reflected, one *ſmaller*, but much more *ſtrong* and *vigorous*, within another more *faint* and *large*. Then by a due Poſture of the Glaſs (found by Trials) both theſe Lights are to be projected as round as poſſible, and at a proper Diſtance from the Wall on which they are reflected; the *round brighteſt Spot* is to be brought into the ſmalleſt Compaſs that it can. (Trial will make all this plain.) When the Glaſs is in this Poſture, if the *bright Spot* be projected juſt in the middle of the fainter Light, the Glaſs is *well centered*: But to whatever ſide of the *faint* Light this *bright* Spot is projected, *on that ſide* is the Glaſs *thickeſt*, and on that ſide lies the *true Centre.*

A Third Way

Of Examining the Centres *of Glaſſes, is yet more* Compleat *than the former: For it does not only diſcover the Fault, (if there be any, as in long* Object-Glaſſes *'tis very rare but there is, eſpecially if they be wrought in the* Form *by the unguided Hand, and not by an Engine) but withal it rectifies the Fault; and is thus:*

Cover the Surface of the Glaſs within a thin piece of Paper, in which there is cut a round Hole of about an Inch Diameter; about this Hole there are to be ſtruck two or three Concentrick Circles. Move this Paper upon the Glaſs, 'till you ſee on the Plane that receives the reflected Light, that the *bright* Spot is exactly in the middle of the other fainter Light round it.

This alſo one may meaſure by a Pair of Compaſſes, having, to that end, ſlightly fix'd the Paper to the Glaſs, that we may more nicely determine whether this *bright* Spot be exactly in the middle. This therefore being carefully adjuſted, by gently ſliding the Paper on the Glaſs, (if it be requiſite) we are, without the leaſt altering this true Poſition of the Paper, to fix it more firmly to the Glaſs; and laying it thus on a Table, let us mark on the Glaſs (by the Point of a Diamond) three Points in one of the Circumferences concentrick to the round Hole in the Paper; and ſticking a ſmall piece of Cement on the Glaſs, about the middle of the round Hole, by means of the three marked Points let us find the exact Centre of this round Hole: Then uncovering the whole Glaſs, (except only the Cement in which the Centre is marked) with a Diamond-pointed Compaſs let us ſtrike as large a Circle on the Glaſs as its Breadth will bear; then *round* the Glaſs according to this Circle, and 'tis as exactly *centred* as the Senſe can judge.

For trying the Regularity and Goodneſs of an Object-Glaſs, *to the greateſt Exactneſs.*

On a Paper ſtrike two Concentrick Circles, one whoſe Diameter is the ſame with the Breadth of the Object-Glaſs, t'other, of half that Diameter: This inward Circumference divide into ſix equal parts, by the known way of applying the Radius ſix times in the Circumference, and making ſix fine ſmall Holes therein with a Needle. Let us cover one ſide of the Glaſs with this Paper, and then expoſing it to the Sun, we are to receive the Rays that paſs through theſe ſix Holes, on a Plane, at a juſt Diſtance from the Glaſs; and by withdrawing or approaching this Plane from or to the Glaſs, we ſhall find whether the Rays that paſs through theſe ſix Holes unite exactly together at any Diſtance from the Glaſs; if they do, we may be aſſured of the *Regularity* of the Glaſs, that is of its *juſt Form*; and at the ſame time we obtain exactly the Glaſs's *Focal* Length.

But, after all, there is no better way for trying the Excellency of an *Object-Glaſs*, than by placing it in a Tube, and trying it with ſmall Eye-Glaſſes, at ſeveral diſtant Objects: For that Object-Glaſs that repreſents the Objects the *brighteſt* and moſt *diſtinct*, that bears the *greateſt Aperture*, and moſt Convex and Concave Eye-Glaſs, without Colouring or Hazineſs, is ſurely the beſt. The moſt convenient Object to try them at, is the *Title Page* of a large Book, where there are generally Letters printed of divers Magnitudes, and therefore affords Variety of ſmall Objects; whereby the Comparative Excellency of Object-Glaſſes may be nicely eſtimated.

OPTICK *Nerves*, or the *Nervi Viſorii*, are the Second Pair, which beſtow on the Eyes the Faculty of Seeing. They ſpring from the upper ſides of thoſe unequal Protuberances of the *Crura* of the *Medulla oblongata*, which are called *Nervorum opticorum thalami*; from whence being carried forward, and ſomewhat downwards, after having fetch'd a Compaſs, they meet one another about the *Infundibulum*, upon the *Sella* of the *Os ſphænoides*; where they are united by the cloſeſt Conjunction, but not Confuſion, of their Fibres, which run parallel lengthways in theſe Nerves, as they do in all other.

They are obſcurely hollow untill they be united; but after, their Hollowneſs cannot be diſcerned. This Hollowneſs may be ſhewed in a large Beaſt newly killed, and in a clear Light.

Thus do *Riolanus*, *Gliſſon*, &c. teach; but *Veſalius*, *Aquapendente*, &c. deny that they have any manner of Cavity. *Malpighius* ſays, they have not one Cavity only, but ſundry; but that theſe Cavities reſult only from the Neceſſity of their Structure, all their inner or medullar part conſiſting of round *Inteſtinula* or Fibres running lengthways, which cannot be ſo cloſely fitted to one another, but that there will reſult long Interſtices, which yet perhaps are of no uſe, nor of

the Nature of Ducts, but only accidental; but whether the *Inteſtinula*, or Filaments themſelves, have not little Chanels in them (like to Blood-veſſels) he thinks may be doubted of: But ſeeing Senſe hath not diſcovered any ſuch, 'tis probable that there are to be admitted only little Pores and Interſtices in the medullar Subſtance, by means whereof the nouriſhing and vivifying Juice may be propagated. After their Unition they are ſeparated again, and each of them running farther forwards, paſſes thro' an Hole of the *Os Cuneiforme*, and is inſerted obliquely into the Centre of the Eye on its own ſide.

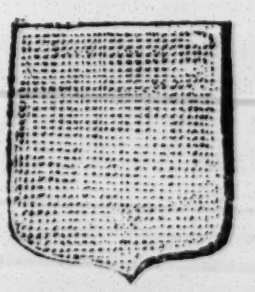
Dr. *Willis* ſays, they receive not only nervous Fibres from the Third Pair of Nerves, but alſo Twigs of Arteries from the fore Branches of the *Carotides*, which run upon them as far as the *Baſis* of the Eye: Whence, he thinks, a Reaſon may be aſſign'd, why, when a Man grows ſleepy after plentiful eating or drinking, he preſently feels a notable Heavineſs or Oppreſſion as it were about his Eyes. For when the Blood, becoming very turgid, fills the Veſſels that run through the Brain, more than uſual, and by diſtending them, ſtops the Pores of the Brain; theſe Nerves alſo in their whole Courſe are compreſſed by the Blood that is become turgid in their Blood-Veſſels likewiſe.

Dr. *Ridley* ſays, That he has ſeen the Blood-Veſſels to run not only upon or within them, but alſo in injected Bodies exactly quite thro' the medullary Subſtance of them, into the Reticular Coat of the Eye, wherein they end in an infinte Number of the moſt capillary Ramifications, which, by an Injection of that Artery, made with Mercury, becomes very delightfully conſpicuous to the Eye.

They are very ſoft, ſo long as they are within the Skull; but having paſs'd the *Os ſphænoides*, they become ſomewhat more firm and hard. The Reaſon of which Alteration ſeems to be, that within the Skull they are only clad with the *Pia mater*; but as they go out, they aſſume a Second Coat from the *Dura mater*.

From the whole Subſtance of theſe Nerves, *viz.* from their two Membranes and the inner medullar and fibrous Subſtance, are the three (proper) Tunicles of the Eyes framed; for the *Cornea* or *Sclerotica* doth proceed from the *Dura mater*, the *Choroides*, or *Uvea* from the *Pia mater*, and the *Retina* from the marrowy Subſtance.

OPTICK *Place of a Star or Planet*, is that Point or Part of its Orbit which is determined by our Sight when the Star is there: And this is either *True*, when the Obſerver's Eye is ſuppoſed to be at the Centre of the Earth or Planet he inhabits; or *Apparent*, when his Eye is at the Circumference of the Earth: And the Difference between theſe two is the *Parallax*, whoſe Uſe is great in determining the Diſtances of the Planets, *&c.*



OR, (*French*) in Heraldry, is the Colour of *Gold*; and they ſay without this, or *Argent*, there can be no good Armoury. In the Coats of Nobles 'tis called *Topaz*, and in thoſe of Sovereign Princes, *Sol*. 'Tis repreſented in Engraving by ſmall Points or Pricks, thus.

ORB, is only a Hollow Sphere.

ORBICULAR *Bone*, is one of the little Bones of the inward Ear, ty'd by a ſlender Ligament to the ſides of the *Stapes*.

ORBICULARIS, or *Conſtringens*, or *Oſculatorius*, is a Muſcle that draws both Lips together: 'Tis called alſo *Sphincter Labiorum*.

ORBICULARIS *Palpebrarum*, is a thin fleſhy Muſcle, whoſe Fibres do Circularly environ the Eye-lids, and are inſerted to them, (like the *Sphincter Labiorum*) not adhering to any Bone, from whence we may derive their Origin, except the Superior part of the great Bone of the Noſe, by ſome reckoned the fourth Bone of the Upper Jaw: The Muſcle acting like the Sphincters of all other Parts, conſtringes the Eye-Lids.

ORBIS *Magnus* is the Orbit of the Earth in its Annual Revolution round the Sun.

This *Copernicus*, Dr. *Gregory*, and ſome others, will have to be but a Point in compariſon of the Diſtance between us and the fix'd Star's: But our moſt Accurate Aſtronomer, Mr. *Flamſteed*, found a very ſenſible Parallax of this *Orbis Magnus*, in reſpect of the Pole Star; ſo that the Pole Star was nearer to the Pole in Summer (at the Solſtice) than in Winter by 40 or 45″; and this was the Reſult of above Seven Years moſt Accurate and continual Obſervation. And from hence he juſtly draws a *Demonſtration* for the *Annual Motion* of the Earth. *Vide Wallis Latin Works, Tom.* 3.

The Semi-diameter of this Annual Orbit of the Earth round the Sun, Dr. *Gregory* makes to be 500000000000, or Fifty Thouſand Millions of Feet; which is (allowing 5280 Feet to a Mile) 94.696969 Miles *Engliſh*. Which therefore may be taken for the mean Diſtance of the Earth from the Sun. And the Semi-diameter of *Saturn*'s Orbit, is about 10 times as great.

All the Ancients and the *Aſtronomers* before the Great *Kepler* ſuppoſed this Orbit to be a perfect Circle, but he proves it to be an Ellipſis; the remoteſt end of whoſe Longer or Tranſverſe Diameter is eight Signs and eight Degrees diſtant from the firſt Star in *Aries*, and having the Sun in one of its Focal Points.

ORBIT of any Planet, is the Curve that it deſcribes in its Revolution round its Central Body: Thus the Orbit of the Sun (or of the Earth) in its Annual Courſe, is the Ecliptick.

ORBITER *Exturnus*, is a Hole in the *Os Maxillare*, below the Orbit, thro' which the Nerves and Veſſels which come from the Teeth, paſs to the Cheeks.

ORBITER *Internus*, is a Hole in the *Coronal Bone*, within the Orbit a little above the *Os Planum*, thro' which paſſes a Branch of the fifth pair of Nerves which goes to the Noſe.

ORDER is a Term in *Military Diſcipline*, being the equal Diſtance of one *Rank* or *File* from another. The uſual *Order* in *Files* is 3 Foot, and in *Ranks* 6 Foot; the *Open Order* is double in each.

ORDER in *Architecture*, is a Rule for the Proportion to be obſerved in the erecting of Pillars, and for the form of certain parts appertaining to them.

So Buildings are ſaid to be of ſeveral *Orders*, when the Proportion between the thickneſs of the Columns, and their height, together with all things requiſite thereto are different.

There are Five Principal Orders *of* Architecture, *viz. The* Tuſcan, Dorick, Ionick, Corinthian, *and the* Compoſit.

The *Tuſcan* is the moſt Simple, and the moſt deſtitute of Ornaments, ſo that it is ſeldom uſed except

except in Vaults, in ſome Ruſtick Edifices, vaſt Piles of Buildings, as *Amphitheatres*, &c.

The *Tuſcan* Pillar with its Baſe and Capital generally hath for its height ſeven Diameters of its thickneſs taken below, and the top ought to be diminiſhed one quarter of its Diameter: The Pedeſtal is very plain, and only one Model high.

The *Dorick Order*, hath its Column eight Diameters high, and ought to have no Ornament neither in its Capital nor Baſe. The *Aſtragal* and *Liſtel* below the Capital, which is half a Diameter high, conſtituting part of the Shank or Body of this Pillar.

The *Ionick Order*, when firſt invented had its Column only eight Models high; but the Ancients deſigning to make it more beautiful, augmented the height of the Pillars, and added a Baſe not uſed before; ſo that with its Capital and Baſe it contains nine Diameters of its thickneſs taken below: The Pedeſtal is two Diameters, and about two thirds high; and the Capital is chiefly compoſed of *Voluta's* or Scrolls, which render it different from the other *Orders*: The *Ionick* Pillars are alſo uſually channelled with 24 Flutes.

The *Corinthian Order*, is the fineſt and richeſt of all; the Length of its Columns with their Baſes and Capitals, is commonly about nine and a half or ten Diameters; and the Capitals are adorned with two Rows of Leaves, and eight *Voluta's* that ſupport the *Abacus*.

The *Compoſit* or *Roman Order*, hath the Capital of its Pillar compoſed of two Rows of Leaves like the *Corinthian*, and of the *Voluta's* or Scrolls of the *Ionick*. Theſe Columns are uſually ten Diameters high, altogether like the *Corinthian* in all its Dimenſions and Numbers, except the Capital, which hath only four *Voluta's* taking up the whole Space, which is filled both by the *Voluta's* and Stems or Stalks in the *Corinthian*.

To theſe Five Orders, *may be added alſo*,

The *Attick*, which is a ſmall *Order* of *Pilaſters* of the ſhorteſt Proportion, having a Cornice raiſed after the manner of an Architrave, for its Entablature. As alſo

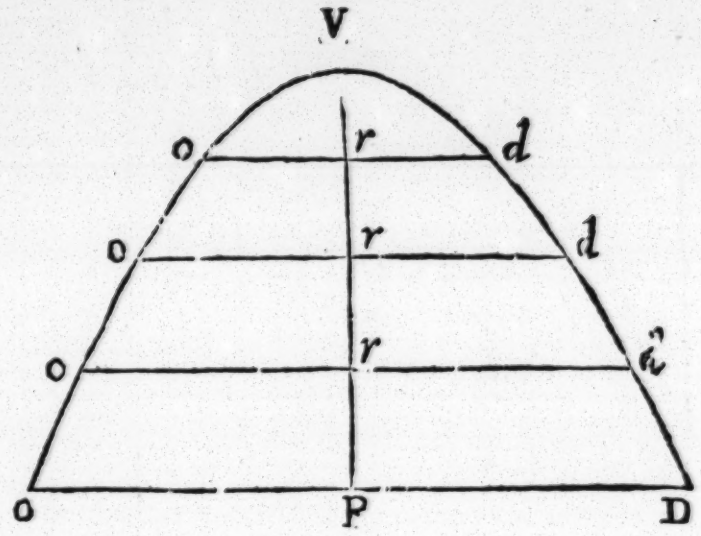
The *Gothick Order*, which is ſo far from the ancient Proportions and Ornaments, that its Columns are either too maſſie in form of vaſt Pillars, or as ſlender as Poles, having Capitals without any certain Dimenſions, carved with the Thorny Leaves of *Thiſtles*, *Coleworts*, *Bears-foot*.

ORDINANCE *of Parliament*, the ſame with *Acts of Parliament*: And Acts of Parliament are in the Parliament-Rolls often called *Ordinances of Parliament*. If there be any Difference, it is, that an *Ordinance* is but Temporary, and to be alter'd by Commons alone; but an *Act* is a perpetual Law, and cannot be altered but by King, Lords and Commons. But Sir *Edw. Coke* aſſerts, That an *Ordinance of Parliament* is to be diſtinguiſhed from an *Act*, for as much as the latter can be only made by the King and the threefold Conſent of the Eſtates, whereas the former is ordain'd with or by two of them.

ORDINARY, in the Civil Law, ſignifies any Judge that hath Authority to take Cognizance of Cauſes in his own Right, as he is a Magiſtrate, and not by Deputation; but in the Common Law, it is taken for him that hath exempt and immediate Juriſdiction in Cauſes Eccleſiaſtical.

ORDINARIES, in Heraldry, are ſuch Charges as are proper to the Art and Uſage of Armory; and therefore are commonly called the Honourable Ordinaries; and are the *Croſs*, the *Chef*, the *Pale*, the *Bend*, the *Feſſe*, the *Eſcutcheon*, the *Chevron*, the *Saltier*, and the *Bar*.

ORDINATE, or *Ordinate Applicate*, is a Line in any Conick Section drawn at Right Angles to and biſſected by the Axis, and reaching from one ſide of the Section to the other; the half of which is properly the Semi-ordinate, but is now uſually called the Ordinate.



Thus, in the Parabola O V D, O D, or *o d*, is an Ordinate rightly apply'd, and its half *r d*, or R D, is the true Semi-ordinate, tho' uſually called the Ordinate it ſelf.

The Properties of theſe Lines you will find under the ſeveral *Conick Sections*.

Dr. *Wallis* in his *Conick Sections*, calls the whole Ordinates O D, &c. the *Lineæ Ordinatim Inſcriptæ*, and the Semi-ordinates O R, &c. he calls the *Ordinate Applicates*.

ORDINATIONE *contra ſervientes*, is a Writ that lieth againſt a Servant for leaving his Maſter.

ORDNANCE, all ſort of Great Guns uſed in War. The ſeveral Parts of a Piece of Ordnance, or Great Gun, are thus called.

1. The Outſide round about the Piece, is called the *Superficies of her Metal*.

2. The Subſtance or whole Maſs of Metal, is called her *Body*.

3. The Part next to us when ſhe ſtands ready to fire, is called the *Breech* or *Coyle*, and the Pummel or round Knob at the End of it, is called the *Caſcabell*; by ſome the *Caſcabell Dock*.

4. The *Trunnions* are the two Knobs, Spindles, or Ears, which hold the Piece in the Carriage.

5. *Maniglions* or *Dolphins*, after the *German* way of caſting Guns, are two Handles placed on the Back of the Piece near the *Trunnions*, and near the Centre of Gravity, to mount and diſmount it the more eaſily.

6. The *Rings* about it are these four: The *Base Ring* is that which is next below the Touch-hole: The next Ring above the Touch-hole is called the *Reinforced Ring*: The next to that forward the *Trunnion Ring*: The next to that, the *Cornice-Ring*: And that at the Mouth is called the *Muzzle-Ring*, or the *Freeze*: Also all the Rings near the Mouth are sometimes called the *Freezes*.

7. As to the Internal Parts, the whole Cavity or *Bore* of the Piece is called her *Chase*. That Part of the Cavity between the *Trunnions*, and the *Muzzle* or Mouth, is called the *Vacant Cylinder*: The Part from the *Trunnions* to the end of the Cavity, or so much of it as containeth (or is *Loaded* with) the Powder and Shot is, called the *Chamber*. The Diameter of the Mouth is called the *Calibre*. The Space between the Shot and the Hollow Superficies of the Piece within is called the *Vent*; being the Difference between the Diameter of the Shot, and of the Mouth of the Piece.

Great Guns in *England* are distinguished into two kinds only, *viz. Field-Pieces*, which are from the least sort of all, to 12 Pounders (*i. e.*) those which carry a Ball or Shot of 12 Pound; and *Cannon of Battery*, which are from a *Culvering* to an whole Cannon.

The Table following gives you all things necessary to be known of the Names, Proportions, Weights, Lengths, Bullets, Ranges, &c. of a Great Gun,

PHILLIPS's TABLE.

The Names of the several Pieces of Ordnance.	Guns Length. Inches. Feet.	Guns Weight. Pounds.	Guns Bore. 8 Parts. Inches.	Bullets Diameter. 8 Parts. Inches.	Bullets Weight. Ounces. Pounds.	Ladles Length. 8 Parts. Inches.	Ladles Breadth. 8 Parts. Inches.	Weight of Powder. Ounces. Pounds.	Point-Blank, or the Level Range. Paces.	Utmost Random. Paces.
A Base	4 6	200	1 2	1 1	0 5	4 0	2 0	0 8	60	600
A Rabinet	5 6	300	1 4	1 3	0 0 8	4 1	2 4 0	0 0 12	70	700
A Falconet	6 0	400	2 2	2 2	0 1 5	4 4	2 4 0	0 1 4	90	900
A Falcon	7 0	750	2 6	2 5	0 2 8	4 8	2 4 4	0 2 4	130	1300
A Minion *Ordinary*	7 0	800	3 0	2 7	0 3 4	4 8	2 4 5	0 2 8	120	1200
A Minion *Largest*	8 0	1000	3 2	3 0	0 3 12	5 0	2 9	0 3 4	125	1250
Saker *Least*	8 0	1400	3 4	3 2	0 4 12	5 6	2 9	0 3 4	150	1500
Saker *Ordinary*	9 0	1500	3 6	3 4	0 6 0	6 0	2 10	0 3 4	160	1600
Saker *Old Sort*	10 0	1800	4 0	3 6	0 7 5	6 2	2 11	0 4 5	163	1630
Demiculverin *Least*	10 0	2000	4 2	4 0	0 9 0	6 4	2 12	0 5 6	174	1740
Demiculv. *Ordinary*	11 0	2700	4 4	4 2	0 10 11	6 6	3 0	0 7 4	175	1750
Demiculv. *Old sort*	11 0	3000	4 6	4 4	0 12 11	6 8	3 4	0 8 8	178	1780
Culverin *Least*	11 0	4000	5 0	4 6	0 15 0	6 10	3 6	0 10 0	180	1800
Culverin *Ordinary*	12 0	4500	5 2	5 0	0 17 5	6 12	3 8	0 11 6	181	1810
Culverin *Largest*	12 0	4800	5 4	5 2	0 20 0	6 12	3 8	0 11 8	183	1830
Demi-Cann. *Least*	11 0	5400	6 2	6 0	1 30 0	7 0	3 10	0 14 0	156	1560
Demi-Cann. *Ordin.*	12 0	5600	6 4	6 1	1 32 0	7 2	3 10	0 12 0	162	1620
Demi-Can. *Large*	12 0	6000	6 6	6 3	1 36 0	7 2	3 10	0 12 0	180	1800
Royal Whole Can.	12 0	8000	8 0	7 4	1 58 0	8 0	4 0	0 14 6	185	1850

To this Table I thought it necessary to adjoin Mr. *Anderson*'s; which, I question not, is *much truer*: As being the Result of more Experience, and more Skill in this kind of Mathematical Learning. However, the Differences of the Ranges are so great, that it is worth Examining which is the Truest.

Mr. Anderson's

Mr. Anderſon's TABLE *of the* Names, Diameters, Chaſes, Requiſites of Powder, Comparative Forces, *and* Greateſt Ranges, *to Eight Degrees of Elevation, of Ten ſeveral Pieces of* Cannon, *Experimentally and Mathematically demonſtrated.*

Names of the Pieces.	Length of the Chaſe.	Diamet. of the Bore.	Requiſite of Powder	Greateſt Range.	Comparative Force.
	Feet.	Inches.	lb. ʒ.	Paces.	
1 A *Rabbinet*	3	1 75	5	3769	38
2 A *Falconet*	4	2	9	4398	61
3 A *Falcon*	6	2 75	1 10	4797	161
4 A *Minion*	8	3	2 10	5864	238
5 A *Saker*	9	3 5	4	5654	371
6 A *Demi-Culverin*	10	4	7 5	4886	733
7 A *Culverin*	11	5	10	4837	1000
8 A *Demi-Cannon*	11	6	14 6	4031	1575
9 A *Whole Cannon*	12	7	21 5	3769	2422
10 A *Cannon-Royal*	12	8	27 14	3298	3382

The Strength and Serviceableneſs of a Piece of Ordnance, conſiſts very much in the Thickneſs of the Metal, eſpecially about its *Chamber* and *Breech*, and this is called its *Fortification*.

And of this there are three degrees both for Cannons and Culverines.

1. Such as are ordinarily fortified, are called *Legitimate Pieces*.

2. Thoſe whoſe Fortification is leſſened, are called *Baſtard Pieces*.

3. There are ſome that are doubly fortified, which are called *Double-fortified*, or *Extraordinary Pieces*.

The Fortification of a Gun is reckoned from the Thickneſs of the Metal at the Touch-hole, at the Trunnions and at the Muzzle, in proportion to the Diameter of the Bore.

The *Doubly-fortified Pieces*, are a full Diameter of the Bore in Thickneſs at the Touch-hole, $\frac{11}{10}$ of it at the Trunnions, at $\frac{7}{10}$ at their Muzzle.

The *Leſſened Cannons* have but $\frac{1}{4}$ or $\frac{12}{10}$ of the Diameter of their Bore, in Thickneſs at the Touch-hole, $\frac{9}{10}$ at the Trunnions, $\frac{5}{10}$ at the Muzzle.

All the *Double-fortified Culverines*, and all leſſer Pieces of that kind, have a Diameter and $\frac{1}{5}$ at the Touch-hole, $\frac{15}{10}$ at the Trunnions, and $\frac{9}{10}$ at the Muzzle. And the Ordinary Fortified Culverines are every way as your Double-Fortified Cannon; and the Leſſened Culverines are as the Ordinary Cannons, in all reſpects.

The *Ordinary Fortified Cannons* have $\frac{7}{8}$ at the Touch-hole, $\frac{1}{8}$ at the Trunnions, and $\frac{3}{8}$ at the Muzzle.

The Famous *Galilæus* was the firſt who proved the Line of a Bullet to be in the Curve of a Parabola (*abſtracting from the Line of Impulſe, and the Reſiſtance of the Medium*, as I judge) as you may find in his Fourth Dialogue; where alſo he gives a Table of *Horizontal Ranges*. *Diſcorſi è Demoſtrazioni Mathematiche*, p. 280, 281.

And his Scholar *Torricellius*, in his Second Book *De Motu Projectorum*, brings the *Horizontal Ranges* to the Table of Sines, and the greateſt Altitudes to the Verſed Sines: That is, he proves, *That all Ranges on the Plane of the Horizon, are in proportion to one another, as the Sines of the Double Angles of the Elevation of their Lines of Direction.* And for the Time of the Continuance of any Shot above the *Horizon*, he ſhews in *Prop.* 18. *Book* 2. That as Radius is to the greateſt Duration (*i. e.* when the Elevation of the Piece is 90 degrees, or when it ſtands perpendicular) : : ſo is the Sine of any other Elevation of the Gun, to the Time of the Range of that Shot.

After this, one *Robert Anderſon*, by Trade a Weaver, but peculiarly ſkilful both in the Application of Mathematicks to this Matter, and alſo prodigiouſly induſtrious and accurate in making Trials with both Guns and Mortars, which he procured to be caſt and fitted at his own Charge: This Man, I ſay, in the Year 1674. publiſhed a Book *of the Genuine Uſe and Effects of the Gun*, together with Tables of the Altitudes of Projections above the *Horizon*, &c. Calculated by Mr. *Street*; in which, in Fifty *Propoſitions*, he ſhews:

1. How from any Shot of a Great Gun, or any Piece, howſoever made, to find the greateſt Random of that Piece: And alſo to ſtrike any Place upon either Aſcents or Deſcents within the Reach of the Piece.

2. He ſhews the Relations of all Guns of the ſame kind among themſelves; and thence the Dimenſions and requiſite Powder of any Piece with a Range anſwerable to any Degree being given: He gives Rules to find the requiſite Powder of any other Piece, and to ſtrike any Place at demand within Reach, its Dimenſions being alſo given.

3. He

3. He ſhews the Nature, Uſe and Property of Mortar-pieces, with their Complications and Relations.

4. He conſiders the Method of ſhooting Grenadoes out of Long Guns, with their manifold Uſes, &c.

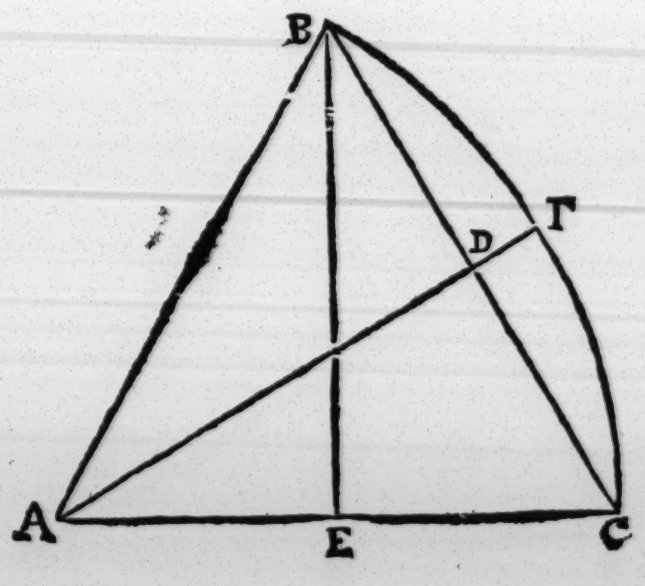
And now, very lately, that excellent Workman Mr. *John Rawley*, Mathematical Inſtrument-maker under St. *Dunſtan*'s Church in *Fleet-ſtreet*, hath contrived a Method of putting *Anderſon*'s Tables upon a Scale; where knowing only the utmoſt Random of any Gun, you have by Inſpection the upper and lower Elevations that are neceſſary to throw the Shot to any aſſigned Diſtance within the Reach of the Piece, and *vice verſa*.

In the Year 1690, *Anderſon* publiſhed another Book, intituled, *To hit a Mark as well upon Aſcents and Deſcents, as upon the Plane of the Horizon*: And in the Preface, he takes Notice of what Mr. *Blondell*, *Mariotte*, *Perault*, and *Halley* have done in this Matter; and agrees with *Cavallerius*, to begin to account the Curve of the Shot to be a Parabola, juſt then where the Force leaves the Thing projected; and the Line of Shot to that place, he calls, *The Line of Impulſe of the Fire*, and for Eaſe of Calculation, takes it for a Right Line: Only he ſays, That the more irregular the Figure of the projected Body is, the longer the Line will be before it paſſes into its Parabola.

He ſaith, after 15 Years Experience (in which Time he made ſome Thouſands of Shots) he knows how to find the Line of Impulſe of Fire, and how to carry the Matter on, on the Principles of *Galilæus*, and can hit a Mark not only on the Plane of the *Horizon*, but upon Aſcents and Deſcents, according to Mathematical Principles; the Method of which you have in his Book.

The Learned Mr. Halley, *now* Savilian *Profeſſor of Geometry in* Oxon, *in* Philoſophical Tranſactions, N°. 179. *having proved the Motion of all* Projectiles, *to be in the Curve of a* Parabola, (*which you will find under* Projectile) *premiſes this* Lemma.

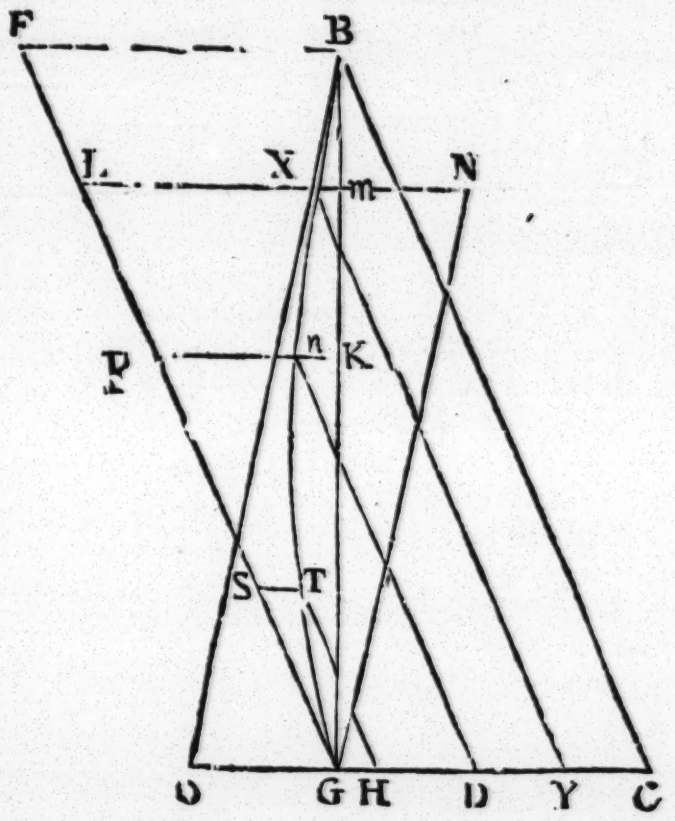
That the Sine of the Double of any Arch, is equal to twice the Sine of that Arch into its Co-ſine, divided by Radius; and the Verſed Sine of the Double of any Arch is equal to the Square of the Sine thereof, divided by Radius.



Let the Arch B C (in *Fig.* 1.) be double to the Arch B F, and A the Centre: Draw the *Radii*, A B, A F, A C, and the Chord B D C, and let fall B E perpendicular to A C, and the Angle B C E, will be equal to the Angle A B D, and the Triangle B C E, will be like to the Triangle B D A: Wherefore it will be as A B to A D, ſo B C, or twice B D, to B E, that is as Radius to Co-ſine, ſo twice Sine to Sine of the Double Arch. And as A B to B D, ſo twice B D or B C, to E C, that is as Radius to Sine, ſo twice that Sine to the Verſed Sine of the Double Arch; which two Analogies reſolved into Equations, are the Propoſitions contained in the Lemma to be proved.

PROPOSITION I.

The Horizontal Diſtances of Projections made with the ſame Velocity at ſeveral Elevations of the Line of Direction, are as the Sines of the double Angles of Elevation.



Let G B (*Fig.* 2.) the Horizontal Diſtance, be $= Z$, the Sine of the Angle of Elevation, F G B, $b = s$, its Co-ſine $= c$, Radius $= r$, and the Parameter $= p$, it will be as c to s :: ſo z to $\frac{sz}{c} =$ F B $=$ G C, and by reaſon of the Parabola $\frac{psz}{c} =$ to the Square of C B, or G F: Now as c to r :: ſo is z to $\frac{zr}{c} =$ G F, and its Square $\frac{zzrr}{cc}$ will be therefore $=$ to $\frac{psz}{c}$: Which Equation reduced, will be $\frac{psc}{rr} = Z$. But by the former Lemma $\frac{2sc}{r}$ is equal to the Sine of the Double Angle, whereof S is the Sine: Wherefore 'twill be as Radius to Sine of double the Angle F G B, ſo is half the Parameter, to the Horizontal Range or Diſtance ſought; and at the ſeveral Elevations, the Ranges are as the Sines of the double Angles of Elevation. *Q. E. D.*

CORO-

COROLLARY.

Hence it follows, *That half the Parameter is the greateſt Random, and that happens at the Elevation of* 45 *Degrees, the Sine of whoſe double is Radius: Likewiſe that the Ranges equally diſtant above and below* 45 *are equal, as are the Sines of all double Arches to the Sines of their double Complements.*

PROP. II.

The Altitudes of Projections made with the ſame Velocity, at ſeveral Elevations, are as the Verſed Sines of the double Angles of Elevations.

As e is to s : : ſo is $\frac{p\,s\,s}{r\,r}$ = G B to $\frac{p\,s\,s}{r\,r}$ = B F, and U K = R U = $\frac{\text{B F}}{4}$ the Altitude of the Projection = $\frac{p\,s\,s}{4\,r\,r}$. Now by the foregoing Lemma $\frac{2\,s\,s}{r}$ = to the Verſed Sine of the double Angle, and therefore it will be as Radius to Verſed Sine of double the Angle F G B, ſo an 8th of the Parameter to the height of the Projection U K; and ſo theſe Heights at ſeveral Elevations, are as the ſaid Verſed Sines, *Q. E. D.*

COROLLARY.

From hence it is plain, that the greateſt Altitude of the Perpendicular Projection is a 4*th of a Parameter, or half the greateſt Horizontal Range; the Verſed Sign of* 180 *Degrees, being* = 2 r.

PROP. III.

The Lines G F, *or Times of the Flight of a Project caſt with the ſame Degree of Velocity at different Elevations, are as the Signs of the Elevations.*

As c is to r : : ſo is $\frac{p\,s\,c}{r\,r}$ = G B by the 6th Propoſition to $\frac{p\,s}{r}$ = G F; that is, as Radius to Sine of Elevation, ſo the Parameter to the Line G F; ſo the Lines G F are as the Sines of Elevation, and the Times are proportional to thoſe Lines: Wherefore the Times are as the Sines of the Elevation: *Ergo conſtat propoſitio.*

PROP. IV.

Problem. *A Projection being made as you pleaſe, having the Diſtance and Altitude, or Deſcent of an Object through which the Project paſſes, together with the Angle of Elevation, with the Line of Direction; to find the Parameter and Velocity that is (in* Fig. 2.*) having the Angle* F G B, G M, *and* M X.

SOLUTION.

As Radius to Secant of F G B, ſo G M the Diſtance given, to G L; and as Radius to Tangent of F G B, ſo G M to L M. Then L M — M X in Heights, or + M X in Deſcents; or elſe M X — M L, if the Direction be below the Horizontal Line, is the Fall in the Time that the direct Impulſe given in G, would have carried the Project from G to L = L X = G Y. Then by reaſon of the Parabola, as L X or G Y is to G L or Y X : : ſo is G L to the Parameter ſought.

To find the Velocity of the Impulſe, by *Prop.* 2. and 4, find the Time in Seconds that a Body would fall the Space L X, and by that dividing the Line G L, the Quote will be the Velocity, or Space moved in a Second ſought, which is always a mean Proportional between the Parameter, and 16 Feet 1 Inch.

PROP. V.

Problem 2. *Having the Parameter, Horizontal Diſtance, and Height or Deſcent of an Object, to find the Elevations of the Line of Directions neceſſary to hit the given Object; that is, Having* G M. M X, *and the greateſt Random equal to half the Parameter; to find the Angles* F G B.

Let the Tangent of the Angle ſought be = t, the Horizontal Diſtance G M = b, the Altitude of the Object M X = h, the Parameter = p, and Radius = r, and it will be as r to t, ſo b to $\frac{t\,b}{r}$ = M L, and $\frac{t\,b}{r} \mp h$ $\begin{cases}\text{in Aſcents}\\ \text{in Deſcents}\end{cases}$ = L X, and $\frac{p\,t\,b}{r} \mp p\,h$ = G L □ = + Y □ by reaſon of the *Parab.* but $b\,b + \frac{t\,t\,b\,b}{r\,r}$ = G L □. 47. 1 *Euclid.* Wherefore $\frac{p\,t\,b}{r} \mp p\,h$ = $b\,b \mp \frac{t\,t\,b\,b}{r\,r}$, which Equation tranſpoſed, is $\frac{t\,t\,b\,b}{r} = \frac{p\,t\,b}{r} \mp p\,h - b\,b$, divided by $b\,b$ is $\frac{t\,t}{r\,r} = \frac{p\,t}{b\,r} + \frac{p\,h}{b\,b} - 1$. This Equation ſhews the Queſtion to have two Anſwers, and the Roots thereof are $\frac{t}{r} = \frac{p}{2\,b} \mp \sqrt{\frac{p\,p}{4\,b\,b} + \frac{p\,h}{b\,b}} - 1$. From which I derive the following Rule.

Divide half the Parameter by the Horizontal Diſtance, and keep the Quote, *viz.* $\frac{p}{2\,b}$, then ſay, As Square of the Diſtance given to the half Parameter, ſo half Parameter $\mp$ double $\begin{cases}\text{Height}\\ \text{Deſcent}\end{cases}$ to the Square of the Secant = $\frac{p\,p \mp 4\,p\,h}{4\,b\,b}$ the Tangent anſwering to that Secant, will be $\sqrt{\frac{p\,p \mp 4\,p\,h}{4\,b\,b}} - 1$ or $r\,r$: So then the Sum

and

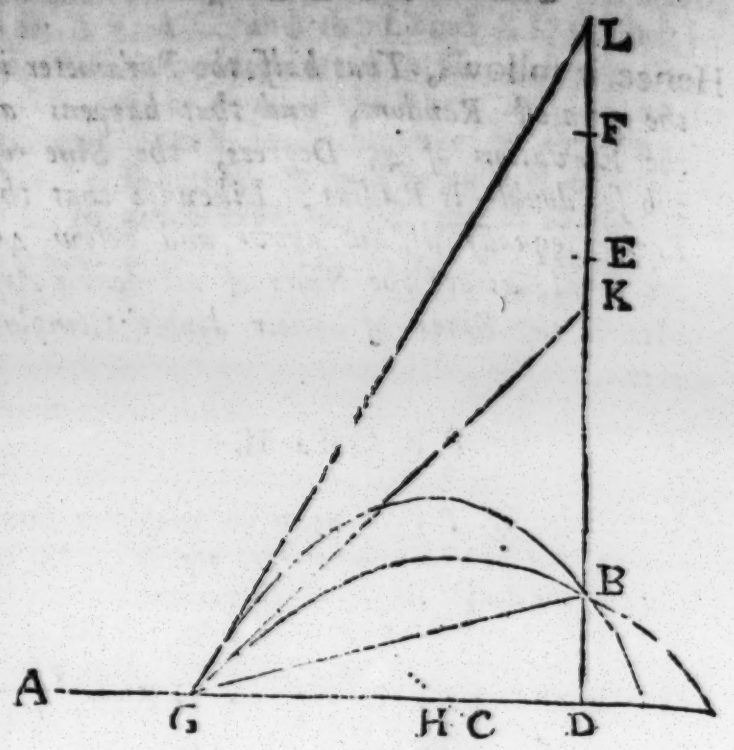
and Difference of the aforeſaid Quote, and this Tangent will be the Roots of the Equation, and the Tangents of the Elevations ſought.

Note here, that in Deſcents, if the Tangent exceed the Quote, as it does when $p\,h$ is more than $b\,b$, the Direction of the lower Elevation will be below the Horizon, and if $p\,h = b\,b$, it muſt be directed Horizontal, and the Tangent of the upper Elevation will be $\frac{p\,r}{b}$: Note, likewiſe, That if $4\,b\,b + 4\,p\,h$ in Aſcents, or $4\,b\,b - 4\,p\,h$ in Deſcents, be equal to $p\,p$, there is but one Elevation that can hit the Object, and its Tangent is $\frac{p\,r}{2\,b}$; and if $4\,b\,b + 4\,p\,h$ in Aſcents, and $4\,b\,b - 4\,p\,h$ in Deſcents, do exceed $p\,p$, the Object is without the reach of a Project caſt with that Velocity, and ſo the Thing impoſſible.

From this Equation $4\,b\,b + 4\,p\,h = p\,p$ are determined the utmoſt Limits of the reach of any Project, and the Figure aſſigned, wherein are all the Heights upon each Horizontal Diſtance, beyond which it cannot paſs; for by Reduction of that Equation, h will be found equal $\frac{1}{4}\,p - \frac{b\,b}{p}$ in Heights, and $\frac{b\,b}{p} - \frac{1}{4}\,p$ in Deſcents: From whence it follows, That all the Points h, are in the Curve of the Parabola, whoſe Focus is the Point from whence the Project is caſt, and whoſe *Latus Rectum*, or Parameter *ad Axem* is $= p$. Likewiſe from the ſame Equation, may the leaſt Parameter or Velocity be found capable to reach the Object propoſed; ; for $b\,b = \frac{1}{4}\,p\,p + p\,h$ being reduced $\frac{1}{2}\,p$ will be $= \sqrt{b\,b + h\,h} + h$ in Aſcents, which is the Horizontal Range at forty five Degrees of Elevation that would juſt reach the Object and the Elevation requiſite will be eaſily had; for dividing the ſo found Semi-parameter by the Horizontal Diſtance given b, the Quote into Radius will be the Tangent of the Elevation ſought.

The Rule may be of good Uſe to all Bombardeers and Gunners, not only that they may uſe no more Powder than is neceſſary, to caſt their Bombs into the Place aſſign'd, but that they may ſhoot with much more Certainty, for that a ſmall Error committed in the Elevation of the Piece, will produce no ſenſible Difference in the Fall of the Shot: For which Reaſon the *French* Engineers in their late Sieges have uſed Mortar-pieces inclined conſtantly to the Elevation of 45, proportioning their Charge of Powder according to the Diſtance of the Object they intend to ſtrike on the Horizon.

And this is all that need to be ſaid concerning this *Problem*, of Shooting upon Heights and Deſcents. But if a Geometrical Conſtruction thereof be required, I think I have one that is as eaſie as any that can be expected, which I deduce from the foregoing Analytical Solution, *viz.* $\frac{s}{r} = \frac{p}{2\,b} + \sqrt{\frac{\frac{1}{4}\,p\,p + p\,b - b\cdot b}{b\,b}}$ and 'tis this.



Having made the Right Angle L D A, *Fig.* 3. make D A, D F $= p$, or greateſt Range, D G $= b$ the Horizontal Diſtance, D B, D C $= h$, the Perpendicular Height of the Object; and draw G B, and make D E $=$ thereto: Then with the Radius A C and Centre E ſweep an Arch, which if the thing be poſſible, will Interſect the Line A D in H; and the Line D H being laid both ways from F, will give the Points K and L, to which draw the Lines G L, G K: I ſay the Angles L G D, K G D are the Elevations required for hitting the Object B. If below the Horizon, its Deſcent D C $=$ D B muſt be laid from A, ſo as to have A C $=$ A D $+$ D C.

Note likewiſe, that if in Deſcents D H be greater than F D, and ſo K fall below D, the Angle K G D ſhall be the Depreſſion below the Horizon. Now this Conſtruction ſo naturally follows from the Equation, that I ſhall need ſay no more about it.

PROP. VI.

To determine the Force or Velocity of a Project in every Point of the Curve it deſcribes.

To this we need no other *Præcognita*, but only the Third Propoſition, *viz. That the Velocity of Falling Bodies, is double to that which in the ſame time would have deſcribed the Space fallen by an equable Motion*: For the Velocity of a Project, is compounded of the conſtant equal Velocity of the Impreſſed Motion, and the Velocity of the Fall, under a given Angle, *viz.* the Complement of the Elevation.

For Inſtance, in *Fig.* 2. in the time wherein a Project would move from G to L, it deſcends from L to X: And by the Third Propoſition, has acquired a Velocity, which in that time would have carried it by an unequal Motion from L to Z, or twice the Deſcent L X: And drawing the Line G Z, I ſay the Velocity in the Point X, compounded of the Velocities G L, and L Z, under the Angle G L Z, is to the Velocity impreſt in the Point G, as G Z is to G L. This follows from the Second Axiome; and by the 20th and 21ſt *Prop. Lib.* 1. *Con. Mydorgii*, X O parallel and equal to G Z, ſhall touch the Parabola in the Point X. So that the Velocities in the ſeveral

ral Points, as are the Lengths of the Tangents to the Parabola in those Points, intercepted between any two Diameters: And these again are as the Secants of the Angles, which those Tangents continu'd, make with the Horizontal Line G B.

From what is here laid down, may the comparative force of a Shot in any Two Points of the Curve, be either Geometrically or Arithmetically discovered.

COROLLARY.

From hence it follows, *That the Force of a Shot is always least at* U, *or the Vertex of the Parabola, and that at equal Distances therefrom, as at* T *and* X, G *and* B, *its Force is always equal; and that the least Force in* U, *is to that in* G *and* B, *as Radius to the Secant of the Angle of Elevation* F G B.

These Propositions considered, there is no Question relating to Projects, which by the Help of them may not easily be solved; and tho' it be true that most of them are to be met withal, in *Galilæus*, *Torricellius*, and others, who have taken them from those Authors; yet their Books being Foreign, and not easie to come by, and their Demonstrations long and difficult, I thought it not amiss to give the whole Doctrine here in *English*, with such short Analytical Proofs of my own, as might be sufficient to evince their Truth.

The Tenth Proposition contains a Problem, untouch'd by *Torricellius*, which is of the greatest Use in Gunnery; and for the sake of which, this Discourse was principally intended: It was first Solved by Mr. *Anderson*, in his Book of *The Genuine Use and Effects of the Gun*, Printed in the Year 1674; but his Solution required so much Calculation, that it put me upon Search, Whether it might not be done more easily? And thereupon in the Year 1678, I found out the Rule I now publish; and from it the Geometrical Construction: Since which time there has a large Treatise on this Subject, Entituled, *L'Art de jetter les Bombes*, been publish'd in *France*, by Monsieur *Blondel*, wherein he gives the Solutions of this Problem by Messieurs *Bout*, *Romer*, and *De la Hire*; but none of them being the same with mine, or in my Opinion more easie, and most of them more Operose; and besides mine finding the Tangent, which generally determines the Angle better than its Sine, I thought my self obliged to Print it for the Use of all such as desire to be informed in the Mathematical part of the Art of Gunnery.

Now these Rules were rigidly true, were it not, as I said before, for the Opposition of the Medium, whereby not only the direct impress Motion is continually retarded, but likewise the Increase of the Velocity of the Fall, so that the Spaces described thereby, are not exactly as the Squares of the Times: But what this Opposition of the Air is, against several Velocities, Bulks, and Weights, is not so easie to determine. 'Tis certain that the Weight of Air, to that of Water, is nearly as 1 to 800, whence the Weight thereof, to that of any Project is given; 'tis very likely, that to the same Velocity and Magnitude but of different Matter, the Opposition should be reciprocally as the Weights of the Shot; as likewise that to Shot of the same Velocity and Matter, but of different Sizes. it should be as the Diameters reciprocally: Whence generally the Opposition to Shot with the same Velocity, but of different Diameters, and Materials, should be as their Specifick Gravities unto their Diameters reciprocally; but whether the Opposition, to differing Velocities of the same Shot, be as the Squares of those Velocities, or as the Velocities themselves, or otherwise, is yet a harder Question. However it be, 'tis certain, that in large Shot of Metal, whose Weight many Thousand times surpasses that of the Air, and whose force is very great, in proportion to the Surface wherewith they press thereon; this Opposition is scarce discernable: For by several Experiments made with all Care and Circumspection with a Mortar-piece extraordinarily well fix'd to the Earth on purpose, which carried a solid Brass Shot of $4\frac{1}{2}$ Inches Diameter, and of about 14 Pounds Weight, the Ranges above and below 45 Degrees were found nearly equal, if there were any Difference, the wider Ranges went rather the furthest, but those Differences were usually less than the Errors committed in ordinary practice, by the unequal Goodness and Driness of the same sort of Powder by the Unfitness of the Shot to the Bore, and by the looseness of the Carriage.

In a smaller Brass Shot of about an Inch and half Diameter, cast by a Cross-Bow, which ranged it, at most about 400 Foot, the Force being much more equal than in the Mortar-piece, this Difference were found more curiously, and constantly, and most evidently, the under Ranges outwent the upper.

From which Trials I conclude, That altho' in small and light Shot, the Opposition of the Air, ought and must be accounted for; yet in Shooting of great and weighty Bombs, there need be very little or no Allowance made; and so these Rules may be put in practice to all Intents and Purposes, as if this Impediment were absolutely removed.

Then after this in *Philosophical Transactions*, Numb. 261. The same Excellent Geometrician pursues this Matter further in the following Discourse, *viz.*

A Proposition of General Use in the Art of Gunnery, *shewing the Rule of Laying a Mortar to pass, in order to strike any Object above or below the Horizon. By* E. Halley.

It was formerly the Opinion of those concerned in Artillery, That there was a certain Requisite of Powder for each Gun; and in Mortars, where the Distance was to be varied, it must be done by giving a greater or lesser Elevation to the Piece. But now our later Experience has taught us, that the same thing may be more certainly and readily performed by increasing and diminishing the Quantity of Powder, whether regard be had to the Execution to be done, or to the Charge of doing it. For when Bombs are discharged with great Elevations of the Mortar, they fall too perpendicular, and bury themselves

too deep in the Ground, to do all that Damage they might, if they came more Oblique, and broke upon or near the Surface of the Earth; which is a thing acknowledged by the Beſieged in all Towns, who unpave their Streets to let the Bombs bury themſelves, and thereby ſtifle the force of their Splinters.

A Second Convenience is, That at the extream Elevation, the Gunner is not obliged to be ſo Curious in the Direction of his Piece, but it will ſuffice to be within a Degree or two of the Truth; whereas in the other Method of Shooting he ought to be very curious.

But a Third, and no leſs conſiderable Advantage is, in the ſaving of the King's Powder, which in ſo great, and ſo numerous Diſcharges, as we have lately ſeen, muſt needs amount to a conſiderable Value.

And for Sea Mortars, it is ſcarce practicable otherwiſe to uſe them, where the Agitation of the Sea continually changes the Direction of the Mortar, and would render the Shot very uncertain, were it not that they are placed about 45 Degrees of Elevation, where ſeveral Degrees above or under, make very little difference in the Effect.

In Numb. 179. of theſe *Tranſactions*, I conſidered and demonſtrated all the Propoſitions relating to the Motion of the *Projectiles*, and gave a Solution to this *Problem*, viz. *To hit an Object above or below the Horizontal Line, with the greateſt Certainty and leaſt Force*, as may be ſeen in that *Tranſaction*, p. 16, 17. That is, That the Horizontal Diſtance of the Object being put $= b$, and the perpendicular Height $= h$, the Charge requiſite to ſtrike the Object with the greateſt Advantage, was that which with an Elevation of 45 Degrees, would caſt the Shot on the Horizontal Line, to the Diſtance of $\sqrt{bb+hh}+h$, when the Object was above the Horizon; or if it were below it, the Charge muſt be leſſer, ſo as to reach on the Horizon, at 45 Degrees Elevation, no greater a Diſtance than $\sqrt{bb+hh}-h$; that is in the one Caſe, the Sum of the Hypothenuſal Diſtance of the Object from the Gun, and the Perpendicular Height thereof above the Gun; and in the other Caſe, when the Object is below the Horizon, the Difference of the ſame, *per* 47. 1. *Euclid*.

And I then ſhewed how to find the Elevation proper for the Gun ſo charged, *viz.* As the Horizontal Diſtance of the Object, to the Sum or Difference of the Hypothenuſal Diſtance, and Perpendicular Height :: So Radius to the Tangent of the Elevation ſought. But I was not at that time aware that the aforeſaid Elevation did conſtantly biſect the Angle between the Perpendicular and the Object, as is demonſtrated from the Difference and Sum of the Tangent and Secant of any Arch, being always equal to the Tangent and Co-tangent of the half Compliment thereof to a Quadrant.

Having diſcovered this, I think nothing can be more compendious, or bids fairer to compleat the Art of *Gunnery*, it being as eaſie to ſhoot with a Mortar at any Object on Demand, as if it were on the Level: Neither is there need of any Computation, but only ſimply laying the Gun to paſs, in the middle Line between the Zenith and the Object, and giving it its due Charge. Nor is there any great need of Inſtruments for this Purpoſe: For if the Muzzle of the Mortar be turned truly Square to the Bore of the Piece, as it uſually is, or ought to be, a piece of Looking-glaſs Plate applied parallel to the Muzzle, will by its Reflection give the true Poſition of the Piece; the Bombardeer having no more to do, but to look perpendicularly down on the Looking-glaſs, alongſt a ſmall Thread with a Plummet, and to raiſe or depreſs the Elevation of the Piece, till the Object appear reflected on the ſome Point of the Speculum, on which the Plummet falls; for the Angle of Incidence and Reflection being equal, in this caſe a Line at Right Angles, to the Speculum, as is the Axis of the Chaſe of the Piece, will biſect the Angle between the Perpendicular and the Object, according as our Propoſition requires. So that it only remains by good and valid Experiments to be aſſured of the force of Gun-powder. How to make and conſerve it equal, and to know the Effect thereof in each Piece; that is, how far differing Charges will caſt the ſame Shot out of it; which may moſt conveniently be engraven on the outſide thereof, as a ſtanding Direction to all Gunners, who ſhall from thenceforward have occaſion to uſe that Piece: And were this Matter well aſcertained, it might be worth the While to make all Mortars of the like Diameter, as near as may be alike in length of Chaſe, Weight, Chamber, and all other Circumſtances.

This Diſcovery that the utmoſt Range on an inclined Plane is, when the Axis of the Piece makes equal Angles with the Perpendicular and the Object, compared with what I have demonſtrated of the ſame *Problem* in the aforeſaid Number 179, does lead to and diſcover two very ready *Theorems*; the one to find the greateſt Horizontal Range at 45 Degrees Elevation by any Shot made upon any inclined Plain with any Elevation of the Piece whatſoever: And the other to find the Elevations proper to ſtrike a given Object with any Force greater than what ſuffices to reach it with the aforeſaid middle Elevation. Both which being performed by one Single Proportion, may be very ſerviceable to ſuch as are concerned in the Practice of *Gunnery*, but are unwilling to trouble themſelves with tedious and difficult Rules.

The Two Propoſitions are theſe.

PROP. I.

A Shot being made on an inclined Plane, having the Horizontal Diſtance of the Object it ſtrikes, with the Elevation of the Piece, and the Angle at the Gun between the Object and the Perpendicular: To find the greateſt Horizontal Range of that Piece, laden with the ſame Charge; that is, half the Latus Rectum *of all the* Parabolæ, *made with the ſame* Impetus.

RULE.

Take half the Diſtance of the Object from the Nadir, and take the Difference of the given Elevation from that half; the Verſed Sine of that Difference ſubtract from the Verſed Sine of the Diſtance of the Object from the Zenith: Then ſhall the Difference of thoſe Verſed Sines be to the Sine of the Diſtance of the Object from the

the Zenith, as the Horizontal Diſtance of the Object ſtruck, to the greateſt Horizontal Range at 45 Degrees.

PROP. II.

Having the greateſt Horizontal Range of a Gun, the Horizontal Diſtance, and the Angle of Inclination of an Object to the Perpendicular, to find the two Elevations neceſſary to ſtrike that Object.

RULE.

Halve the Diſtance of the Object from the Nadir, this half is always equal to the half Sum of the two Elevations we ſeek. Then ſay, As the greateſt Horizontal Range is to the Horizontal Diſtance of the Object : So is the Sine of the Angle of Inclination or Diſtance of the Object from the Perpendicular, to a fourth Proportional ; which Fourth being ſubtracted from the Verſed Sine of the Diſtance of the Object from the Zenith, leaves the Verſed Sine of half the Difference of the Elevation ſought ; which Elevations are therefore had by adding and ſubtracting that half Difference to and from the aforeſaid half Sum.

I ſhall not need to ſpeak of the Facility of theſe Solutions : I ſhall only obſerve, That they are both general, without Exception or Caution, and derived from the Knowledge that theſe two Elevations are equi-diſtant above and below the Line, biſſecting the Angle between the Object and the Zenith.

ORDONANCE, in Architecture, is the giving to all the Parts of an Edifice that juſt Quantity and Dimenſion which they ought to have, according to the Model.

OREXIS, is the Natural Appetite of Meat, which proceeds from an Acid Ferment in the Ventricle that comes from the *Cæliac* Arteries, with which the nervous Tunick of the Stomach and its Nerves are extraordinarily moved to covet Nouriſhment. *Blanchard.*

ORGANICAL *Part*, is that Part of an Animal or Vegetable Body which is deſigned for the performing ſome particular Action : Whereas ſome Parts are *Non organical* ; which have no particular Action, but rather ſome Uſe in the Oeconomy of the Whole.

ORGANS, the Parts of an Animal Body, fitted as Inſtruments to diſcharge any particular Office or Function. Thus the Organ of Sight is the Eye with all its Parts ; the Organ of Hearing is the Ear, *&c.* Therefore by *Organical Parts* are meant the Subſtantial Parts or Members of the Body, appointed to perform any particular Function or Action.

ORGANUM, or *Organon*, the Name or Title that *Ariſtotle* gave to his Book of Logick.

ORGASMUS, is an *Impetus* and quick Motion of Blood or Spirits ; as when the Animal Spirits ruſh violently into the Nerves.

ORIENT, is the Eaſt Quarter of the *Horizon*, or is that Part of the *Horizon* where the Ecliptick, or the Sun therein, aſcends into the upper Hemiſphere ; and therefore, according to ſome Writers way of Expreſſion, the

Eſtival ORIENT, is that Point of the Horizon where the Sun riſes, when he enters into *Capricorn.*

Equinctial ORIENT, is that Point of the Horizon which the Sun riſes upon, when he enters into *Aries* or *Libra.*

ORIENTAL, in Aſtronomy : A Planet is ſaid to be *Oriental*, when it riſes in the Morning before the Sun.

ORIFICE, the Mouth, Entry, or Brim of any thing, more-eſpecially that of a Wound, Vein, Tube, *&c.*

ORIGINAL *Equations.* A Term uſed by *Harriot* in his Algebra ; ſee *Quadratick Equations.*

ORIGINALIA, in the Treaſurer's Remembrancer's Office in the *Exchequer*, are Records or Tranſcripts ſent thither out of the *Chancery*, and are diſtinguiſhed from *Recorda*, which contain the Judgments and Pleadings in Suits tryed before the Barons of that Court.

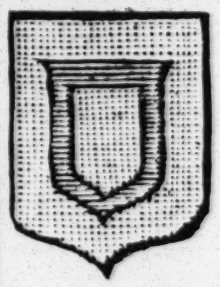
ORILLON, in Fortification, is a ſmall Rounding of Earth lined with a Wall, which is raiſed on the Shoulder of thoſe Baſtions that have Caſements, to cover the Cannon in the Retired Flank, and prevent their being diſmounted by the Enemy.

There are alſo other ſorts of *Orillons*, properly called *Shoulderings*, which are almoſt of a Square Figure : They are alſo called *Epaulements.*

ORION, a Southern Conſtellation, conſiſting of 39 Stars.

ORGUES, in Fortification, are many Harquebuſſes link'd together, or divers Musket-Barrels laid in a row, within one Wooden Stock, ſo that they may be diſcharged either all at once, or ſeparately. They are made uſe of to defend Breaches and other Poſts that are attack'd.

This Term is alſo appropriated to certain long and thick pieces of Timber, arm'd with Iron Plates at the ends, and ſeparated one from another. They are hung with Cords over the Gates of a Town or Fortreſs, and in Caſe of Surprize, let fall perpendicularly ; by which means the Paſſage is ſtopt, ſo that the Enemy cannot eaſily remove or hoiſt up all the Wooden Bars with a Leaver, or any other Machine ſet under them : On which account theſe *Orgues* are to be preferr'd before *Herſes* or *Portcullices*, becauſe the Pieces whereof the latter conſiſt are join'd together ; ſo that when any Part is hung or heaved up, the whole Machine is likewiſe removed. Theſe *Orgues* therefore are much better than *Portcullices.*



ORLE, is an Ordinary in Heraldry, almoſt of the Figure of an *Ineſcocheon*, only it is voided, ſo that the Field appears through, Thus : He beareth *Or*, an *Orle Azure*, by the Name of *Bertram.* Whenever an *Orle* is flowered, it is called a *Treſſure* ; and if there be two of them, a *Double Treſſure.*

Sometimes an *Orle* conſiſts of three pieces one within another. Alſo if a Round of *Martlets*, *Cinquefoils*, *Eſcallop-ſhells*, &c. are placed about any *Ordinary*, 'tis called an *Orle* of *Martlet's*, *Cinquefoils*, &c.

ORLE, a Term in Architecture ; the ſame with *Plinth*, which ſee.

ORLOPE, properly the Spare-Deck in a great Ship, reaching from the Main-maſt to the Miſſen ; and in a Three-Deck'd Ship the Second and Loweſt Deck are ſometimes called *Orlopes.*

ORNAMENTS, in Architecture, are the *Architraves*, *Friezes*, and *Cornices* of the ſeveral *Orders.* But there are alſo many Ornaments frequent-

ly carved in the Mouldings, and on all other Members; as divers ſorts of *Leaves*, *Chaunellings*, *Wreaths*, *Ovals*, *Chaplets*, *Treſſes*, *Feſtoons*, *Flowers*, *Roſes*, &c. The *Ornaments* of the Columns the *French* call *Oeufs*.

ORNITHOLOGY, is a Deſcription of the ſeveral Natures and Kinds of Birds.

OROBOIDES, is a ſubſiding in Urine, like to a kind of Pulſe called *Vetches*. *Blanchard*.

ORTEIL, a Term in Fortification; the ſame with *Berme*, which ſee.

ORTHODROMIQUES, is the Art of ſailing in the Ark of ſome great Circle: For the Ark of every great Circle is ὀρθοδρομία, the ſhorteſt ſtraiteſt Diſtance between any two Points on the Surface of the Globe.

ORTHOGRAPHY, in *Grammar*, is writing and ſpelling any Language truly, according, to its juſt Etymologies and Proprieties.

ORTHOGRAPHY, in *Mathematicks*, is the true Delineation of the fore-right Plain of any Object.

In *Architecture*, 'tis taken for the Model, Platform, and Delineation of the Front of a Houſe that is to be built and contrived according to the Rules of Geometry; according to which Pattern, the whole Fabrick is erected and finiſhed.

In *Perſpective*, the *Orthography* of any Body, or Building, is the foreright ſide of any Plane; that is, the Side or Plane that lies parallel to a ſtreight Line, that may be imagined to paſs thro' the outward Convex Points of the Eyes, continued to a convenient Length. The Word *Schenography* is uſed by *Lamy* and Others in the ſame Senſe.

In *Fortification*, it is the *Profile* or Repreſentation of a Fortreſs, made after ſuch a manner, that the Length, Breadth and Height of its ſeveral Parts may be diſcovered.

ORTHOGRAPHICAL *Projection of the Sphere*, is the drawing the Superficies of the *Sphere* on a Plane which cutteth it in the middle, the Eye being placed at an infinite Diſtance vertically to one of the *Hemiſpheres*; then a Right Line extended from the Eye to any aſſigned Point in the Surface of that Hemiſphere, ſhall project the aſſigned Point upon the Plane; and the Diſtance upon the Plane from the Apex, or top of the Hemiſphere to the projected Point, is equal to the Sine of the Ark, from the Vertex of the Hemiſphere to the aſſigned Point, the Radius being the Semi-diameter of the *Sphere*. This Projection is alſo called the *Analemma*, which ſee.

ORTHOGONIAL, the ſame with *Right-angled*; and when referred to a Plain Figure, ſuppoſes one Leg or Side to ſtand perpendicular to the other: And when it is ſpoken of Solids, it ſuppoſes their Axis to be perpendicular to the Plane of the Horizon.

ORTHOPNOEA, is an ill Reſpiration, when the Perſon affected cannot breathe but with his Neck erect.

OS, a Bone, is an hard, dry, and cold Subſtance, conſiſting eſpecially of earthy and ſaline Particles; which Particles, ſaith Dr. *Havers*, being in their ſeveral Series united at their Extremities, form Strings; and thoſe Strings united make diſtinct Plates, which lying one above another, conſtitute the whole Thickneſs of the Bone.

The Bones in an Human Body, are deſigned for the upholding of the Body, to render its Motion eaſie, and for a Fence for ſeveral Parts. Some make the Number of the Bones to be 249, others commonly 304, and others as many as the Days of the Year; yet the Number of them is uncertain, becauſe the Bones of Infants differ from thoſe of Adult Perſons; alſo, becauſe the Bones called *Seſamoidea*, (ſee them in their proper Place) and the Teeth, are not determined to a certain Number in Old Men and Adult Perſons. They are of different Shapes; ſome are round, others plain, acute, obtuſe, hollow, ſpongy, ſolid, oblong, triangular, &c. If you would find any particular Bone, ſee the Word that diſtinguiſhes it; as, for *Os frontis*, or *Coronale*; ſee *Frontis Os*, or *Coronale*.

OS *Calcis*. See *Calcaneus*.

OSCILLATION. If a Ball be hung at the end of a String or Wire, and that Wire or String hang on a Pin faſtened above, ſo that the Ball may ſwing or play freely on that Pin, it is called a *Pendulum*, and the Pin is the *Centre of Suſpenſion*: But if you imagine the Pin to be the Centre of a Circle, whoſe Circumference ſhall divide the Ball or Bob into two equal Parts, the middle Point of the Ark, ſo dividing the Ball, is called the *Centre of Oſcillation*. If the Bob be of any other Figure but orbicular, the Centre of Gravity of it will be the Centre of Oſcillation.

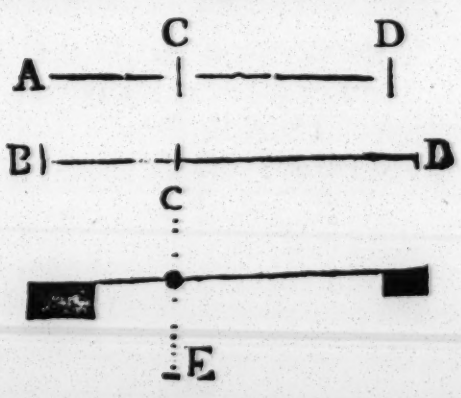
N. B. The ſhorter the *Oſcillations* or Swings are, the truer will the *Pendulum* meaſure Time; or the more *Iſochrone* will the *Vibrations* be, as ſome love to expreſs themſelves.

To find the Centre of Oſcillation *exactly, in order to adjuſt the Royal Pendulum of a Clock, Mr.* Hugens *gives this Proportion,* (Horol. Oſcillat. p. 141.)

As the Length of the String from the Point of Suſpenſion, to the Centre of a Ball or Bob: is to the Semi-diameter of that Ball or Bob :: ſo is that Semi-diameter to a Fourth Number.

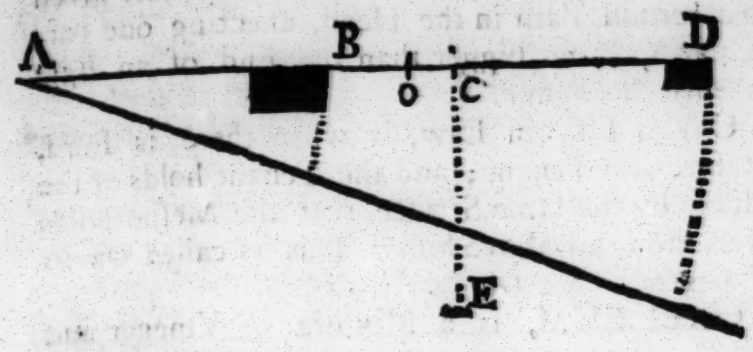
Add $\frac{2}{5}$ of that Fourth Number to the former Length, and you have the *Centre of Oſcillation*.

But this Term, the *Centre of Oſcillation* is often in *Mechanicks* taken in a more large and comprehenſive Senſe. As ſuppoſe there be a *Libra*, as B D, having the Weights B and D,



hanging at its ends by their Centres of Gravity B and D; and let the Point C be the *Hypomochlion*, *Fulciment* or Prop which is ſuppoſed to ſupport the *Libra* in the common Centre of Gravity C, belonging to the two Bodies B and D; then will thoſe Weights be *in Æquilibrio*. Let this *Libra*, with the Weights B and D hanging at it, deſcend perpendicular to the Horizon all together, and ſtill retain a Paralleliſm to its ſelf

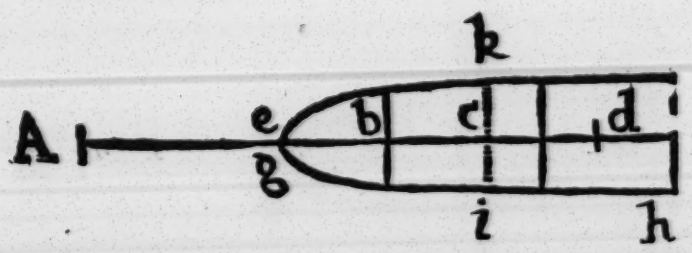
ſelf in its firſt Situation; and as it thus moves, let it meet with an Obſtacle, as E, which ſhall ſtrike it in C, the above-mentioned common Centre of Gravity: Then becauſe the Deſcent of the *Libra* was by a parallel Motion, the Points B and D will have acquired equal Velocities; and conſequently the Weights hanging at ſuch Points will alſo gain equal Velocities; and therefore if the *Libra* ſtrike upon E, the *Æquilibrium* muſt continue the ſame as before, that is, will not *oſcillate* or ſwing any way, but keep at Right Angles with the Line C E: Wherefore C is both the common Centre of Gravity, and alſo of Oſcillation.



But ſuppoſing the *Libra* to turn round the Centre A, or to ſwing on it like a *Pendulum*, with its Weights B and D affixed to it, as before: In this Caſe will the Weights B and D acquire each a Degree of Velocity, proportionable to their reſpective Diſtances from the Centre. And conſequently if *o* (ſuppoſe) had been their common Centre of Gravity, before the new Rotation of the *Libra* round A, it cannot now be the Point on which the Revolving Bodies B and D will poize, or be in *Æquilibrio*: That is, the Point *o* cannot be the Centre of Oſcillation.

For ſince *o* is ſuppoſed to be the common Centre of Gravity, therefore the Moment of B O x, B, muſt be equal to the Moment of D O multiplied by D: But ſince the Velocity of B is to that of D, as A B is to A D; therefore the Compound Moment of B x B O x A B cannot be equal to the Compound Moment of D x D *o* x A D; and conſequently there cannot be an *Æquilibrium* about the Point *o*: Wherefore if an *Obex* or Obſtacle ſhould meet with the *Libra* in the Point *o*, the *Libra* would oſcillate or dip towards the Parts of D, becauſe that *Momentum* is the greater of the two. But the true Centre of Oſcillation will be a Point as C, taken ſo, that the Moment of B x B C x A B, ſhall be equal to the Moment of B x D C x A D. That is, if A D. A B :: B x B C. D x D C, then will C be the true Centre of Oſcillation; and if the Revolving *Libra* ſhould be ſuppoſed to meet with an *Obex*, it would not oſcillate upon it.

In like manner, if inſtead of a *Libra* burden'd with two Weights, as above, we conceive any plain or ſolid Figure to revolve about the Centre A, its Centre of Oſcillation is to be determin'd by the ſame Principle.



Thro' the Point C of the Revolving Figure taken in the Axis *e d*, let the Line *k i* be drawn, dividing the Figure into two Parts, *e k i g*, and *k f b i*; the Centres of Gravity of which Parts ſuppoſe to be at *b* and *d*: Then if the Compound Moment of *i e*, *k e* x *b c* x A *b* = *k f b i* x *c d* x A *d*: for the ſame Reaſon as before, C will be the Centre of Oſcillation.

This I had from Mr. Humphry Ditton.

OSCITATION, Yawning, is a certain light Convulſive Motion of thoſe Muſcles which open the lower Jaw of the Face. Some think that Excrementitious and Halituous Matter, which irritates the neighbouring Parts, is expelled by this Action of Yawning.

OSCULA, are the Openings of Veſſels in an Animal Body, at their ends.

OSCULATORIUS *Muſculus*. See *Orbicularis*.

OS *Mali*. See *Zygoma*.

OS *Unguis*. See *Unguis Os*.

OS *Occipitis*. See *Occipitis Os*.

OS *Palati*. See *Palati Os*.

OSSA *Parietalia*. See *Parietalia Oſſa*.

OSSA *Temporum*. See *Temporum Oſſa*.

OS *Sphænoides*. See *Sphænoides*.

OSSICULUM, among the Botaniſts, is the Stone of a Plum, Cherry, or ſuch like Fruit.

OSTENSIVE *Demonſtrations*, are ſuch as plainly and directly demonſtrate the Truth of any Propoſition; in which they are diſtinguiſhed from *Apogogical* ones, or *Deductiones ad Abſurdum*, *ſive ad Impoſſibile*, which prove the Truth propoſed, by demonſtrating the Abſurdity or Impoſſibility of aſſerting the contrary.

OSTENSIVE *Demonſtrations*, are of two ſorts: Some of which barely (but directly) prove the Thing to be, which they call ὅτι; and Others demonſtrate the Thing from its Cauſe, Nature, or Eſſential Properties, and theſe are called in the Schools διότι.

OSTEOLOGIA, is a Deſcription of Bones.

OSTOCOPI, are Pains in the Bones, or rather in the Membranes and Nerves about the Bones: For Bones, as ſuch, are inſenſible. *Blanchard*.

OTACOUSTICKS, are Inſtruments which help or improve the Senſe of Hearing. See *Acouſtica*.

OTALGIA, is a Pain in the Ears, whenceſoever it proceeds.

OTENCHYTA, an Auricular Clyſter. *Celſus* calls it *Oegin*, a little Syringe or Squirt which injects Medicines into the Ears.

OTICA, are Medicines againſt Diſtempers in the Ears.

OVAL, in Architecture, the ſame with *Echinus*. Some write it *Ovo*, becauſe of its Figure, being like an Egg. It is placed in the Mouldings of the Cornices, for Ornament; and in a Pillar it is placed next the *Abacus*.

OVAL *Figure*, in Geometry, is a Figure bounded by a regular Curve Line returning into its ſelf; but of its two Diameters cutting each other at Right Angles in the Centre, one is longer than the other, in which it differs from the *Circle*. See *Ellipſis*.

OVAL *Window*, one of the Holes in the Hollow of the Ear, opening pretty wide into the *Labyrinth*; the other being called the *Round Window*.

OVARIA, are the Teſticles of Females, and are ſo called, becauſe they reſemble and have the ſame Uſe as the Lathers or Collections of Eggs in the Bodies of Fowls.

OVELTY *of Services*, in Law, ſignifies Equality of *Services*; as when the Tenant Paravail owes as much to the Meſne, as the Meſne does to the Lord Paramount.

OVER-*Rake*. When a Ship, riding at Anchor, doth ſo over-beat her ſelf into a Head Sea, that ſhe is waſh'd by the Waves breaking in upon her, then they ſay the Waves do *Over-rake her*.

OVERT-ACT, a Term in Law, ſignifying an Open ACT, which may be manifeſtly proved.

OVIDUCTUS, the ſame with *Tuba Fallopiana*.

OVIPAROUS *Animals*, are ſuch as lay Eggs.

OUTACOUSTACON, an Ear-pipe to augment Hearing.

OUTLAW, ſignifies one deprived of the Benefit of the Law, and out of the King's Protection.

OUTLAWRY, is the Loſs of the Benefit of a Subject, that is, of the King's Protection. See *Utlawry*.

OUTLICKER, in a Ship, is a ſmall piece of Timber three or four Yards long, as Occaſion ſerves, and is made faſt to the top of the Poop, and ſo ſtands right out a-ſtern: At the outmoſt end of it is a Hole, into which the ſtanding part of the Sheet is reeved and made faſt through the Block of the Sheet; and then again reeved thro' another Block, which is ſeized to this Outlicker, hard by the end of it. This is ſeldom uſed in Men of War, or in great Ships; and whenever it is made uſe of, it is becauſe the Miſſen-maſt is placed ſo far *aft*, that there is not room enough within board to hale the Sheet flat.

OUTRIDERS, in Law, are Bailiffs Errant employed by the Sheriffs, or their Deputies, to *ride* to the fartheſt Places of their Counties or Hundreds, with the more ſpeed to Summon ſuch as they thought good to their County or Hundred Courts.

OUTWARD *Flanking-Angle*, or the *Angle of the Tenaille*, is comprehended by the two Flanking Lines of Defence.

OUT-*Works*, in Fortification, are all ſorts of Works which are rais'd without the Incloſure of a Place, and ſerve for its better Defence, and to cover it from the Enemy, in the Plain without; as, *Ravelins*, *Half moons*, *Horn-works*, *Crown-works*, *Counter-guards*, *Tenailles*, &c.

It is a general Rule in all Out-works, that if there be ſeveral of them one before another to cover one and the ſelf-ſame *Tenaille* of a Place, the nearer ones muſt gradually, and one after another, command thoſe which are fartheſt advanced out into the Campain; that is, muſt have higher Ramparts, that ſo they may over-look and fire upon the Beſiegers, when they are Maſters of the more outward Works.

The *Gorges* alſo of all Outworks muſt always be plain, and without Parapets; leſt, when taken, they ſhould ſerve to ſecure the Beſiegers againſt the Fire of the Retiring Beſieged; wherefore the *Gorges* of Out-works are only Palliſado'd, to prevent a Surprize.

OUVERTURE, is a kind of Muſick, uſually played at the Opening or Beginning of an Opera; it commonly ends with a *Fugue*.

OVUM, by ſome Writers, is a Name given to a certain Pain in the Head, affecting one particular Spot, no bigger than the End of an Egg; whence the Name.

OWELTY, in Law, is when there is Lord, Meſne, and Tenant; and the Tenant holds of the Meſne by the ſame Service that the Meſne holds over the Lord above him: This is called *Owelty of Services*. See *Ovelty*.

OXELÆUM, is a Mixture of Vinegar and Oil.

OXYCRATUM, is a Mixture of Vinegar with Water, called *Puſca* or *Poſca*.

OXYDERCICA, are Medicines which quicken the Sight.

OXYGALE, is Sowre Milk.

OXYGONE, the ſame with an *Acute-Angled Triangle*; which ſee. And in the General,

OXYGONIAL, is *Acute-Angular*.

OXYMEL, is a Compoſition of Vinegar and Honey, like a Syrup.

OXYREGMIA, is an acid ſowre Belch from the Stomach.

OXYRHODINUM, is Vinegar of Roſes mix'd with Roſe-water.

OYER and *Terminer*, in Law, is a Commiſſion eſpecially granted to ſome Eminent Perſons for the hearing and determining one or more Cauſes: It is the firſt and largeſt of the Commiſſions, by which the Judges of Aſſiſe do ſit in their ſeveral Circuits.

OYER *de Record*, is a Petition made in Court, That the Judges, for better Proofs ſake, will be pleaſed to hear or look upon any *Record*. So when an Action is brought upon an Obligation, the Defendant may pray *Oyer* of the Bond; or if Executors ſue for any one, the Party ſued may demand *Oyer* of the Teſtament.

OZOENA, is an old ſtinking Ulcer in the inſide of the Noſtrils, taking its Name from the Fulſomneſs of its Smell.

PACHUNTICK Medicines (from παχὺς) Thick, Denſe, &c. are ſuch as are of a thickning Nature, but withal cold; theſe when mix'd with a thin Juice, by joining the Parts together ſtiffen it, and make it of a more Denſe, and firm Compoſition: Such as Bole-Armoniack, Almonds, Poppies, Water-Lilies, &c. *Blanchard.*

PAINE *fort & dure*, in Law it ſignifies an eſpecial Puniſhment for him that being Arraigned of Felony, refuſes to put himſelf upon the ordinary Trial of God and his Country, and thereby ſtands Mute by the Interpretation of the Law.

And is thus deſcribed by *Stamford.*

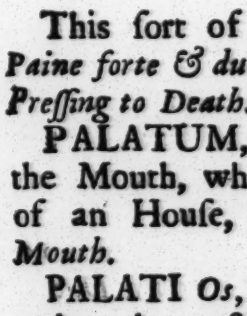
"He ſhall be ſent back to the Priſon, whence "he came, and laid in ſome low dark Houſe, "where he ſhall lie Naked on the Earth, with-"out any Litter, Ruſhes, or other Cloathing, and "without any Rayment about him, but only "ſomething to cover his Privy Members: And "he ſhall lie upon his Back, with his Head co-"vered and his Feet; and one Arm ſhall be "drawn to one quarter of the Houſe with a "Cord, and the other Arm to another quarter, "and his Legs uſed in the ſame manner; let "there be laid upon his Body, Iron and Stone as "much as he may bear, or more: And the next "Day following he ſhall have three Morſels of "Barly-bread, without Drink; and the ſecond "Day he ſhall have Drink three times, as much "at each time as he can Drink of the Water "next unto the Priſon, except it be running "Water, without any Bread: And this ſhall be "his Diet till he Die."

This ſort of Puniſhment, called by the Law *Paine forte & dure*, is that which is vulgarly called *Preſſing to Death.*

PALATUM, the Palate, is the upper part of the Mouth, which becauſe it reſembles the Roof of an Houſe, is thence called the *Roof of the Mouth.*

PALATI *Os*, is a ſmall Bone almoſt ſquare, it makes the poſterior part of the Roof of the Mouth: It is joined to that part of the *Os Maxillare*, which makes the fore-part of the Palate; it is alſo joined to its Fellow, and the *Proceſſus Pterigoidæus.* It has a ſmall Hole, thro' which a Branch of the fifth pair of Nerves goes to the Membrane of the Palate.

PALINDROME, is a Diſeaſe into which one relapſes. *Blanchard.*



PALE, one of the Eight Honourable Ordinaries in Heraldry, containing the third part of the Eſcutcheon, thus:

He beareth *Gules*, a *Pale Or.*

PALL, the Heralds have a kind of Croſs, which they call by this Name, and they deſcribe it thus:

He beareth *Gules* a *Croſs Pall Argent.*

PALLET, is the Moiety, or half of the *Pale*, and muſt never be charged with any thing either Quick or Dead; neither can it be divided into two equal parts, but it may into four, for one fourth part of the *Pallate*, or $\frac{1}{4}$ part of the *Pale*, is called an *Endorſe.*

If the *Pale* be upon any Beaſt, they ſay the Beaſt is *Debruſed with the Pale:* But if the Beaſt be upon the *Pale*, they ſay he is *Supported of the Pale.*

Pallets alſo is a Term which belongs to the *Ballance* of a Watch or Movement. See *Ballance.*

PALLET is a Room within the Hold of a Ship, cloſely parted from it, in which by laying ſome Pigs of Lead, &c. a Ship may be ſufficiently Balaſted, without loſing room in the Hold; which therefore will ſerve for Stowing the more Goods.

PALLIATION of a Diſeaſe, or a *Palliative Cure*, is a Method which helps (as much as is poſſible) incurable Diſeaſes by the Application of preſent Remedies.

PALLIER, a Landing-place in a Stair-Caſe or a Step, which being much broader than the others, ſerves to reſt upon.

PALLISADOES, or *Palliſades* in Fortification, are ſtrong Wooden ſharp-pointed Stakes, ſix or ſeven Inches ſquare, eight Foot long, of which three Foot is in the Ground, ſet up half a Foot ſometimes one above another, with a croſs piece of Timber that binds them together. Some of theſe are alſo ſometimes arm'd with two or three Iron-Spikes.

Theſe *Palliſadoes* are uſually fixed in the void Spaces without the *Glacis*, near the Baſtions and Curtains; and in the Avenues of all ſuch Poſts as are liable to be ſurprized by the Enemy, or carried by Aſſault. Sometimes they are driven downright in the Ground, and ſometimes ſtand at an Acute Angle towards the Enemy, that if they ſhould throw Cords about them to pull them up, they may ſlip off again.

Palliſadoes are always planted on the *Berme* of Baſtions, and at the *Gorges* of Half-Moons and other Out-works: They alſo *Palliſade* uſually the Bottom of the Ditch; and to be ſure, the *Parapet* of the *Covert way:* And tho' ſometimes they have placed theſe *Palliſadoes* three Foot from the ſaid Parapet outwards towards the Campaign, yet of late they have been planted in the very middle of the *Covert way:* All *Palliſadoes* ſhould ſtand ſo cloſe, as to admit between them only the Muzzle of a Muſquet, or a Pike.

PALMARIS *Longus*, is a Muſcle of the Palm of the Hand, which has an Acute Beginning from the Internal Extuberance of the *Os Humeri*; and ſoon becoming a Fleſhy Belly, and contracting

cting it ſelf again to a long, flat, ſlender Tendon, marches Obliquely with the Tendon of the *Flexor Carpi Superior*; and paſſing over the *Ligamentum Annulare*, where it expands it ſelf, and cleaves firmly to the Skin of the Palm, is inſerted to the Roots of the Fingers laterally; it being there divided to tranſmit the Tendons that bend them.

Columbus obſerves the long Beginning of this Muſcle, from the Extuberance of the *Os Humeri*, is ſometimes wanting, which Obſervation is alſo confirmed by our Experience (ſaith Mr. *Cowper*:) It aſſiſts, in firmly graſping any Tactile Body, and defends the ſubjacent Tendons from External Injuries.

PALMARIS *Brevis*, is a Muſcle of the Palm of the Hand, by *Spigelius*, called, *Caro Muſculoſa Quadrata*. Anatomiſts (ſaith *Cowper*) have been extreamly deceived in their Idea's of this Muſcle; it not ariſing from the *Membrana Carnoſa*, as *Columbus* pretends, or from the eighth Bone of the *Carpus*, as *Fallopius* writes; but it ſpringeth with a broad Membrane-like Tendon from the External part of the *Os Metacarpi Minimi Digiti*, and one of the Bones of the *Carpus*; whence aſcending over the *Abductor Minimi Digiti*, it becomes a thin diſgregated Fleſhy Muſcle, marching under the Tendinous expanſion of the former in the Palm; and is inſerted by a ſhort, ſtrong Tendon, to the eighth Bone of the *Carpus*, This acting draws the *Mons Lunæ* towards the *Os Metacarpi Minimi Digiti*, whereby the Palm becomes hollow; contrary to the Opinion of *Spigelius*, who pretends it extends the Hand when we open it; which is not done by any proper Muſcle, but by the Common Extenders of the Fingers.

PALMUS, is a Shivering, or Palpitation of the Heart, cauſed by a Convulſion, or Irritation of the Nerves. *Blanchard.*

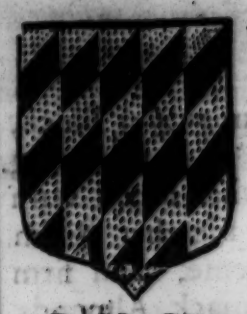
PALPEBRÆ are the *Eye-lids*, or Coverings of the Eyes; they conſiſt outwardly of a very thin Skin; inwardly they are lined with the *Pericranium*, which is here moſt thin and ſmooth; and between theſe two, is the *Membrana Carnoſa*, which is alſo very thin.

Steno obſerved ſeveral *Puncta Lachrymalia* in the Inner Membrane, which run on each ſide into one Duct (which he calls *Colliciæ*) whereby the ſuperfluous Moiſture of the Eye-lids is conveyed into the Noſtrils. At their Edges they have little ſoft Cartilages called *Cilia*, which ſerve to ſtrengthen them, and to make them meet and cloſe the more exactly. Their Corners are called *Canthi*, the outer and leſſer of which hath a Gland in it called *Innominata*, which might well be called *Lachrymalis*, becauſe it ſupplies moſt of the Matter of the Tears.

PALPITATION *of the Heart*, when Natural is in the Syſtole thereof; whilſt the Cone and the Sides are preſs'd together, the Baſis and the Roots of the Veſſels being blown up with the Blood that gathers there, grows big and ſwoln. But it oft alſo proceeds from an extraordinary Contraction of the Heart, or a Thick and irritating Matter which ſticks in the Heart; and this is a Diſeaſe and preternatural. *Blanchard.*

PALSEY. See *Paralyſis.*

PALY, when an Eſcutcheon is divide into 6, 8, or 10 Even Diviſions *Pale-wiſe*; 'tis always Blazon'd, *Paly* of 6, 8, or 10, &c. *Pieces*; but if the Number be odd, then the Field is firſt named, and the Number of the *Pales* ſpecified. The like is to be underſtood alſo of *Barry* and *Bendy*.



PALY *Bendy*, is when a Coat is divided both *Pale* and *Bend-wiſe*, as here.

The Field *Paly Bendy Topaz* and *Diamond*. *Guillim*, p. 279.

PANACEA, was anciently a Name given by *Galen* to ſome Medicines which he had a great Opinion of: After, by the Chymiſts, it was the Term for their Boaſted *Univerſal Medicine*, which they pretended would Cure all Diſeaſes in all Circumſtances, Ages, and Conſtitutions. There are ſeveral *Panacea*'s whoſe Preparation you will find in Books of Chymiſtry and Pharmacy; as that of Mercury, of Antimony, &c. which perhaps may be good Medicines in many Caſes, but do all fall ſhort of the Character of being *Univerſal Medicines*, and indeed it ſeems impoſſible there can be any ſuch thing. The Word *Panacea* comes from the *Greek*, πᾶν and ἀκέομαι, *omnia ſano*. There is alſo a Plant of this Name.

PANARITIUM, *Vid. Paronychia.*

PANCHYMAGOGUES, are Univerſal Purgative Medicines that expel all kinds of Humours; according to the ancient Way of Expreſſion.

PANCREAS, the Sweet-bread, *Pancration*, *Pancreon*, *Callicreas*, *Callicreon*, and *Lactes*, are all Synonymous. It is a conglomerated Glandule in the *Abdomen*, compacted out of many Globules, or knots of Glands included in a common Membrane which it hath from the *Peritonæum*; theſe Globules are joined to one another, partly by Membranes, and partly by Veſſels. It is placed behind the *Ventricle*, and faſtened to the Gut *Duodenum*, and reaches from the Cavity of the Liver croſs the *Abdomen*, to the lower end of the Spleen: By its Duct it is annexed to the *Duodenum*, and ſometimes to the *Porus Bilarius*, to the *Rami Splenici*, the *Caul*, the upper-part of the *Meſentery*, and the upper Nervous *Plexus* of the *Abdomen*; the Uſe and Office thereof, is to convey a Volatile, Inſipid, and Lymphatick Juice, or as others will have it (for it is a diſputable Point) a ſomething acid Juice, by its own *Ductus* to the Gut *Duodenum*, in order to a farther Fermentation and Volatilization of the Chyle, and to attemperate and allay the Qualities of the Gall: It is the biggeſt Glandule in the whole Body, but bigger in a Dog than a Man.

Its Veſſels are of five Kinds; for it hath Veins from the *Ramus Splenicus*; Arteries from the Left Branch of the *Cæliaca*, and ſometimes from the *Splenica*. Nerves it receives from the Intercoſtal Pair, eſpecially from the Upper *Plexus* of the *Abdomen*. It hath alſo many *Lymphatick* Veſſels, which paſs as the reſt do, to the common Receptacle of the Chyle. Beſides which it hath a proper Duct of its own, which is ſometimes called *Ductus Wirtſungianus*, becauſe found out by one *Wirtſungus* at *Padua*, about 50 Years ago, but we uſually call it the *Pancreatick Duct*: This Veſſel hath uſually but one Trunk, whoſe Orifice opens into the lower End of the *Ducdenum*, or Beginning of the *Jejunum*, and ſometimes is joined to the *Ductus Bilarius*, with which it makes but one Mouth into the Inteſtine; within the *Pancreas* (ſaith *Whar-*

(*Wharton*) it is divided into two Branches which ſend forth abundance of little Twigs into all the Globules, of which the Subſtance of the *Pancreas* is compoſed, where they imbibe the Humour that is ſeparated by them from the Arteries, and by their Trunk tranſmit it to the Guts. The Pancreatick Juice is never found in this Duct, any more than Urine is found in the *Ureters*, by reaſon of the Swiftneſs of its Motion, and the Steepneſs of the Way.

PANDALEA, as the Modern Phyſicians call it, is the ſame with a ſolid Electuary, but that it remains *intire*; for the Sugar being rightly boiled, is let grow hard: The Patient takes a Piece of it like a Lambitive. It only differs from Rolls and Morſels as to its Shape. *Blanchard.*

PANDEMIUS, (*ſt. Morbus*) is a Diſeaſe which is univerſally rife in any place.

PANDICULATION, is the Reſtleſſneſs, Stretching, and Uneaſineſs that uſually accompanies the cold Fit of an Intermitting Fever: 'Tis ſuppoſed to be occaſioned by a Convulſive Dilatation of the Muſcles, by which Nature endeavours to throw off ſomething that is diſagreeable to them.

PANICULA, is a Term in *Botany*, for a kind of ſoft Woolly Beard or String, on which the Seeds of ſome Plants do hang pendulous, as in *Reeds*, *Millet*, &c. It ſignifies the ſame with *Juba*, and is oppoſed to *Spica*.

PANIS *fortis & durus.* See *Paine fort & dure.*

PANNICULUS *Carnoſus*, is a flat ſort of Membrane, in ſome part thick and muſculous; in other parts thin, with many *Ductus*'s of Fat in it: It covers the whole Body.

PANSELENE, ſignifies the *Full Moon*.

PANUS, is a ſort of Botch or Sore under the Arm-pits, Jaws, Ears, and Groins; to wit, in the Glandulous Parts. It is alſo taken for *Phygethus*.

PAPER-*Office*. All the Acts of the Council-board, occaſional Proclamations, Diſpatches, and Inſtructions for Foreign Miniſters, Letters of Intelligence, and many other publick Papers communicated to the King's Council, or the two Secretaries of State, are afterwards tranſmitted to the *Paper-Office*, wherein they are all diſpoſed in a Place of good Security and Convenience within the King's Royal Palace.

Alſo an Office ſo called belonging to the *King's-Bench*.

PAPILIONACEOUS Flower of a Plant; is by the Botaniſts accounted ſuch an one as repreſents ſomething of the Figure of a Butter-fly with its Wings diſplayed: And here the *Petala*, or Flower Leaves, are always of a very Difform Figure. They are Four in Number, but joined together at the Extremities, wherefore they are rather *Monopetalous*, than truly *Tetrapetalous*. One of theſe four Leaves is uſually larger than the reſt, and is erected in the middle of the Flower, and by ſome called *Vexillum* and *Clypeus*. The Plants that have this Flower, are of the Leguminous kind, as *Peaſe*, *Vetches*, &c.

PAPILLA, or the Nipple, is a red Excreſcency in the middle of each Breaſt, in the Pores whereof are received all the Milky Tubes or Pipes, proceeding from the Glandules of the Breaſt: It is of a ſpongy Subſtance, and covered with a very thin Skin: It is of exquiſite Senſe, that both the Infant's Mouth in Sucking, and the Trickling of the Milk through it, may affect the Nurſe with Pleaſure in Suckling the Child.

PAPILLÆ *Inteſtinorum*, are little Glandules, wherewith the Innermoſt Tunick of the Inteſtines or Guts is full: They ſoak in the percolated Chyle, and diſpenſe it to the Lacteal Veins. *Pecquet* calls this Lining of the Guts, a *Spongy Periſtoma*; and *Bilſius*, a *Woolly Moſs*. 'Tis probable alſo, that theſe *Papillæ* hinder the Excoriation of the Inteſtines. *Willis* takes them for a diſtinct Coat, and calls it *Glanduloſa*, and *Villoſa Tunica Inteſtinorum*.

PAPILLARUM *Proceſſus*, or the *Proceſſus Mamillares*, are the Extremities of the Olfactory Nerves, which convey the ſlimy viſcous Humours by the Fibres, which perforate the *Os cribriforme*, to the Noſtrils and Palate.

PAPPOSE *Herbs.* See *Pappus.*

PAPPUS, in *Botany*, is that ſoft light *Down* which grows out of the Seeds of ſome Plants, ſuch as *Thiſtles*, *Dandelion*, *Hawkweed*, &c. and which buoys them up ſo in the Air, that they can be blown any where by the Wind. And therefore this diſtinguiſhes one kind of Plants which is called *Pappoſa* or *Pappi Flora*.

PAPULÆ, the ſame with *Puſtulæ*; alſo a kind of *Small-pox*: See *Exanthemata*.

PARABOLA; the Quotient in Geometrical Diviſion, is called by this Name, by *Diophantus* and others: The Reaſon of which ſee in *Diviſion*.

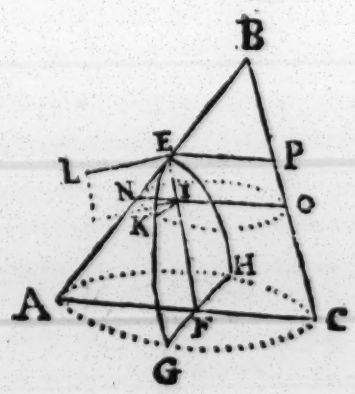
PARABOLA, is a *Conick Section* ariſing from a Cone's being cut by a Plane parallel to one of its Sides, or parallel to a Plane that touches one Side of the Cone.

In any *Parabola*, G K E H, the Square of I K, the *Ordinate Applicate*, or *Semi-ordinate*, is equal to the Rectangle I L, under the *Latus Rectum* E L, and the *Abſciſſa*, or *Intercepted Ax* E I.

NOTATION.

Let the Side A B (of the Cone) be a, the Side B C $= b$, the Diameter of the Baſe A C $= c$: Let E B be called $o\,a$, and E I $= e\,b$.

Wherefore the Triangles B C A and E I N being ſimilar, B C (or b) will be to A C (or C) : : as E I ($= e\,b$) is to N I a Fourth Proportional; which in this Notation will be $\frac{e\,b\,c}{b}$, or $e\,c$. Therefore N I $= e\,e$.



Alſo becauſe the Triangles A B C, and B E P are ſimilar, E P, or its Equal I O, will (this way) be found to be $o\,c$.

DEMONSTRATION.

K I is a mean Proportional between N I and I O, (the Segments of the Diameter to which it is perpendicular) wherefore the □ of I K = □ N I O, which in this Notation is $eoccc$. Divide therefore $eocc$ by the *Abſciſſa* E I = eb, the Quotient is $\frac{occ}{b}$, which muſt be the *Latus Rectum*: For it multiplied into the *Abſciſſa*, makes $eoccc$, the Square of the Ordinate I K. And from this Equality between the Square and the Rectangle, *Apollonius* gave this Section the Name of the *Parabola*.

COROLLARIES.

I. Hence may the *Latus Rectum* be found very eaſily, if to bc, and oc, (that is, to the *Side of the Cone parallel to the Axis of the Section*, to the *Diameter of the Baſe*, and to the *Latus Primarium*) you find a Fourth Proportional; for that will be $\frac{occ}{b}$, the *Parameter*, or *Latus Rectum* = E L.

II. And if you multiply the *Parameter* $\frac{occ}{b}$ both above and below the Line by a (the Side of the Cone in which is the Vertex of the Section) you will have this Quantity $\frac{aocc}{ab}$; which may eaſily be reſolved into theſe Proportionals,

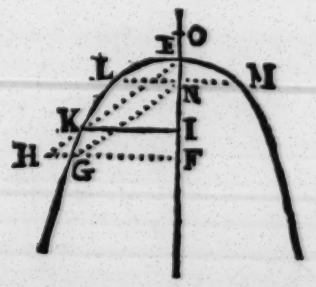
$$ab : cc :: ao : \frac{aocc}{ab}, \text{ i.e. } \frac{occ}{b}.$$

Which gives *Apollonius* his Canon to find the *Latus Rectum*, (Lib. 1. Prop. 11. *Barrow*) and is in Words thus: *As the Rectangle under the Sides of the Cone is to the Square of the Diameter of the Baſe* : : *ſo is the Diſtance between the Vertices of the Cone and of the Section, to the* Latus Rectum.

III. *Praxis* 1. Hence if you have the *Vertex* and *Parameter* of any *Parabola*, 'tis eaſie to deſcribe it on a Plane.

For draw a Right Line for the Axis, and in *that* take as many *Abſciſſæ* as you pleaſe; then find between them ſingly and the *Latus Rectum*, ſo many mean Proportionals, which if you rightly apply to the Axis will be *Semi-ordinates*; and, laſtly, their Ends or Extreams neatly joined, ſhall give the Curve of the *Parabola*.

IV. *Praxis* 2. Having the Vertex and Ordinate, To find the *Parameter*, Geometrically,



Apply rightly the Semi-ordinate K I, and take from the Vertex O, E F = I K; then through F, draw a Parallel (as H F) to the Ordinate I K, and produce O K to H; ſo will H F be the *Parameter* or *Latus Rectum* ſought.

For the Triangles O K I and O H F being ſimilar, E I : I K : : E F (= I K) : F H; and conſequently F H is a true *Parameter*.

V. And ſince the *Parameter* in this way of Notation, is $\frac{occ}{b}$, let it in the laſt Figure be applied to the *Parabola* in the Poſition L M. Then will N be the Point which is called the *Focus* of the *Parabola*: L N will be $\frac{occ}{2b}$, and its Square $\frac{oocccc}{4bb}$, which divided by the *Parameter* $\frac{occ}{b}$, gives $\frac{occ}{4b}$ for the *Abſciſſa* E N: *And ſhews that the Focus is always diſtant from the Vertex of the* Parabola *by* $\frac{1}{4}$ *of the Parameter.*

VI. *Praxis* 3. Having thus gained the *Focus*, the Curve of a *Parabola* may be deſcribed yet more eaſily and readily: If you draw firſt the Axis O F (*Fig. laſt*) and then an Ordinate in any Point, as F. After this, take the *Abſciſſa* O F in your Compaſſes, and ſetting one Foot in the *Focus* N, croſs the Ordinate in G, ſo ſhall the Point G be in the *Parabola*. And thus may as many Points as you will, be ſpeedily found.

The DEMONSTRATION *of which Practice depends upon this:*

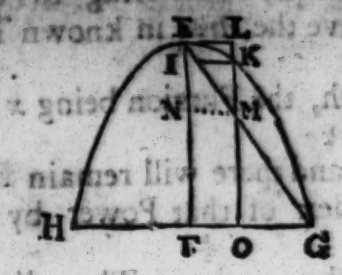
That E N being = $\frac{occ}{4b}$ for E F, put ib; then ſhall N F = $ib - \frac{occ}{4b}$, whoſe Square is $iibb - \frac{occi}{2} + \frac{oocccc}{16bb}$. To which if you add the Square of G F, which in this way of Notation was above ſhewed to be $oicc$, then the Square of N G will be $iibb + \frac{oicc}{2} + \frac{oocccc}{16bb}$, whoſe Root in this Notation, will be $ib + \frac{occ}{4}$. So that a Line drawn from the *Focus* to the End of the Ordinate will always be equal to the *Abſciſſa* E F + E N. That is, (ſuppoſing E O taken equal to E N) to the Line F O.

PROPOSITION II.

In the Parabola E K G H, *the Squares of the* Ordinates *are as the* Abſciſſæ.

I ſay, □ K I □ G F : : E I : E F.

For



For let E F be called $i\,b$, as E I was before called $e\,b$: Then the Parameter being $\frac{o\,c\,c}{b}$ the Square of F G the Ordinate, will be equal to the Parameter multiplied by $i\,b$ the *Abſciſſa*; that is $= o\,i\,c\,c$: as before, the Square of K I was $= o\,e\,c\,c$. But Rectangles having the ſame Baſes, are as their Altitudes; wherefore theſe Rectangles will be as the *Abſciſſæ*: And theſe Rectangles are = to the Squares of the Ordinates; wherefore the Squares of the Ordinates are as the *Abſciſſæ*. *Q. E. D.*

COROLLARY.

If a Line, as L O, be drawn parallel to the Diameter or Axis of the Section, and be cut by the Tranſverſe Line E G in M, and by the Curve of the Parabola in K; then ſhall O L, M L, and K L, be in continual Proportion.

For the Triangles E F G and E N M being ſimilar, and N M parallel to F G, E F muſt be to E N :: as F G : N M (*i. e.* I K). But the Squares of G F and I K are in a *duplicate Ratio* of E F to E N, and yet are by this Propoſition as the *Abſciſſæ* F E and E I; wherefore F E to I E, is in a *duplicate Ratio* of E F to E N; that is, E F : E N :: E N : E I. And by the Conſtruction of the Figure, it will be the ſame in L O, which is parallel to E F: that is, O L : M L :: M L : K L : or O L, M L, and K L are in continual Proportion. *Q. E. D.*

PROPOSITION III.

In the Parabola, *the* Parameter *is to the Sum of any two* Ordinates, *as their Difference is to the Difference of the* Abſciſſæ.

I ſay, E L the Parameter, is to I K + F G :: (*ſee the laſt Figure*) that is, to H O :: O G their Difference, is to I F (or K O) the Difference of the *Abſciſſæ*.

Let E F the greater *Abſciſſa* be called $i\,b$, and the leſſer E I, $e\,b$. Then, by *Prop.* 1. the Square of the Ordinate K I, will be $o\,e\,c\,c$, and conſequently the Ordinate itſelf $= \sqrt{:}\, o\,e\,c\,c$; ſo alſo putting i inſtead of e, $\sqrt{:}\, o\,i\,c\,c$ will be the Ordinate F G.

Having thus noted them, if you ſet the *Latus Rectum*, the Sum and Difference of the *Ordinates*, and the Difference of the *Abſciſſæ*, after the manner of four Terms, in disjunct Geometrical Proportion (as below) you will find the Rectangles of the Extreams and Means equal, and conſequently the four Terms to be truly proportional. *Q. E. D.* As,

Param.
$o\,c\,c$: Sum of the Ord. :: Diff. of the Ord. : D. Abſ.
$b \;.\; \sqrt{:}\, o\,i\,c\,c + \sqrt{:}\, o\,e\,c\,c \;::\; \sqrt{:}\, o\,i\,c\,c - \sqrt{:}\, o\,e\,c\,c \;:\; i\,b - e\,b.$

And to avoid the Trouble of Multiplication in Surds, which is the Caſe of the two middle Terms, you need only conſider this *Theorem*: That *the Sum of any Two Quantities multiplied by their Difference, is equal to the Difference of their Squares.* For ſo you will eaſily find, that the Product in both Caſes, will be the ſame Quantity $o\,i\,c\,c - o\,e\,c\,c$.

N. B. This is that Property of the *Parabola* on which our famous Mr. *Baker* founded his *Clavis Geometrica Catholica*, which was unknown to the Ancients, and communicated to him by Mr. *Tho. Strode* of *Maperton* in *Dorſetſhire*: And by which he ſhews how to find the Value of the Unknown Root in all Equations, not exceeding *Biquadraticks.*

See *Conſtruction* and *Central Rule.*

This Property of the *Parabola*, I thus briefly demonſtrate in my *Algebra*, p. 78.

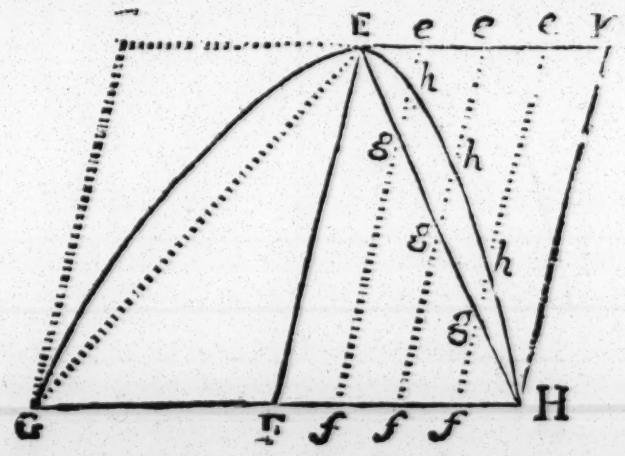
Let P be the Parameter of any *Parabola*, whoſe two *Ordinates* are O and *o*, and their reſpective *Abſciſſæ* A and *a*. Then I am to prove that P : O + *o* :: O − *o* . A − *a*. Which is clear; becauſe from the firſt Property of the *Parabola*, P A $=$ O O and P *a* $=$ *o o*. Wherefore P A − P *a* $=$ O O − *o o*, from the Nature of Equations. And that laſt, reſolved into Proportionals, will ſtand thus,

P : O + *o* :: O − *o* : A − *a*.

Which was the Thing at firſt propoſed to be proved.

A PARABOLICK *Space*, is that Area contain'd between the Curve of the *Parabola* and any *Entire Ordinate* G H.

And this *Space* is to a *Parallelogram circumſcribed* as 2, 3, and to a *Triangle inſcribed* as 4, 3.



Let F H, the Semi-Ordinate be divided into 4 $=$ Parts, or into 8, 16, *&c.* and thro' the Diviſions draw Lines, as *e f*, *e f*, &c. to parallel the Axis E F. Suppoſe alſo E F to be 4.

Then I ſay, The *Parabolick Space* E H F, is to the *Parallelogram* F . K :: 2 . 3. But to the △ E F H :: as 4 . 3.

For, 1. gf, gf, gf, &c. are in continual Arithmetical Proportion from the Nature of Plain Triangles.

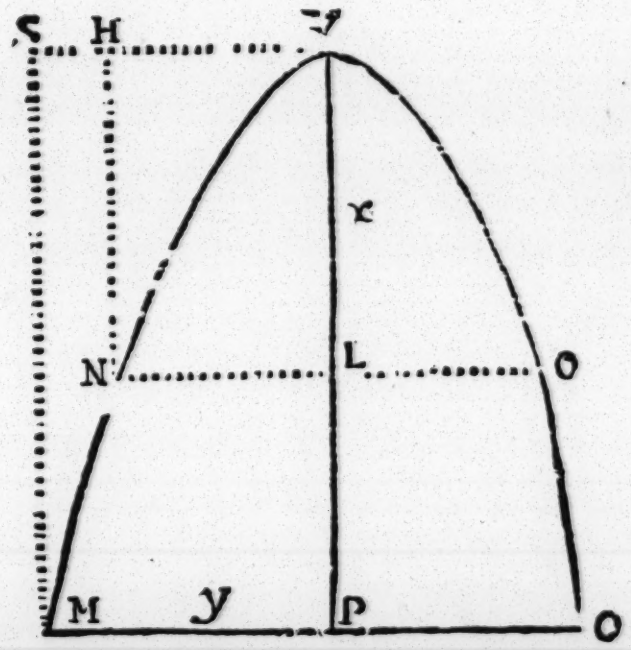
2. $fe . ge :: ge . eh$, (by *Cor.* 1. *Prop.* 2. of the *Parabola.*) But be in the Axis $EF = o$, and in the firſt Parallel ef muſt be equal to $\frac{1}{4}$: in the next ef, it will be equal to $\frac{4}{4}$; in the third to $\frac{9}{4}$; and ſo on in a Duplicate Arithmetical Progreſſion. For as ef $(=4)$. ge . $(=1.)$ :: ſo is ge $(=1)$. eh $(=\frac{1}{4}.)$ And as the ſecond ef $(=4)$. eg $(=2)$: : eg 2, to $eh = \frac{4}{4}$, &c. And thus will it be if the Lines Ff, ff, &c. be again biſſected, &c. *ad Infinitum.* So that all the Indiviſibles of the Trilinear Space EKHE will be in a Duplicate Arithmetical Progreſſion increaſing. But

3. The Sum of a Rank of ſuch Terms is ſubtriple to a Rank of as many equal to the greateſt; (as we proved in N° 7. of *Arithmetical Progreſſion*, which ſee) wherefore the whole Trilinear Space EKHE is to the Parallelogram : : as 1 to 3. And conſequently the remaining Parabolick Space muſt be to it as 2 to 3. *Q. E. D.*

And ſince the Triangle FEH is to the Parallelogram as 1 to 2, it muſt be to the Parabola as $1\frac{1}{2}$ to 2, or as 3 to 4. *Q. E. D.*

And this is a true and very ſhort Quadrature of the *Parabola* of which *Archimedes* wrote ſo long ago, and many Geometricians have ſince expedited. 'Tis plain alſo that this Demonſtration is Univerſal, and extends to any *Parabolick Space.*

The *Quadrature* of the *Parabola*, by the Method of *Fluxions*, I have formerly in my *Algebra* ſhewed to be very briefly thus:



Let the *Parameter* be $p = 1$, the *Abſciſſa* be called x, and the *Ordinate* y.

Then by the firſt Property of the Parabola $x = yy$, becauſe $p = 1$.

And conſequently by the Extraction of the Roots of each, and uſing the new Notation, $\dot{x}^{\frac{1}{2}} = y$. Then multiplying $\dot{x}^{\frac{1}{2}}$ by $\dot{x}$ the *Fluxion* of the *Abſciſſa*, it will ſtand thus $\dot{x}\,\dot{x}^{\frac{1}{2}} =$ to the *Fluxion* of the *Area.* After which find the Flowing Quantity anſwering to that Fluxion, which ſhall give the *Area* in known Terms.

To do which, the Fluxion being $\dot{x}\,\dot{x}^{\frac{1}{2}}$, firſt take away the $\dot{x}$, and there will remain $\dot{x}^{\frac{1}{2}}$; next increaſe the Index of that Power by Unity, and it will ſtand thus $\dot{x}\,\dot{x}^{\frac{1}{2}}$. Then divide $\dot{x}\,\dot{x}^{\frac{1}{2}}$ by $1 + \frac{1}{2}$ or by $\frac{3}{2}$ (thus $\frac{1}{3}$) $\frac{\dot{x}\,\dot{x}^{\frac{1}{2}}}{1}\left(\frac{2\,\dot{x}\,\dot{x}^{\frac{1}{2}}}{3}\right)$ and the Quotient you ſee will be $\frac{2\,\dot{x}\,\dot{x}^{\frac{1}{2}}}{3}$.

Laſtly, inſtead of $\dot{x}^{\frac{1}{2}}$ ſubſtitute what was before found equal to it, *viz.* $\dot{y}$, and it will be $\frac{2\,x\,\dot{y}}{3} =$ to the *Area* of the *Semi-parabola* VMP. And if you double that, you will gain the *Area* of the whole *Parabola* MVO.

Wherefore the *Parabolick Area* is Two thirds of a Rectangle under the *Abſciſſa* and the *Ordinate.* *Q. E. D.*

The Following General Method for the Quadrature of all manner of Parabolick Curves, *is Mr.* Humphrey Ditton's.

The General Equation of theſe Curves, is $r^{p-q}\,x^{q} = y^{p}$, where p and q are the Indexes, and r is the *Latus Rectum*: That is, becauſe of r a ſtable quantity, $x^{q} = y^{p}$, wherefore in Fluxions $p\,y^{p-1}\,\dot{y} = q\,x^{q-1}\,\dot{x}$, and from the General Equation, it is $y^{p-1} : x^{q-1} :: x : y$, wherefore ſubſtituting x and y, inſtead of y^{p-1}, and x^{q-1} in the Fluxional Equation, we have $p\,\dot{x}\,y = q\,\dot{y}\,x$, but all $\dot{x}\,y =$ all SHMN = the Complement, and all $\dot{y}\,x =$ all PLMN = the Area: The Area therefore is to the Complement as p. q. *Q. E. D.*

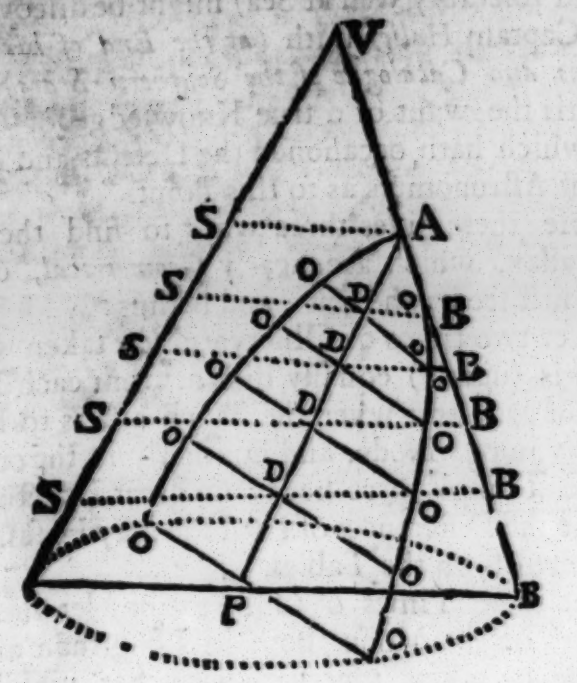
PARABOLICK *Pyramidoid*, is a ſolid Figure, ſo named by Dr. *Wallis* from its Geneſis, or Formation, which is as follows.

Let all the Squares of the Ordinate Applicates in the *Parabola* be imagined to be ſo placed, that the Axe ſhall paſs thro' all their Centres at Right Angles.

Then will the Aggregate of theſe Planes, which he proves before to be Arithmetically proportional (*Prop.* 9. *Wallis Con. Sect.*) Form the *Parabolick Pyramidoid.*

Whoſe Solidity is gain'd by multiplying the Baſe by half the Altitude: The Reaſon of which is clear; for its component Planes being a Series of Arithmetical Proportionals beginning from o, their Sum will be = to the Extreams multiplied by half the Number of Terms, *i. e.* in the preſent caſe = to the Baſe multiply'd by half the height.

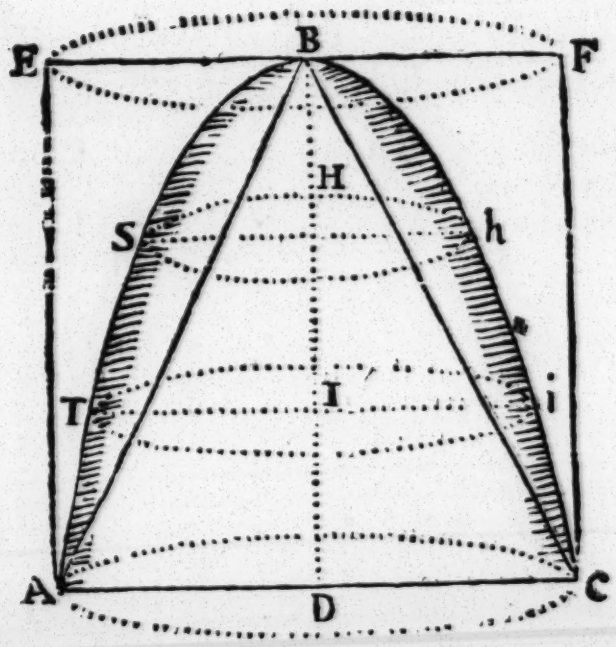
PARABOLICK *Cuneus*, is a Solid mention'd by the ſame Author, and formed thus:



Multiply all the D B's into the D S's, or which is the ſame thing, upon the Baſe A P B erect a Priſm, whoſe Altitude ſhall be A S or P S; and this ſhall be the *Parabolical Cuneus*, which muſt of Neceſſity be equal to the *Parabolical Pyramidoid*; being all the Component Rectangles in one, are ſeverally equal to all the Component Squares in the other.

PARABOLICK *Conoid*, is a ſolid Figure made by the Rotation of a *Semi-Parabola* about its Axe, and is $= \frac{1}{2}$ of its circumſcribing Cylinder: And the Circles which may be conceived to be the Elements of this Figure, are in an Arithmetical Proportion decreaſing towards the *Vertex*.

A PARABOLICK *Conoid*, A S B *h* C, is to a *Cylinder* of the ſame Baſe and Height, as 1 to 2; and to a *Cone* of the ſame Baſe and Height, as $1\frac{1}{2}$ to 1.



Let B D be divided into Three equal parts; then □ A D : □ S H :: B D : B H, (by the ſecond Property of the *Parabola*) that is, as 3 to 1, and □ A D : □ T I :: B D : B I :: 3 : 2. Wherefore 'tis plain, That the Squares on S H, T I and A D, (as alſo on S *h*, T *i*, and A C) and the Circles anſwering to them, will be in Arithmetical Progreſſion, or as 1, 2, 3; and thus it will be *ad Infinitum*, if the Three Diviſions be biſſected, and thoſe again biſſected, *&c.* But a Rank of Numbers in ſimple Arithmetical Progreſſion, will be to a Rank of as many equal to the greateſt as 1 to 2, and conſequently, the *Parabolick Conoid*, will be juſt half the *Cylinder*. *Q. E. D.*

And a *Cone* being $\frac{1}{3}$ of the *Cylinder*, the *Conoid* will be $= 1\frac{1}{2}$ of it; and therefore *Cylinder Conoid*, and *Cone* will be as $\frac{1}{3}$, $1\frac{1}{2}$, 1.

PARABOLICK *Spindle*, is a ſolid Body made by Rotation of a *Semi-parabola* about its *Ordinate*; and is equal to $\frac{8}{15}$ of its circumſcribing Cylinder, *Cavalerius Exerc. Geometr.* p. 282.

PARABOLISMUS, the ſame with the *Depreſſion of an Equation*. See *Equation*, N 3.

PARACELSISTICK Medicines. See *Hermetical*.

PARACENTESIS, or *Punctio*, is a Perforation of the Cheſt, or *Abdomen*. It is made in the Breaſt, when that is ſtuffed with putrified Matter, or Water, and then the Perforation is made in the Side between the fifth and ſixth *Vertebra*. It is made in the *Abdomen*, when that is ſwelled by a Dropſie, and near the *Linea Alba*, in the Muſcles that either aſcend right or oblique: In which laſt Caſe, if a Man be ſtrong, and has taken a Purge, and alſo his Lungs, and the reſt of his Entrails be uncorrupted, when you ſee the Navel doth Protuberate, there you muſt make the Inciſion; don't let Purulency and Water come out both together, for that were to kill the Patient, but one after the other: As in Seven Days about a Pound, or a Pound and a half, as the Patient can endure it: After the Operation is finiſhed, draw the Wound up with an Aſtringent Plaiſter. *Blanchard.*

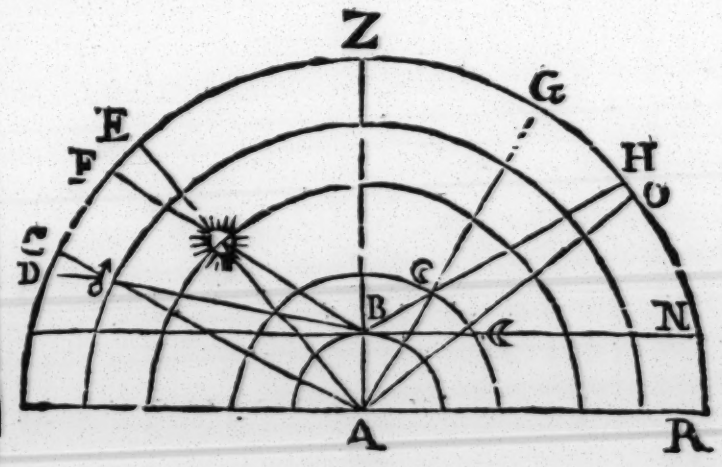
PARACIUM, in Law, ſignifies the Tenure that is between *Parceners*, viz. That which the Youngeſt oweth to the Eldeſt.

PARACHYNANCHE, is an Inflammation with a continual Fever and difficulty of Breathing excited in the outward Muſcles of the Larynx.

PARACMASTICA, is a daily declining Fever; alſo declining Age. *Blanchard.*

PARADE, is a Military Word, ſignifying the Place where Troops uſually draw together, in order to mount the Guards, or for any other Service.

PARALLAX, is that Arch of a great Circle, paſſing thro' the Zenith and true Place of the Sun or Stars, and intercepted between the true and apparent Place.



In this Figure,

A, denotes the Centre of the Earth.

B, the Place on the Superficies of the Earth, from whence the Star is ſeen.

♂, ☉ ☾, the Stars or Planets Places in their Orbs.

A ♂ C, A ☉ E, A ☽ G, the Lines of their true Places.

B ♂ D, B ⊙ F, B ☾; the Lines of their apparent Places.

Here the Angle made by the Interſection of the ſaid two Lines thro' the Body of the Planet, is the Angle of *Parallax*.

That is,

In *Mars*, the Angle A ♂ B = Angle C ♂ D, (by 15 *e. i.*)

In the *Sun*, the Angle of *Parallax*, is the Angle A ⊙ B = Angle E ⊙ F.

In the *Moon*, it is the Angle A ☾ B = Angle G ☾ H.

Here 'tis manifeſt, that the nearer the Star is to the Horizon, and Center of the Earth, the greater is the *Parallax*: Whence it is, That the Orbit of the Moon being neareſt to the Earth, her *Parallax* is greateſt and moſt perceptible: For the Semi-diameter of the Earth bears a greater Proportion to the Semi-diameter of the Moon's Orbit, than to any of the reſt.

The Horizontal Parallax of the Moon is the Difference between her Real and Apparent Place when ſhe is either Riſing or Setting. As ſuppoſe her Setting, then the Angle of the Horizontal Parallax will be B ☾ A = ☉ A R. The Knowledge of the Quantity of which, is of the greateſt uſe in Aſtronomy; becauſe from thence the Diſtance of the Moon, Sun, (or any other Planet) from the Earth may moſt eaſily be had; for in the Triangle B A ☾: A B the Semi-diameter of the Earth, B the Right Angle, and ☾ the Angle of the Parallax being known, 'tis eaſie to find any Side or Angle ſought, and conſequently A ☾, the Diſtance of the Moon from the Earth. This came firſt to be diſcovered by the ancient Aſtronomers, thus:

They obſerved, That the apparent Semi-Diurnal Motion of the Moon was but 4 Degrees, whereas in Reality and Truth, it was 6 Degrees: Wherefore they concluded, That the Moon's Place was put forward in her Riſing 1 Degree, and as much put backwards in her Setting; which muſt needs cauſe her viſible Motion above the Earth in 12 Hours, to be obſerved nearly 2 Degrees leſs, than the half of 12 Degrees, her apparent Motion, in 24 Hours.

Wherefore from hence they concluded the Horizontal Parallax to be juſt 1 Degree: which having found, 'twas eaſie to diſcover, that A ☾ muſt be near 60 times A B, or 60 Semi-Diameters of the Earth (*i. e.* at 70 Miles to a Degree, and 4000 Miles the Earth's Radius) 240000 Miles *Engliſh*.

Mr. Auzout *gives you a* Method *to find the* Moon's Parallax, *thus; On a Day when ſhe is in her* Perigee, *or* Apogee, *and in the moſt Boreal Signs,*

Take her Diameter towards the Horizon, and then towards the South, with her Altitude above the Horizon; the Difference of which Diameters will ſhew the Proportion of her Diſtance with the Semi-diameter of the Earth; but this is beſt of all done in thoſe Places where ſhe paſſes thro' the Zenith.

If the Moon's Horizontal Parallax could be truly and exactly found, it would be of prodigious Advantage; for by it the Longitudes of Places on Land (and tolerably well at Sea) might be diſcovered.

Captain *Halley* ſaith (*at the End of his Obſervations and Catalogue of the Southern Stars*), "That "'tis the want of a true Knowledge of *Geometry*, "which hath occaſioned the Defects and Miſtakes "of Aſtronomers as to this Point."

He there gives three ways to find the Moon's Parallax, which are nearly *Geometrical*, of which the firſt ſeems the beſt; and is thus:

Let two times of Obſervation be taken when the Sun is (nearly) equally diſtant from each Node of the Moon, and when the Moon alſo is to be Northerly in one Node, and Southerly in the other; in theſe Things there needs no great Exactneſs, becauſe the Differences of Latitude may be ſufficiently ſupplied from the Tables.

At theſe Times of Obſervation, let the viſible Places of the Moon, both in Longitude and Latitude be taken, together with her viſible Altitudes and Diameters, which let be reduced to the Horizontal; then from the Times and viſible Places, let in each Obſervation the Vertical Angle be computed, which is made with the Circle of Latitude at the Moon's Centre; and then the Difference by which the Southern Latitude exceeds the Northern (in our Northern Part of the World) is the Sum of the Parallaxes of Latitude, which muſt be divided into two Parts; which to do, put into one Sum the Logarithms of the Sine of the Horizontal Semi-diameter of the viſible Diſtance of the Moon from the Vertex, and of the Complement of the Angle of the Vertical Circle, with the Cycle of Latitude, in each Obſervation.

Then out of the greater Sum, take the leſſer, and to the Difference add Radius, the Sum ſhall be the Logarithm of the Tangent of an Ark, from whence take 45 Degrees; then will it be as Radius to the Tangent of the Remaining Ark:: So is the Tangent of the half Sum of the Parallax, to the Tangent of half their Difference: But the half Sum and half Difference together, is the greater Parallax of Latitude, and the Difference between them is the leſſer. Take this Parallax of Latitude out of the viſible Southern Latitude; or add it to the Northern, and it will ſhew the *Inclination*.

And then, laſtly, it will be as the Rectangle under the Sines of the Diſtance ſeen from the Zenith, and of the Complement of the Angle of the Vertical Circle with the Circle of Latitude, is to the Square of the Radius:: So is the Sine of the Parallax of Latitude, to the Sine of the Horizontal Parallax.

And there is between the Sine of the Horizontal Semi-diameter of the Moon, and the Horizontal Parallax, ſo conſtant a Proportion, that if it can be but once known, the Moon's Parallax at any time will be had from the Obſervation of her Diameter.

All the Difficulty of this Proceſs, is, in obſerving the viſible Latitudes of the Moon, and which indeed cannot be had without the Help of the Fixed Stars, whoſe Latitudes are in no Catalogue yet extant, correct to a Minute: Therefore the accurate Solution of this Problem muſt depend on ſome better Tables than are yet publiſhed. And thoſe I hope we may expect from the moſt

Accurate

Accurate Aſtronomer, Mr. *Flamſteed*, when he hath finiſhed his Catalogue of the Fixed Stars, which he is now about.

In the Ingenious Dr. *Gregory*'s *Aſtronomia Phyſica & Geometrica*, you have a great and very uſeful Variety of Propoſitions for the finding the Parallax, *Vide Lib.* 2. *Sect.* 7.

Though there be no Parallax of the Fixed Stars, in reſpect of the Earth's Semi-diameter, the whole Body of the Earth being but a Point in reference to the Diſtance between us and the Fixed Stars; yet in reſpect of the annual Orbit of the Earth, it hath juſtly been expected by Aſtronomers, that ſome Parallax ſhould be found: And this would be a Diſcovery of great Moment, if it could be made; becauſe it would be an undoubted Demonſtration for the annual Motion of the Earth round the Sun, if any ſuch Parallax could be diſcovered.

This the Ingenious Dr. *Hook* attempted to find by obſerving the various Diſtance of a Fixed Star from the Zenith (See a Diſſertation of his deſignedly written on this Subject). And our Excellent Aſtronomer Mr. *Flamſteed*, actually did obſerve it by the Acceſs and Receſs of a Fixed Star to and from the Pole of the Equator at different Times of the Year.

And he aſſures us, in his Letter to Dr. *Wallis*, written *Decemb.* 20. 1698, and publiſhed in the *Latin* Edition of Dr. *Wallis*'s Works: "That he "found the Diſtance of a Fixed Star near the Pole "of the World to be 40 Seconds, or 45 Seconds "nearer to it at the Winter-Solſtice than at the "Summer one." And this he obſerved for Seven Years together with great Accuracy.

So that he judges the Objection of *Ricciolus* againſt the Earth's Motion to be intirely removed, and its Revolution round the Sun proved.

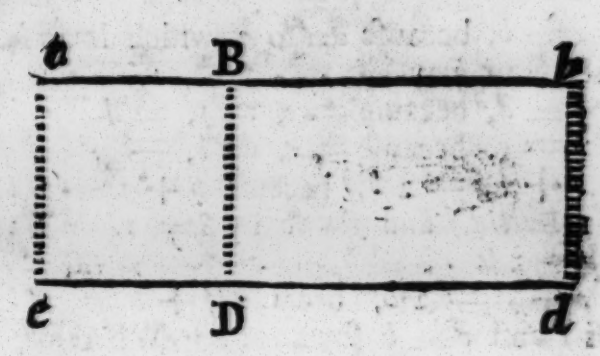
Dr. *Gregory* ſeems not ſatisfied with this Proof, (though he believes the Doctrine from other Principles) but inclines rather to the Opinion of *Copernicus*, That the Diameter of the Earth's annual Orbit is inſenſible, in reſpect of the Diſtance of the Fixed Stars. But others may judge whether he brings Reaſons ſufficient to overthrow Obſervations ſo carefully, and ſo often made, as thoſe produced by Mr. *Flamſteed*. See his *Aſtron.* p. 275, 276.

PARALLAX *of Latitude*, is an Arch of a great Circle paſſing by the Poles of the Zodiack to the apparent Place of the Star, and intercepted between two Circles of the Ecliptick equally diſtant, whereof the one paſſeth by the True place of the Star, and the other by the Apparent place.

PARALLAX *of Longitude*, is an Arch of the Ecliptick (or Parallel thereto) intercepted between two great Circles, whereof the one paſſeth from the Poles of the Ecliptick, and the true Place; the other from the ſaid Poles by the apparent Place: So that the Parallax of Longitude is only the Difference of the true and apparent Place according to to the Longitude of the Ecliptick.

PARALLACTICAL *Angle*, is an Angle made by the Oblique cutting of a Circle of Altitude, or Vertical Circle with the Ecliptick. How to find it, ſee *Angle of the Ecliptick with the Vertical Circle.*

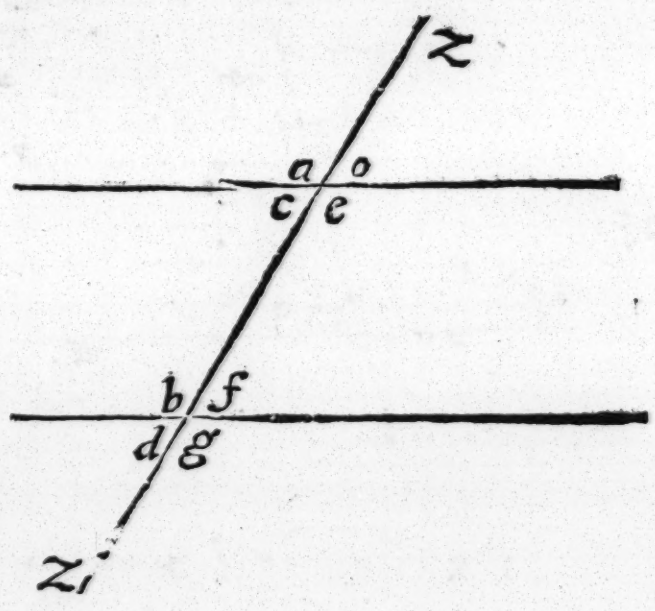
PARALLEL *Lines*, in Geometry, are thoſe which run always equi-diſtant from each other; ſo that if they were infinitely produced, they would neither go further from, nor come nearer to each other; and their Diſtance is always meaſured by a Perpendicular, which, where-ever it be taken, is of the ſame Length, or is always equal to it ſelf.



Thus the two Lines, *a b* and *d e*, are *Parallel*, if they are equally diſtant from each other in *a e*, B D, *b d*, and in all other Places.

COROLLARY I.

Parallel Lines P *p*, have the ſame Inclination one as the other, to any Right Line as Z Z, which cuts or croſſeth them both, and conſequently (ſince an Angle is the Mutual Inclination of two Lines which meet in a Point) the *External Angle o* or *a*, muſt be equal to the *Internal and Oppoſite One*, *f* or *b*: that is, *o* = *f*, and *a* = *b*.



For if *o* be not equal to *f*, and *a* not equal to *b*, it muſt be becauſe the upper Parallel P, is either more or leſs inclined to Z Z, than the lower Parallel *p* is; which if true, then the Line cannot be parallel; which contradicts the Suppoſition.

PROPOSITION.

A Right Line Z Z *falling on Two Parallel Lines* P *p*, *makes the* alternate Angles *o* = *f*, *and e* = *b*; *alſo o* = *d*, *and a* = *g*, *and the two* Internal Angles *c* + *b*, *or e* + *f* = *to two Right ones.*

That is, $\left\{\begin{matrix}1\ c = f\\ 2\ e = b\\ 3\ o = d\\ 4\ a = g\end{matrix}\right\}$ and $\left\{\begin{matrix}5\ c + b\\ 6\ e + f\end{matrix}\right\} = 2\ L$

DEMON-

DEMONSTRATION.

1. $c = f$, becauſe $c = o$, its Vertical or oppoſite Angle, and $o = f$, by the precedent Corollary.

2. $e = b$, becauſe $=$ to a, which is $= b$, proved the ſame way.

3. $o = d$, becauſe $= c$, $= f$, $= d$.

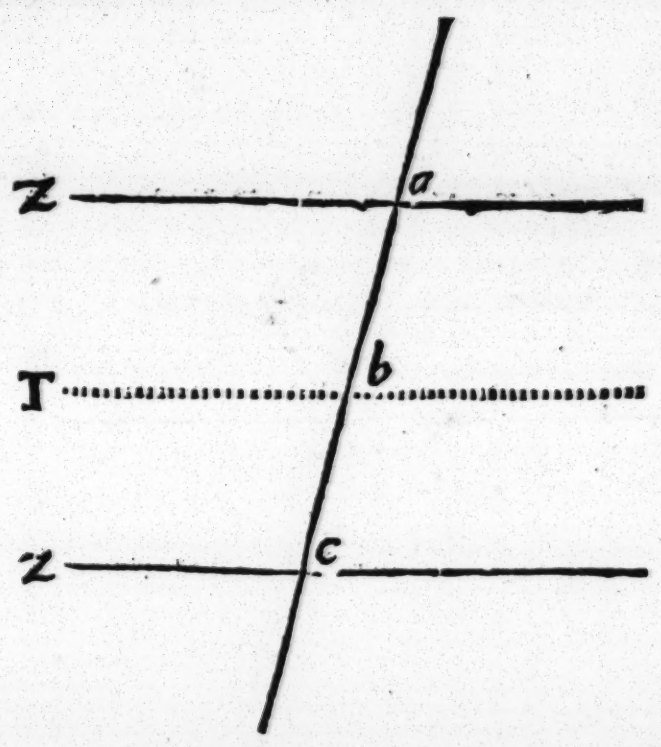
4. $a = g$, becauſe $= e$, $= b$, $= g$.

5. $e + b$, $= 2 L$, becauſe $b + f = 2 L$, (by 13 *è* 1 *Euclid.*) and $f = c$ by *Step.* 1. Wherefore $c + b - 2 L$.

6. $e + f = 2 L$, becauſe $f + b = 2 L$, (by 13 *è* 1.) and $e = b$ (by *Step.* 2.) Wherefore $e + f = 2 L$. *See the laſt Figure.*

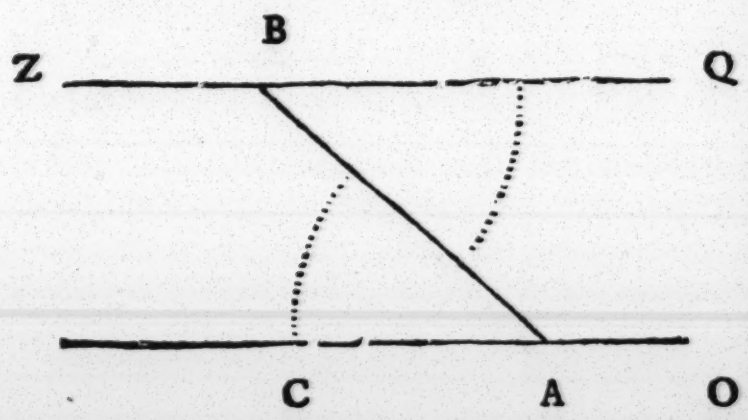
COROLLARY II.

Two Right Lines as Z Z, parallel to a Third, as T, are parallel to each other. For ſince the Angle $a = b$, and c alſo $= b$, becauſe the Outer Lines are parallel to the Inner one: Therefore the Angle $a = c$, *i. e.* the two Outer Lines, are alſo parallel by *Cor.* 1.



PROBLEM I.

A Right Line, as Z Q, *being given, to draw another* parallel *to it, thro'* A, *a given Point.*



From A draw a Line making any Angle, as A B Q, with the given Line; then ſetting one Foot of the Compaſſes in A, make the Angle B A C = A B Q, ſo ſhall C A O be the Line required, for the Angle A = to the Alternate one B.

PARALLEL *Sphere*, is where the Poles are in the Zenith and Nadir, and the Equator in the Horizon, which is the Caſe of ſuch (if any ſuch there be) who live directly under the North and South Pole.

The Conſequences of this Poſition are, That the Parallels of the Sun's Declination will alſo be Parallels of his Altitude.

The Inhabitants can ſee only ſuch Stars as are on their ſide the Equinoctial; and they muſt have ſix Months Day, and ſix Months continual Night every Year; and the Sun can never be higher with them, than 23 Degrees 30 Minutes, which is not ſo high as he is with us in *February*.

PARALLEL *Ruler*, is an Inſtrument made of Braſs, Steel, or Wood, to draw Lines parallel to each other; of great Uſe in Fortification, Architecture, and many other Parts of the *Mathematicks*.

PARALLELS *of Altitudes*, or *Almacanters*, are Circles parallel to the Horizon, imagined to paſs thro' every Degree and Minute of the Meridian, between the Horizon and Zenith, having their Poles in the Zenith. And on the *Globes* theſe are deſcribed by the Diviſions on the *Quadrant of Altitude*, in its Motion about the Body of the Globe, when 'tis ſcrew'd to the Zenith of any Place.

PARALLELS *of Latitude*, on the *Terreſtrial Globes*, are the ſame with *Parallels of Declination* on the *Celeſtial*. But the

PARALLELS *of Latitude* on the *Celeſtial Globes*, are ſmall Circles parallel to the *Ecliptick*, imagined to paſs through every Degree and Minute of the *Colures*, and are repreſented there by the Diviſions of the *Quadrant of Altitude*, in its Motion round the Globe, when it is ſcrew'd over the *Poles of the Ecliptick*.

PARALLELS *of Declination*, are Circles parallel to the *Equinoctial*, imagined to paſs thro' every Degree and Minute of the Meridians, between the *Equinoctial* and each *Pole of the World*.

PARALLEL *Rays*, in *Opticks*, are thoſe that keep an equal Diſtance from the viſible Object to the Eye, which is ſuppoſed to be infinitely remote from the Object.

PARALLEL *Planes*, are thoſe Planes which have all the Perpendiculars drawn betwixt them equal to each other; that is, when they are every where equally diſtant.

PARALLEL *Circles* on the *Globes*, the ſame with the *Leſſer Circles*.

PARALLELS alſo on the *Terreſtrial Globe*, are Circles drawn thro' the middle of every *Climate*, dividing them into two Halves, which are called *Parallels*.

PARALLELISM of the Earth's Axis, is the Earth's keeping its Axis in its annual Revolution round the Sun, in a Poſition always parallel to its ſelf, which it doth nearly, but not exactly; for tho' the Difference be inſenſible in one Year, Dr. *Gregory* in his *Aſtronomy* ſaith, It becomes ſenſible enough in many Years.

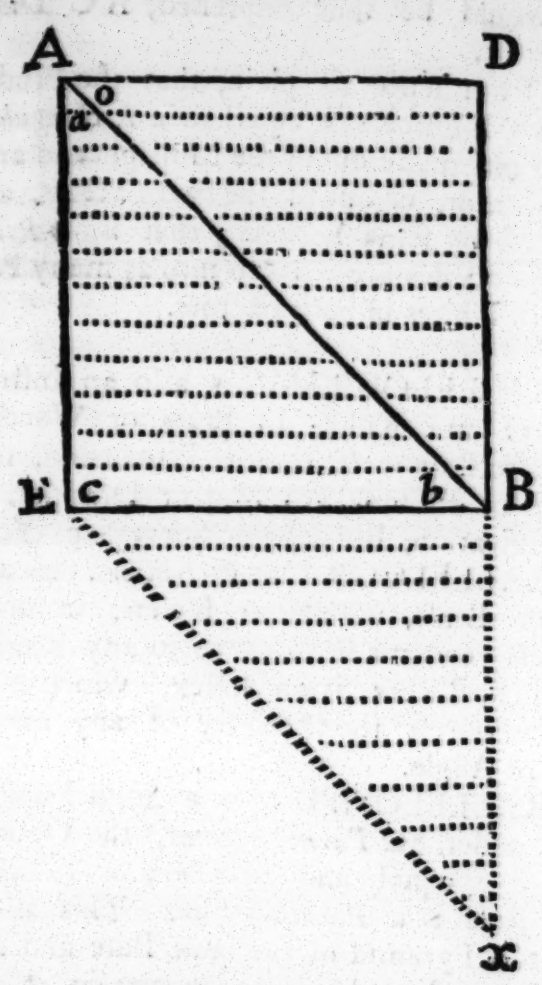
This *Parallelifm* he ſhews to be the neceſſary Reſult of the two Motions of the Earth, that is round its Axis, and its Annual one, and that there needs no third Motion be feigned to explain it, or account for it: For as the Earth moves Annually round the Sun (without the Diurnal Motion) it moves only according to its Centre of Gravity; and each Point and Line in it keeps always the ſame Poſition. Let its Axis be one of thoſe Lines; the Diurnal Revolution of the Earth round this (which as to that Motion is ſuppoſed immoveable)

able) cannot change the Poſition of it; and therefore it will be always the ſame, *i. e.* always Parallel to it ſelf.

PARALIPSIS (a Figure in *Rhetorick*) is a pretended deſire in us of omitting what we ſay; as if one ſhould ſay, *I am willing to forget the Wrong that my Enemy has done me; I will not ſpeak of the Injury that I have received from him*, &c.

PARALLELOGRAM in *Geometry*, is a Right Lined Quadrilateral Figure, whoſe Oppoſite Sides are Parallel and Equal. To find its Superficial Content: See *Area*.

The Formation, or Generation of all Parallelograms, Squares, *and* Rectangles, *may be thus conceived.*



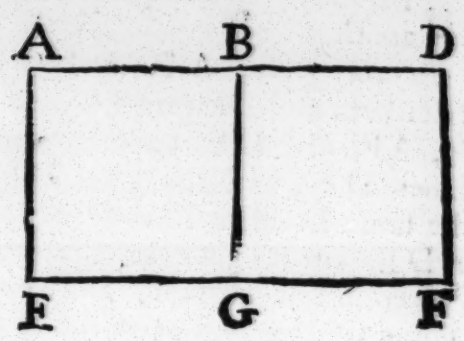
If a Right Line, as A D, having one of its Ends or points in the Top (or Vertex A) of the Angle E A B, be ſuppoſed to move downwards, with a Motion always Parallel to its ſelf in its firſt ſituation: And as it moves thus, always keep its ſaid end A in the Line A E; till at laſt it be moved down ſo low, as that it is all of it gotten within the Legs of the Angle, and is come to lie in the Situation E B: Tis plain, this Line A D. will by its Motion downwards have deſcribed the Quadrilateral Figure A D B E. And as in its Deſcent, the Line A D continually cuts the Line A B, ſo it will deſcribe alſo on each ſide of A B the two equal Triangles A D B and A E B. The Parts of the former of which, do continually decreaſe, as thoſe of the latter A E B do increaſe.

Alſo, if either Leg of an Angle E A D, as ſuppoſe the Leg A D, or any part of that Leg A B, be conceived to move along the other A E, with a Motion Parallel to its firſt Situation, it will alſo deſcribe a Quadrilateral Figure, which if the *Deſcribent* Line A B, be equal to the *Dirigent* A E, (for ſo thoſe two Lines may be called) will be an Equilateral one. But when the Dirigent is either longer or ſhorter than the Deſcribent Line, then the oppoſite Sides of the Figure only will be equal.

From which Formation of Quadrangles, (and alſo of Triangles) theſe Corollaries may be deduced.

COROLLARY I.

That all Quadrilateral Figures thus formed, muſt alſo be *Parallelograms*, or have their oppoſite Sides equal and parallel. The Reaſon of which is becauſe the Moving Line, or Deſcribent A D, is always ſuppoſed to be carried Parallel to it ſelf; and the Diſtance between A and D, or A and B the Deſcribent Points, are always the ſame. 33. *è* 1.



COROLLARY II.

Since the Angles A and E are together equal to two Right Angles, if one be a Right Angle, the other muſt be ſo alſo; and then all the Angles of the Figure will be Right ones, and ſo 'twill be a Rectangle as A F; and if the Deſcribent be equal to the Dirigent, the Figure will be a Square, as A G. *Cor.* 29. *è* 1. *Eucl.*

Hence alſo 'tis plain, That the Oppoſite Angles of every *Parallelogram* are equal; becauſe they do each of them, with the Angle between them, make two Right Angles.

COROLLARY III.

Whence it appears, That every Diagonal A B, Divides, the *Parallelogram* into two equal Parts. 34. *è.* 1 *Eucl.*

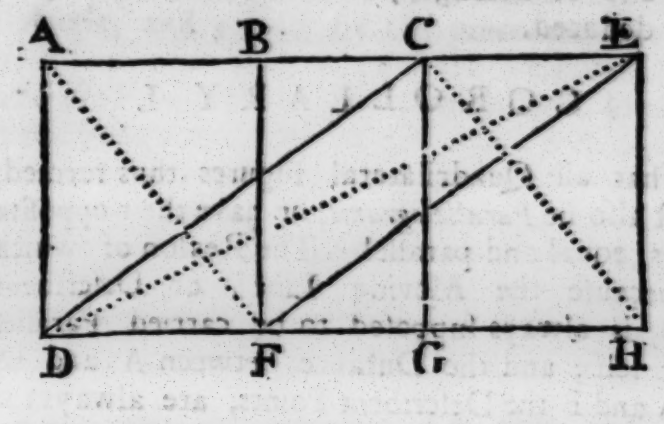
COROLLARY IV.

As alſo, That every *Parallelogram* muſt be Double to a Triangle, having the ſame, or an equal Baſe and Height. 41 *è* 1 *Eucl.*

For every Triangle that can be drawn on the Baſe E B, or on a Baſe equal to it, and having the ſame Height, or being between the ſame Parallel Lines, will be equal to the Triangle A E B, which is half the *Parallelogram* A B, *per Cor.* 3.

COROLLARY V.

Hence all *Parallelograms* that are between the ſame Parallel Lines, and on one and the ſame, or equal Baſes, muſt be equal.



I ſay, The *Parallelograms* A F, D E, G E, having the ſame Baſe D F, or its equal G H, muſt be equal to one another.

For the *Parallelograms* A F, and G E, have both the Deſcribent and Dirigent Lines equal.

And alſo, A F, and D E, have the ſame Deſcribent Lines D F; and the Line D F, tho' it go not in the ſame Dirigent Line to form the *Parallelogram* D E, yet it goes in the whole but the ſame Perpendicular Altitude, and only moves ſlower for going Obliquely, but all the Indiviſibles or Component Lines in one, muſt be equal to thoſe in the other.

COROLLARY VI.

Hence alſo follows, That Triangles on the ſame, or equal Baſes muſt be equal if they are between the ſame Parallels; becauſe they are the Halves of equal *Parallelograms*.

COROLLARY VII.

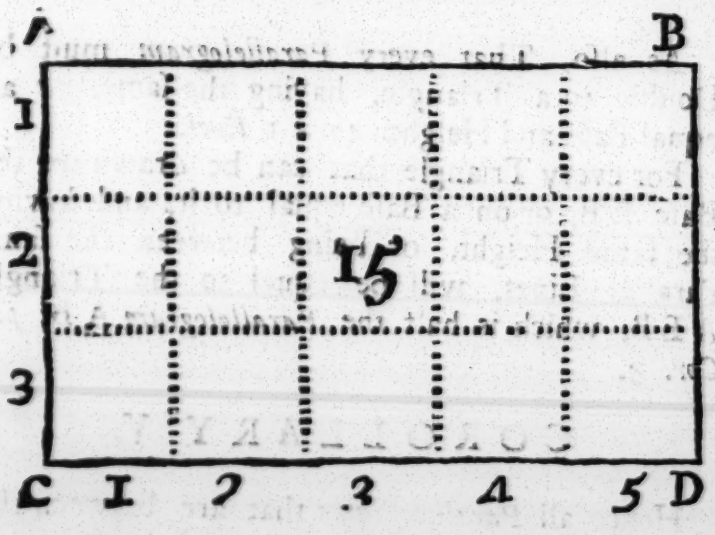
Alſo from hence is eaſily proved, That the three Angles *a*, *b*, *c*, of any Triangle, are equal to two Right Angles. (See *Fig.* 1.)

For ſince the Angle $c + a + o = 2 \angle$, (becauſe A D is Parallel to E B.)

And that $b = o$, for the ſame Reaſon.

Therefore $b + c + a = 2 \angle$. *Q. E. D.*

COROLLARY VIII.



If the Line A C, ſtanding at Right Angles with C D, be divided into Three Parts, as C D is into Five; and being made a Deſcribent, be moved along the Dirigent C D, till it come at laſt to the End of it, and ſtand in the Poſition B D; the *Rectangle* A D will by this means be divided into as many little Rectangles as the Unites both in the Deſcribent and Dirigent Line will produce, by being multiplied one by another, that is 15; for 3 times 5 is 15. And this is what is called a *Rectangle* made between any two Lines, or the Product ariſing from the Parts of the one multiplied by the Parts of the other.

And this is uſually in the *Latin* Tongue expreſs'd by the Verb *ducere*, which ſignifies to *lead* or *guide along*. As, for Inſtance, if the Line A C were to multiply C D, they would ſay in that Language, *Duc* A C in C D; that is, ſet your Line A C perpendicular to C D; and then keeping it always in that Poſition, lead or guide it along till it comes to the End of C D, and it will by its Motion have formed the Rectangle A D; and by its Three Parts, the 15 little ones within it. And therefore in *Latin* Mathematical Books the Product would be thus expreſſed, A C *Ducta in* C D = 15.

And from hence 'tis plain, that the Product of any two Numbers is equal to a *Rectangular Parallelogram*, made out of the Multiplicand and the Multiplicator, or out of the two Factors, as they are called by ſome Writers; that is, a *Rectangle* whoſe two Sides are divided into as many Parts as there are Unites in both Factors.

PARALLELOGRAM, is alſo an Inſtrument made of five Rulers of Braſs or Wood, with Sockets to ſlide or ſet to any Proportion, uſed to enlarge or diminiſh any Map or Draught, either in Fortification, Building or Surveying, *&c.*

PARALLELOGRAM *Protractor*, is a Semi-circle of Braſs, with four Rulers, in form of a *Parallelogram*, made to move to any Angle: one of which Rulers is an Index, which ſhews on the Semi-circle the Quantity of any inward or outward Angle.

PARALLELOPIPED, is a Solid Figure contained under Six *Parallelograms*, the Oppoſites of which are equal and parallel; or 'tis a Priſm, whoſe Baſe is a *Parallelogram*. This is always triple to a Pyramid of the ſame Baſe and Height, as is demonſtrated under *Proportion of Solids*; which ſee.

PARALLELOPLEURON, a Word uſed by ſome Geometricians for an Imperfect *Parallelogram*, or kind of Trapezium, having unequal Angles and Sides, yet not all ſo, in regard that at leaſt ſome of them anſwer to one another, obſerving a certain Regularity and Proportion of Parallels; ſo that they do not extend ſo largely as Trapeziums, which are any Irregular Four-ſided Figures; nevertheleſs, like them, they are capable of being variouſly diverſify'd.

PARALOGISM, is a pretended Demonſtration or Method of Arguing, but which is in reality fallacious and falſe.

PARALYSIS, the *Palſey*, is an entire Loſs of voluntary Motion or Senſe, or both, either in all the Body, or only in ſome Part. It comes by either an Obſtruction, Obſciſſion, Contuſion, or preſſing of the Nerves, or by an Indiſpoſition, or ill Conformity of the Muſcles. *Blanchard.*

PARAMESUS, is the next finger to the Middle one, called the Ring-finger.

PARAMETER, by ſome, as *Mydorgius* and others, called the *Latus Rectum* of a *Parabola*, is a Third Proportional to the *Abſciſſa* and any *Ordinate*: So that the Square of the *Ordinate* is always equal to to the Rectangle under the *Parameter* and *Abſciſſa*. See the Demonſtration under *Parabola*.

This

This Word *Parameter*, or *Latus Rectum*, is alſo uſed as to the *Ellipſe* and *Hyperbola*; but in thoſe it hath another Proportion, as you will find under thoſe Words.

PARAMOUNT, in our Law, ſignifies the Supream Lord of the Fee: For there may be a Tenant to a Lord, that holdeth himſelf another Lord; the former of which is called *Lord Meſne*, and the ſecond *Lord Paramount*. And a *Lord Paramount* conſiſteth only in Compariſon, as one Man may be *great*, being compared to a *leſs*; and *little*, being compared with a *greater*. So that none ſimply ſeemeth to be *Lord Paramount* but only the King, who is *Patron Paramount* to all the Benefices in *England*.

PARAPET, in Fortification, is an Elevation of Earth and Stone upon the Rampart, behind which the Soldiers ſtand ſecure from the Enemies Great and Small Shot, and where the Cannon is planted for the Defence of the Town or Fortreſs. Every *Parapet* having its *Embraſures* and *Merlons*, is about Six Foot high on the Side of the Place; and from Four to Five on that towards the Country. So that this Difference of Heights forms a kind of *Glacis* above, from whence the Musketeers mounting the *Banquet* of the *Parapet*, may eaſily fire into the Moats, or at leaſt upon the Counterſcarp. It ought alſo to to be from 18 to 20 Foot thick, if made of Earth; and from 6 to 8 if of Stone. The Earth is much better than Stone, becauſe Stone will fly to pieces when battered, and do miſchief.

This Word *Parapet* is alſo given to any Line that covers Men from the Enemies Fire: So there are *Parapets* of Barrels, of Gabions, of Bags filled with Earth, *&c.*

PARAPHANALIA, or, according to the Civil Law, *Parapharnalia*, are thoſe Goods which a Wife, beſides her *Dower* or *Jointure*, is after her Husband's Death allowed to have; as Furniture for her Chamber, Wearing Apparel, (and Jewels, if ſhe be of Quality) which are not to be put into her Husband's Inventory, eſpecially in the Province of *York*.

PARAPHIMOSIS, is a Fault of the Yard, when the *Præputium*'s too ſhort; alſo a Narrowneſs and Contraction of the Womb.

PARAPLEGIA, is a Palſie which ſeizeth all the Parts of the Body below the Head, thro' an Obſtruction of the Spinal Marrow. *Blanchard.*

PARAPHRENITIS, is madneſs accompanied with a continual Fever, through the Inflammation of the *Diaphragm*, with Difficulty of Breathing, as the Ancients dream'd. But Doctor *Willis* has confuted this Opinion of it, and ſays the Matter of it lies in the *Cerebellum*, whereby the Animal Spirits cannot flow, and thence the Midriff and Lungs are troubled. *Blanchard.*

PARAPHROSYNE, is a ſlight ſort of Doting in the Imagination and Judgment. *Blanchard.*

PARASELENE, a *Mock Moon*, is occaſion'd by the ſame Means as the *Parhelia* are about the *Sun*; tho' not ſo frequent.

PARASITICAL *Plants*, are thoſe which ſome call *Epidendra*, becauſe they grow not on the Ground, but on the Arms or Limbs of Trees, as our *Viſcum* or *Miſletoe* doth.

PARASTATÆ. See *Epididymis.*

PARASYNANCHE, is an Inflammation of the Muſcles of the Upper part of the *Oeſophagus*, with a continued Fever.

PARAVAILE, in Common Law, ſignifies the loweſt Tenant, or him that is Tenant to one who holdeth his Fee over of another; and is called *Tenant Paravaile*, becauſe it is preſumed he hath Profit and *Avalye* by the Land.

PARBUNCLE, is the Name of a Rope in a Ship, almoſt like a pair of Slings: 'tis ſeized both Ends together, and then put double about any heavy thing that is to be hoiſed in or out of the Ship; having the Hook of the Runner hitched into it to hoiſe it up by.

PARCENERS, is a Word taken either according to the Courſe of the Common Law, or according to Cuſtom. *Parceners*, according to the Courſe of the Common Law, are, Where one ſeized of an Eſtate of Inheritance, hath Iſſue only Daughters, and dies, and the Lands deſcend to the Daughters, then they are called *Parceners*, and are but as one Heir. The ſame Law is, If he have not any Iſſue, but that his Siſters be his Heirs.

Parceners, according to Cuſtom, are, Where a Man is ſeized of Lands in *Gavel-kind*, as in *Kent*, and other Places Franchiſed, and hath Iſſue divers Sons, and dies, then the Sons are *Parceners* by the Cuſtom.

PARCENARY, in Law, ſignifies a holding or occupying of Land *pro indiviſo*, by Joint-Tenants, or otherwiſe called *Co-parceners*: For if they refuſe to divide their common Inheritance, and chooſe rather to hold it jointly, they are ſaid to hold in *Parcenary*.

PARCO *Fracto*, is a Writ that lies againſt him that violently breaketh a Pound, and taketh out Beaſts thence, which for ſome Treſpaſs done upon another Man's Ground, are lawfully impounded.

PARCELLING *of a Ship*, is laying of Pieces of Canvaſe of about a Hand's breadth, over the Seams, when ſhe is newly Calked.

PARCEL-*Makers*, are two Officers in the *Exchequer* that make the *Parcels* of the *Eſcheators* Accounts, wherein they charge them with every thing they have levied for the King's Uſe within the Time of their Office, and deliver the ſame to one of the *Auditors* of the Court to make an Account with the *Eſcheator* thereof.

PARENCEPHALOS, the ſame as the *Cerebellum*.

PARENCHYMOUS *Parts of the Body*, by the Old Anatomiſts, are reckoned ſuch Fleſhy Parts of it as fill up the Interſtices between the Veſſels, and not conſiſting of Veſſels themſelves. But by the Help of the Microſcope, and more accurate Obſervations, it hath ſince been diſcovered, that there is no part of an Animal Body but what is a kind of Net-work of an innumerable Quantity of ſmall Capillary Veſſels.

PARENCHYMATA, are the Intrails thro' which the Blood paſſes for its better Fermentation and Perfection, as the Lungs, Liver, Heart, and Spleen, *&c.*

Sometimes the Word *Parenchyma* is taken in a large Senſe for all the Intrails. *Blanchard.*

PARIETAL *Bones*, or the Bones of the *Sinciput*, are the thinneſt Bones of the *Cranium*, in Form almoſt ſquare, ſomewhat long; they are joined to the *Os Frontis* by the *Sutura Coronalis*, to one another in the Crown of the Head by the *Sutura Sagittalis*, to the *Os Occipitis* by the *Lambdoidalis*, and to the *Oſſa Temporum* by the *Sutura Squamoſa*. They are ſmooth and equal

on their Out-side, but on their Inside they have several Furrows made for the Passage of the Veins of the *Dura mater*. They have each a small Hole near the *Sutura Sagittalis*, through which there pass some Veins which carry the Blood from the Teguments to the *Sinus Longitudinalis*.

PARISTMIA, or *Amygdalæ*, are two Glandules of the Mouth tied together by a broad slender Production; they have one common Cavity large and oval, opening into the Mouth. The Use they serve for is, to transmit a certain slimy or pituitous Matter into the Jaws and Mouth. They are called also *Tonsillæ*, which see. *Blanchard.*

PARK *of the Artillery*, is a certain Place in a Camp without Cannon-shot of the Place besieged, where the Cannon, Artificial Fires, Powder, and other Warlike Ammunition are kept, and guarded only by Pike-men, to avoid Casualties which may happen by Fire. Every Attack at a Siege hath its *Park of Artillery*.

PARK *of Provisions*, is another Place in the Camp on the Rear of every Regiment, which is taken up by the Sutlers, who follow the Army with all sorts of Provisions, and sell them to the Soldiers.

PARONYCHIA, a *Whitlow*, is a preternatural Swelling in the Fingers, and very troublesome: It arises from a sharp malign Humour, which sometimes gnaws the Tendons, Nerves, the Membrane about the Bone, and the very Bone it self. *Blanchard.*

PAROTIDES, are glandules behind the Ears; also a preternatural Swelling of those Glandules.

PAROXYSM, a *Fit*, is Part of the Period of Diseases, whereby they encrease and grow worse. It is either Regular, which returns at certain Times, as in a Tertian or Quartan Ague; or Irregular, that hath no certain Times, but comes sometimes one Day, sometimes another, as the Erratick Ague. *Blanchard.*

PARRELS, in a Ship, are Frames made of Trucks, and Ribs, and Ropes, which having both their Ends fastened to the Yards, are so contrived as to go round about the Masts, that the Yards by their means may go up and down upon the Masts. These also, with the Breast Ropes, do fasten the Yards to the Masts.

PARRICIDE, signifies properly him that kills his Father, and may be applied to him that murders his Mother.

PARSON, *Persona*, is the Law Term for the Rector of a Church; because for his Time he represents his Church, and sustaineth the Person thereof, as well in suing, as in being sued in any Action Touching the same. Formerly he who had a Church by Institution and Induction only for his own Life, was called *Parson Mortal.*

But any Collegiate or Conventual Body, to whom the Church was for ever appropriated, was called *Parson Immortal.*

In the New book of Entries, *Verb.* Aid in Annuity, are these Words: *Et Prædictus A. dicet quod ipse est Persona Prædictæ Ecclesiæ de S.* Impersonata *in eadem ad Præsentationem F. Patronissæ.* By which it seems that *Persona* or *Parson* anciently was the Patron, and *Persona Impersonata* the Rector to whom the Benefice was given by the Patron's Right; which also *Dyer* sheweth, *fol.* 221. So that in Law, the *Parson Impersonæ* is he that hath the Possession of a Benefice or Rectory, be it appropriate, or otherwise, by the Act of another.

PARSONAGE, or *Rectory*, is a Spiritual Living composed of Glebe-Land, Tythe, and other Oblations of the People, separate or dedicate to God in any Congregation, for the Service of his Church there, and for the Maintenance of the Minister to whose Charge the same is committed.

PARTES *Finis nihil habuerunt*, &c. in the Common Law, is an Exception taken against a Fine levied.

PARTIES, in Law, are those which are named in a Deed, or Fine, as Parties to it; as those that Levy the Fine, and to whom the Fine is levied: So those that make any Deed, and they to whom it is made, are called *Parties in the Deed.*

PARTITIONE *Facienda*, is a Writ that lies for those that hold Lands or Tenements *pro indiviso*, and would sever to every one his Part, against him or them that refuse to join in *Partition* as *Copartners*, &c.

PARTITION, is a dividing of Land descended by the Common Law, or by Custom, among *Co-heirs* or *Parceners*, where there are two at least; and this Partition is made Four ways, whereof Three are by Agreement, the Fourth by Compulsion. The First *Partition* by Agreement is, When they divide the Land equally themselves into so many Parts as they are Coparceners, and each to choose one Share or Part, according to Order. The Second is, when they choose some of their Friends to make the Division for them. The Third is by drawing Lots, thus: Having first divided the Land into as many *Parts* as there are Parceners, they write every part severally in a distinct Scroll, and wrapping it up, throw each of them into a Hat, Bason, or such like thing, out of which each Parcener draws one, according to their Superiority; and so the Land is severally allotted. The Fourth *Partition*, which is by Compulsion, is, When one or more of the Parceners, by reason of the Refusal of some other, sues out a Writ of *Partitione facienda*; by Force whereof they shall be compelled to part.

In *Kent*, where Land is of *Gavel-kind* Nature, they call their Partition, *Shifting*.

Partition also may be made by Joint-Tenants, or Tenants in Common, by Ascent, by Deed, or by Writ.

PARTY-*Jury*. See *Medietas Linguæ*.

PARTNERS, in a Ship, are strong pieces of Timber bolted to the Beams incircling the Masts, to keep them steady in their Steps, and also keep them from rowling (that is falling) over the Ship's Sides. There are also of these *Partners* at the Second Deck, to the same End; only the Missen-mast hath only one pair of *Partners* in which that Mast is wedged so firm, as that it can by no means budge. Some Ships sail not well, unless their Masts are loose, and have leave to play in the Partners: But in a Storm this is dangerous, lest the Partners should be *wronged*, (as they say) *i. e.* forced out of their places; for then there is no Help, but to cut the Mast by the Board.

PARTNERSHIP, a Rule in Arithmetick; the same with the *Rule of Fellowship*, which see.

PART *Proportional*, is a Part or Number agreeable and analagous to some other Part or Number; or a Medium to find out some Number or Part unknown by Proportion and Equality of Reason.

PAR *Vagum*, a pair of Nerves arising below the *Auditory* ones, from the Sides of the *Medulla Oblongata*, behind the *Proceſſus Annularis*, by ſeveral Threads which join together, and go out by the ſame Hole that the *Sinus Laterales* diſcharge themſelves into the *Jugulares*. It is joined by a Branch of the *Nervus Spinalis*, or *Acceſſorius Willisii*, and by a ſmall Branch of the *Portio Dura*: Immediately after it comes out of the Scull, it gives a ſmall Branch to the *Larynx*, as it goes down the Neck, above the Intercoſtal Nerve, by the Side of the Internal *Carotide*. At the Axillary Artery it caſts back the *Recurrent Nerves*, of which the Right embraces the Axillary Artery, and the Left the *Aorta*. Theſe two Branches aſcend on each ſide of the *Trachea*, or *Aſpera Arteria*, to the *Larynx*, where they are ſpent on the Muſcles of the *Larynx* and Membranes of the *Trachea*. This Pair, after it has entred the Cavity of the *Thorax*, ſends out ſeveral Branches to the *Pericardium*, Heart, Lungs, and Concave ſide of the Liver.

This Pair of Nerves was formerly accounted the Sixth, but is now uſually reckoned the Eighth.

There is a notable Fibre, or rather Nerve, coming from the Spinal Marrow, about the Sixth or Seventh *Vertebra* of the Neck, which is ſo joined to this *Par Vagum*, as if they grew into one Nerve; being covered with it, with the ſame Coat, from the *Dura mater*, but appears diſtinct when that is taken off. This Nerve they call the *Acceſſory Nerve*, which runs to the Muſcles of the Neck and Shoulder-Blade.

Out of the Trunks of this Eighth Pair ſpring two Nerves that they call the *Recurring Nerves*; the Right of which riſes higher, and winds about the *Axillary Artery*; the Left ſprings lower, and twiſting about the Trunk of the deſcending *Aorta*, recurrs or returns back from thence.

Dr. *Willis* thinks this *Recurrent Nerve* to be really a diſtinct one from the very Original, to be no Branch of the *Par Vagum*, but only is included in the ſame Coat or Cover with it, for Safety and Convenience of Paſſage.

About the firſt or ſecond Rib this Pair hath a kind of *Plexus* or Knot, which is called *Plexus Cardiacus*, becauſe it ſends out Twigs which go to the Heart and its Appendages.

PARVO *Nocumento*, is a Writ of Nuſance; which ſee.

PARVUM & *Craſſum*, is the Fourth Pair of Muſcles of the Head; ſo called, becauſe it is but a little one, yet pretty thick. It lieth under the *Complexum Trigeminum*, or Third Pair, and riſes Nervous from the Tranſverſe Proceſſes of the Six uppermoſt *Vertebræ* of the Neck, and is inſerted into the hinder Root of the Mamillary Proceſs.

PARYLIS, is an Inflammation, Rottenneſs, or Excreſcency among the Gums. *Blanchard.*

PASCHA *Clauſum*, ſignifies the *Octaves* of *Eaſter*, or *Low-Sunday*, which cloſes or concludes that Solemnity. *Die* (*tali*) *poſt paſcha clauſum*, is a Date in ſome of or our Old Deeds. And the firſt Statute of *Weſtminſter*, *Anno* 3 *Edw.* 1. is ſaid to have been made *lendes menda de la cloſe de Paſche*, that is, *the Monday after Eaſter-Week.*

PASCHAL *Rents*, are Rents or Annual Duties paid by the Inferior Clergy to the Biſhop, or Archdeacon, at their *Eaſter Viſitations*. They are alſo called *Synodals*; which ſee.

PAS *de Souris*, a *French* Term in Fortification, the ſame with *Berme*; which ſee.

PASSANT. The Term in Heraldry for a Lion born in any Eſcutcheon in a walking Poſture. But this in moſt other Beaſts, they call *Tripping.*

PASSAGIO, is a Writ directed to the Keepers of the Ports, to permit a Man to paſs over Sea that hath the Kings Licenſe.

PASSARADO, is a Rope in a Ship, whereby all the Sheet-Blocks of the Main and Foreſails are haled down after; the *Clew* of the Mainſail to the *Cubbrige-head* of the Main-maſt, and the *Clew* of the Fore-ſail to the *Cat-head*. This is to be done when the Ship goes large; and they are alſo kept firm down, and hindred from flying up, by this *Paſſarado-Rope.*

PASSPORT, ſignifies a Licence made by any one that hath Authority, for the ſafe Paſſage of any Man from one Place to another.

PASSIVE *Principles*. So the Chymiſts call *Water* and *Earth*, becauſe either their Parts are at reſt, or elſe at leaſt not ſo rapidly moved as thoſe of Spirit, Oil, and Salt, and ſo do ſerve to ſtop and hinder the quick Motion of the *Active Principles*. Beſides if theſe Principles could be drawn pure, they would have nothing in them but bare Bulk, Figure, Colour, and Weight; the one in a Fluid, the other in a Solid Form; and would be without either Smell, Taſte, &c. or any Active Operations.

PASTILIS, are Odoriferous *Tablets*, or *Trochiſks* made up of Perfumes or Odorous Bodies, with Mucilage or Gum *Tragacanth.*

PATE, in Fortification, is a kind of Platform like what they call an Horſeſhoe, not always regular, but generally oval, encompaſſed only with a Paraper, and having nothing to flank it. It is uſually erected in Marſhy Grounds to cover a Gate of a Town.

PATEE, a Term in Heraldry for a *Croſs* of this Figure. The Field is *Sable a Croſs Patee Argent*, by the Name of *Croſs*. This Form of a *Croſs* is called alſo *Formee.*

PATELLA. See *Mola genu*, the Knee Pan.

PATENTS. See *Letters Patent.*

Note, That *Patents* differ from Writs, and that a Coroner is made by Writ, and not by *Patent.*

PATENTEE, is he to whom the King grants his Letters Patent.

PATHETICK *Nerves*, are the Fourth pair ariſing from the Top of the *Medulla Oblongata*, (and ſo is different from all others, which ariſe either from its Baſe or Sides) behind the round Protuberances, called by Anatomiſts the *Nates* and *Teſtes* of the Brain; whence bending forwards by the Sides of the *Medulla Oblongata*, they preſently hide themſelves under the *Dura Mater*; under which proceeding a while, they paſs out of the Skull, each in a ſingle Trunk, at the ſame Hole with the Optick Nerves, (and they communicate with no other in their whole Paſſage) and are beſtowed entirely, as *Willis* ſaith, on that Muſcle of the Eye which they call *Trochlearis*, becauſe it ſerves to rowl the Eye round about; which being a Motion that is uſually conſequential upon ſome Paſſion of the Mind, ſuch as Love, &c. theſe

Nerves

Nerves are therefore very properly called *Oculorum motores pathetici.*

PATH *of the Vertex*, a Term frequently uſed by Mr. *Flamſteed* in his *Doctrine of the Sphere*, and ſignifies a Circle deſcribed by any Point of the Earth's Surface, as the Earth turns round its Axis. This Point is conſidered as Vertical to the Earth's Centre, and is the ſame with what is called the *Vertex* or the *Zenith* in the *Ptolemaick* Projection.

The Semi diameter of this *Path of the Vertex* is always equal to the Complement of the Latitude of the Point or Place that deſcribes it; that is, to that Places Diſtance from the Pole of the World.

PATHOGNOMONICK, a Term in the Art of Medicine, is a proper inſeparate Sign which agrees only to ſuch a thing, and to all of that kind, and tells the Eſſence of its Subject, and alſo laſts from the Beginning to the End; as in a true Pluriſie there's always a continual Fever, hard Breathing, and Stiches, with a Cough. *Blanchard.*

PATHOLOGY, is a part of Phyſick that teacheth us the preternatural Conſtitution of a Man's Body, ſo as thereby to diſcover the Nature and Cauſes of Diſeaſes.

PATONCE. The Heralds Term for one of their Croſſes of this Figure.

Gules, a Croſs Patonce, Argent, by the Name of *Latimer.*

PATRIMONY, is an Hereditary Eſtate, or Right, deſcended from Anceſtors. The Legal Endowment of a Church, or Religious Houſe, was called *Eccleſiaſtical Patrimony.*

PATRON, is uſed in the Civil Law for him that hath manumitted a Servant, and thereby is both juſtly accounted his great Benefactor, and challengeth certain Reverence and Duty of him during his Life.

In the Canon and Civil Law it ſignifies him that hath the Gift of a Benefice; and the Reaſon is, Becauſe the Gift of Churches and Benefices belonging unto ſuch good Men as either built, or elſe endowed them with ſome great part of their Revenue.

PATROUILLE, or *Patroul*, as we generally pronounce it, is a Round of Soldiers, to the Number of Five or Six, with a Serjeant to command them: Theſe ſet out from the *Corps de Gards*, and walk round the Streets of a Garriſon, to prevent Quarrels, Miſchief, *&c.* and to keep all in Order, Peace and Quietneſs.

PAUPER. See *Forma pauperis.*

PAUSE or *Reſt*, in Muſick, is a Silence or Artificial Intermiſſion of the Voice or Sound, proportioned to a certain Meaſure of Time, by the Motion of the Hand or Foot.

Theſe *Pauſes* or *Reſts* are always equal to the Length or Quantity of the Notes whereto they are annex'd, and are therefore called by the ſame Names, as a *Long-reſt*, *Breve-reſt*, *Semi-breve-reſt*, &c.

Odd Reſts are thoſe which take up only ſome part of a *Semi-breve*'s Time or Meaſure, and have always reference to ſome *Odd Note*: for by thoſe two *Odds* the Meaſure is made even.

PAUNCH, or *Panch*, is thoſe Matts made of Sinnet, which in a Ship are made faſt to the Main and Fore-yards, to keep them from galling againſt the Maſts.

PAWLE, in a Ship, is a ſmall piece of Iron bolted to one End of the Beams of the Deck, cloſe to the Capſtan, but yet ſo eaſily as that it can turn about. Its Uſe is to ſtop the Capſtan from turning back, by being made to catch hold of the Whelps: Therefore they ſay, *Heave a Pawle!* That is, Heave a little more for the *Pawle* to get hold of the Whelps: And this they call *Pawling the Capſtan.*

PAYING. The Seamen call laying over the Seams of a Ship a Coat of hot Pitch, *paying her*; which when 'tis done with Canvaſs, is called *Parcelling.* Alſo, when after ſhe is *Graved*, and her *Soil* burned off, a new Coat of Tallow and Soap, or one of Train-Oil, Roſin and Brimſtone, boiled together, is put on upon her, that is called *Paying of a Ship.* They ſay alſo ſometimes, when in tacking about, a Ship's Sails being backſtay'd, fall all flat againſt the Maſts and Shrouds, *ſhe is payed.*

PEAN, in Heraldry, is when the *Field* of a Coat of Arms is *Sable*, and the Powderings are *Or.*

PECTEN *Arboris*, is the Grain of the Wood of any Tree.

PECTINEUS, is a Muſcle of the Thigh; ſo called from its Beginning at the *Os Pubis* or *Pectinis.* It has a thick, broad, and fleſhy Origination from the External part of the ſaid Bone, between the *Pſoas Magnus* and the *Iliacus Internus*, and ſecond Head of the *Triceps*; and deſcending obliquely backwards, it becomes a flat ſtrong Tendon near its Implantation to the Aſperity on the Poſterior part of the *Os Femoris*, immediately below the leſſer *Trochanter*, at the Inſertion of the *Pſoas Magnus* and *Iliacus Internus.*

This acting together with the *Pſoas Magnus* and *Iliacus Internus*, doth not only draw the *Os Femoris* upwards, but direct it outwards, by its Curve Deſcent from its Origination to its Inſertion at the Poſterior part of the *Os Femoris*; which is a Provident Contrivance of Nature in walking, ſince the Thigh-Bones by their oblique Poſition do thereby render the Toes liable to turn inwards.

PECTINIS, or *Pubis Os*, the Share-Bone, is the lower and inner, or fore-part of the *Os Innominatum*; and even before, is joined to its Fellow by a Cartilage, called *Synchondroſis*, which is much thicker, but looſer and ſofter in Women than in Men; for in Women, one Bone can a little recede from the other in Travail, to make way for the *Fœtus.* It has a very large *Foramen* between the *Sinus* of the *Coxendix*, and that part whereby it is joined to its Fellow, making room for two Muſcles of the Thigh; and above this *Foramen* is a *Sinus*, by which the Crural Veins and Arteries paſs to the Thighs. The Upper part of this Bone is called its *Spine*, into which the Muſcles of the *Abdomen* are inſerted.

PECTORALS, or *Pectoral Medicines*, are ſuch as are uſed in Diſeaſes of the Breaſt, by attenuating, or thickning, or allaying the Heat thereof, and render the Matter which cauſes coughing, fit to be expectorated or ſpit out. *Blanchard.*

PECTORALIS, a Muſcle of the Arm, ſo called from its Situation. This hath a broad ſemi-

circular

circular fleshy beginning above, from near half the Inferior part of the *Clavicula*: Below, from the *Os Pectorale*, and all the Cartilaginous Endings of the Six superior Ribs, and from the Bony part of the Seventh, it hath a distinct *Fasciculus* of fleshy Fibres, (which sometimes is confounded with the *Obliquus Descendens Abdominis*.) From this large Origin it marcheth transversly, and becometh narrower but thicker, and lessens it self as it passeth over the upper part of the *Biceps Cubiti*, and is inserted by a short, but broad, strong Tendon, to the Superior part of the *Os Humeri*, above the Termination of the *Deltoides*. The Fibres of this Muscle decussate each other, near their Implantation to the *Os Humeri*; those of the Superior part running downwards, and those of the Inferior marching up, intersect the former in Acute Angles. When it acts it moves the Arm either obliquely upwards, or directly forwards, or obliquely downwards, according to the various Direction of its *Series* or *Fibres*.

PECULIAR, signifies a particular Parish or Church that hath Jurisdiction within it self, for *Probat* of Wills, *&c.* exempt from the Ordinary, and the Bishops Courts.

The King's Chapel is a Royal *Peculiar*, exempt from all Spiritual Jurisdiction, and reserved to the Visitation and immediate Government of the King himself, who is Supreme Ordinary.

It is an Ancient Privilege of the See of *Canterbury*, That wheresoever any Mannors or Advowsons do belong to it, they forthwith become exempt from the Ordinary, and are reputed *Peculiars*.

PEDESTAL, in Architecture, is that part which supports a Pillar or Column, having its proper Base and Cornice different, according to the several Orders of Architecture.

The *Tuscan Pedestal*, being the most simple of all, hath only a *Plinth* for its Base, and an *Astragal* crown'd for its *Cornice*.

The *Dorick Pedestal*, (according to *Palladio*) borrowing the *Attick* Base, ought to have for its Height 2 ½ Diameters of the Column taken below. But no *Pedestals* to this *Order* are seen among the Ancient Buildings.

The *Ionick Pedestal* is Two Diameters and about Two thirds high.

The *Corinthian Pedestal* hath the Fourth part of the Column for its Height, being divided into Eight parts; whereof one must be allowed for the *Cymatium*, two others for the Base, and the rest for the Dye or Square.

The *Composit Pedestal* ought to have the Third part of the Pillar for its Height.

PEDICULARIS *Morbus*. See *Phthiriasis*.

PEDICULUS, in Botany, is the Foot-stalk of any Leaf, Flower, or Fruit.

PEDIMENT, a Term in Architecture; the same with *Fronton*, which see.

PEDIUM. See *Tarsus*.

PEDRERO, or, as it is usually called by the Seamen, *Petterero*, is a small piece of Ordnance, most used on board of Ships to fire Stones, Nails, broken Iron, or Partridge-shot, on the Enemy, when he attempts to board you. Most of these are open at the Breech, and have the Chamber to take out, and to be loaded that way, and not at the Muzzle.

PEEK, a Sea-word, used in these Senses: An Anchor is said to be *a-peek*, when a Ship being about to weigh, comes so over her Anchor, that the Cable is perpendicular between the Hawse and the Anchor; and to bring the Ship thus, is called *Heaving a-peek*.

They say also, *Peek the Missen*; that is, Put the Missen-yard right up and down by the Mast.

A Ship is said to *Ride a peek*, where she lies with her Main and Fore-yards hoised up; and then having one end of the Yards brought down to the Shrouds, the other is raised up an end: And this is done to contrary Sides; (*i. e.*) the Starboard Yard-arm of the Main-yard comes down to the Starboard side, and so doth the Larboard end of the Fore-yard; so that the Yards appear a cross each other like St. *Andrew*'s Cross. The Way to do this, is, To let go the Starboard Top-sail-sheets from the Main-yard, and then topping up the Larboard-lifts: And so quite contrary for the Fore-yard.

To *Ride a-broad peek* is much after the same manner, only the Yards are raised up but half so high.

The Reason why they thus *peek* up their Yards is, left lying in a River (and they hardly ever use it but then) with their Yards a-cross, another Ship should be foul upon them, and break their Yards.

Their is also a Room in the Hold of a Ship, that is called the *Peek*: 'Tis from the Bitts forwards to the Stem. Here Men of War keep their Powder; and Merchant-men, Outward-bound, place their Victuals here.

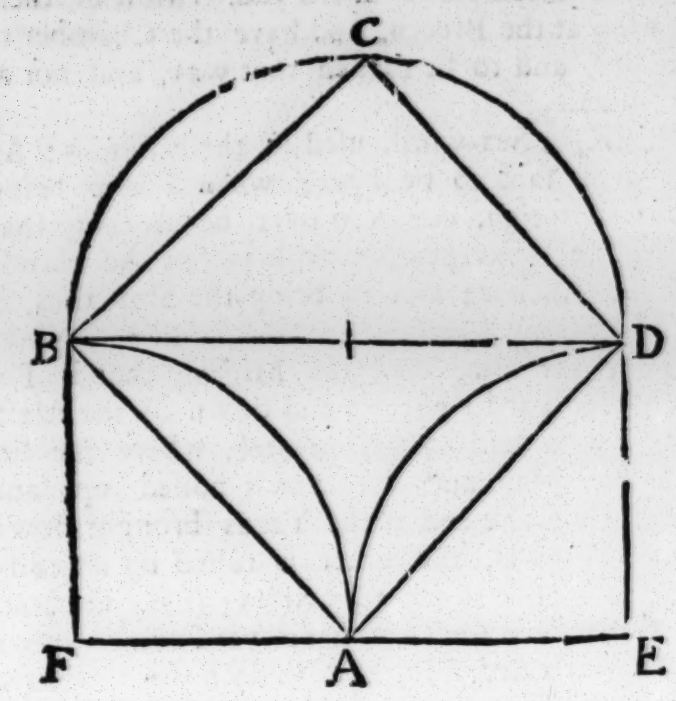
PEGASUS, a Constellation in the Northern Hemisphere, containing 23 Stars.

PEIRCED. When any *Ordinary* or *Charge*, in Heraldry, hath an Hole in it, so that the *Field* appears through, they say that *Ordinary* or *Charge* is *pierced*.

PELAGIÆ, is a Term used by the Writers of Natural History, to express such Sea Shell-fishes, as never or very rarely are found near the Shores, but always reside in the Deep, in those parts of the Bottom of the Sea which are most remote from Land.

PELICOIDES, is the Name given by some to the Figure B C D A, contained under the two

inverted



inverted Quadrantal Arks A B and A D, and the Semi-circle B C D, whoſe Area is = to the Square A C, and that to the Rectangle E B.

'Tis equal to the Square A C, becauſe it wants of the Square on the Left Hand the two Segments A B and A D, which are equal to the two Segments B C and C D, by which it exceeds it on the Right Hand.

PELIDNUS, is a Black-and-blue Colour in the Face, frequent in Melancholick Men.

PELLETS, a Bearing in Heraldry. See *Balls.*

PELLICAN, is the Chymiſts Term for a kind of Double Veſſel, uſed in Circulations. See *Double Veſſels.*

PELLICLE, a little Skin. When any Solution in Chymiſtry is in a gentle Heat evaporated ſo long till a thin Skin or Film ariſe on the top of the Liquor, 'tis call'd an *Evaporation to a Pellicle*; and then there is very little more Liquor left than what will juſt ſerve to keep the Salts in Fuſion.

PELVIS, is the Place at the Bottom of the Belly, wherein the Bladder and Womb are contained.

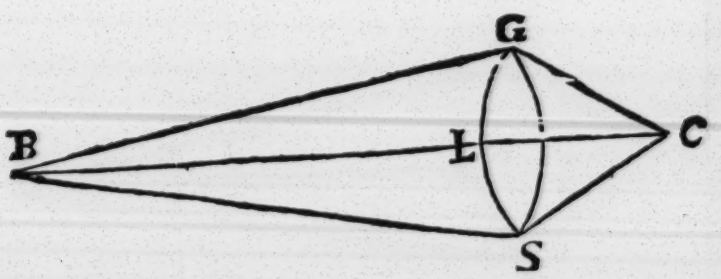
PELVIS *Aurium.* See *Cochlea.*

PELVIS *Cerebri.* See *Choana.*

PELVIS *Renum*, is a Membranous Veſſel or Receptacle in either Kidney, which receives the Urine, and pours it into the Bladder.

PEMPHIGODES *Febris*, is a Spotted Fever; ſome ſay a Windy or a Flatulent Fever.

PENCIL of Rays in *Opticks*, is a double Cone of Rays joined together at the Baſe; one of which hath its Vertex in ſome one Point of the Object, and the Glaſs G L S for its Baſe; and the other hath its Baſe on the ſame Glaſs, but its Vertex in the Point of Convergence, as at C.



Thus: B G S C is a Pencil of Rays, and the Line B L C, is called the Axis of that Pencil.

PENINSULA, in Geography, is a Portion of Land, which being almoſt ſurrounded with Water, and is joined to the *Continent* only by an *Iſthmus*, or narrow Neck of Land; as *Africa*, the greateſt *Peninſula* in the World, is joined to *Aſia*; that of *Morea* to *Greece*, &c.

PENETRATION *of Dimenſions*, is a Philoſophical way of expreſſing, That two Bodies are in the ſame Place, ſo that the Parts of one do every where penetrate into, and adequately fill up the Dimenſions or Places of the Parts of the other; which is manifeſtly impoſſible, and contradictory to Reaſon.

PENUMBRA, in Aſtronomy, is a faint kind of Shadow, or the utmoſt edge of the perfect Shadow, which happens at the Eclipſe of the Moon; ſo that it is very difficult to determine where the Shadow begins, and where the Light ends.

PENDANTS of a Ship, are of two kinds.

1. Thoſe long Colours, or *Streamers*, cut pointing out towards the end, and there divided into two parts, and which are hung out at the Heads of the Maſts, or at the Yard-Arm ends, are called Pendants; and are uſed for ſhew, and ſometimes for Diſtinction of Squadrons.

2. That ſhort Rope is called a *Pendant*, which at one end is faſtened to the Head of the Maſt, or to the Yard, or to the Clew of the Sail, and at the other end hath a Block and Shiver, to reeve ſome running Rope into. Thus the Pendant of the *Tackle* is made faſt to the Head of the Maſt; and the Pendants to the *Back Stays* are faſtened to, and hang down on the Inſide of the *Shrowds*. Alſo all the Yard-Arms, except the Miſſen, have of theſe Pendants, into which the Braces are reeved.

PENDULUM, is a Weight hanging at the end of a String, Chain, or Wire, by whoſe *Vibrations* or *Swings* to and fro, the Parts or Differences of Time are meaſured.

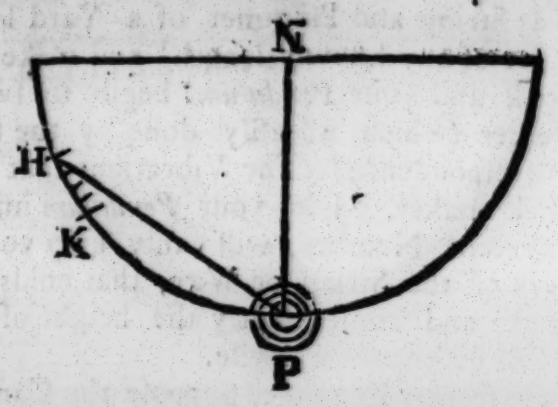
The Velocities of *Pendulums* in their loweſt Points are as the Chords of the Arks they fall from or deſcribe.

Thus if the *Pendulum* N P be let fall from the Height H, its Velocity at P will be expounded by the Chord H P. (*In the Figure following.*)

'Tis ſaid that *Ricciolus* was the firſt that attempted to meaſure Time by the *Pendulum*, and therein he was followed, tho' near about the ſame time, by *Langrenus Vendelinus, Merſennus, Kircherus*, &c. ſome of which declare they knew nothing of *Ricciolus*'s Attempt: But the firſt that applied it to a Movement, Clock, or Watch, was Mr. *Chriſtopher Hugens*, and who brought it alſo to a good degree of Perfection.

The Learned Sir *Iſaac Newton*, in his Accurate Experiments on *Pendulums*, found that the Matter of all Bodies is exactly proportionable to their Weight.

If



If the *Pendulum* P, be let fall from the Height H, and then at its return that way come up again as far as K, the Ark HK repreſents the Retardation ariſing from the Reſiſtance of the Air.

The ſhorter Arks any *Pendulum* deſcribes, the equaller will the Vibrations be to one another; and when the Arks are exceeding ſmall, the Vibrations will be nearly equal as if the *Pendulum* did ſwing in a *Vacuum*. Wherefore it ſeems to be a Miſtake in thoſe who admire a Clock or Watch for its *Pendulums* ſwinging far, or taking a great Compaſs as they call it.

PENDULUMS, *Merſennus* found the length of a *Pendulum* that wou'd ſwing Seconds to be 3 Feet 6 Inches, and ſince 'tis agreed that in our Latitude, it is juſt 39 Inches, 2 Tenths.

A *Pendulum* of 10 Inches, wanting about one Tenth of an Inch, will very near ſwing half Seconds, or the 120th part of a Minute of Time; which is 7200th part of an Hour.

The Lengths of *Pendulums* (which are always accounted from the Centre of Oſcillation, to the Centre of the Ball or Bob) are to each other in a Duplicate Proportion of the Times in which their Vibrations are reſpectively performed; or are as the Squares of the Vibrations performed in one and the ſame time. Wherefore the Times muſt be in Subduplicate Proportion to the Lengths. Sir *Iſaac Newton* demonſtrates, *Cor.* 2. *Prop.* 54. *Princip.* That if the Force of the Movement of a Clock required to keep a *Pendulum* in Motion, could be ſo compounded with the gravitating force of the *Pendulum*, that the whole Force or Tendency downwards, ſhall be as the Line which ariſes by dividing the Rectangle under the Semi-ark of the Vibration and the Radius, is to the Sine of that Semi-ark, then all the Oſcillations ſhall ſtill be made in the ſame ſpace of Time.

PROBLEMS.

I. *To find the Length of a* Pendulum *which ſhall make any Aſſigned Number of Vibrations in a Minute.*

Let the Number of *Vibrations* be 50, the Length of a String counted from the *Point of Suſpenſion*, to the Centre of *Oſcillation*, or of the Bullet or Round Ball at the end of it, is required.

Since *the Lengths of Pendule's* are to each other as the *Squares* of their *Vibrations*. And that a Pendule Vibrating Seconds (or 60 times in a Minute) is by Experience found to be of the length of 39 Inches and $\frac{2}{10}$ of an Inch.

I here uſe Sir *Jonas Moor's* Computation.

Say, as the Square of 50, (which is 2500): to the Square of 60 (which is 3600) : : So is 39, 2 : to the Length of the *Pendulum* required: which will be found to be 56, 4 Inches. See the Work.

As 2500 to 3600 : : ſo 39, 2 to
39,2

7200
32400
10800

25 | 00) 14112 | 00 (56,4
125

161
150

112
100

12

But for ready Practice; ſince in theſe Queſtions the Product of the mean Terms will always be 1411200 (that is the Product of the Square of 60 Multiplied by 39,2.) *i. e.* 3600 × 39,2. You need only divide that Number by the Square of the Number of Vibrations aſſign'd, and the Quotient will give the Length of a *Pendulum*, that ſhall Vibrate juſt ſo many times in a Minute.

PROBLEM II.

The Length of a String and Plummet being known (reckoned as before from the Point of Suſpenſion to the Centre of the Weight;) To find the Number of Vibrations ſuch a Pendulum *ſhall make in a Minute.*

This is the Reverſe of the former Problem; therefore ſay, As the Length given ſuppoſe 56,4, to the Length of the Standard Pendulum ſwinging Seconds, *viz.* 39,2. So is the Square of the Vibrations of the *Standard Pendulum* to the Squares of the Vibrations ſought. See the Work.

As 56,4 : 39,2 : : 3600 : 2500, as will be found by working the *Golden Rule* as before. And the Square Root of 2500, will be 50, the Number of Vibrations ſought.

But for uſe (here as in the former Problem) you need only to divide 1411200 by the Length, and it gives the Squares of the Vibrations, as there you divided by the Square of the Vibrations to find the Length.

USE.

And theſe two Problems may be of excellent uſe, both to regulate the Motion of a Clock or Watch, and exactly to meaſure Time without either; which may gratifie and aſſiſt the Curious in obſerving *Eclipſes*, eſpecially thoſe of the *Satellites* of *Jupiter*, and in the Tranſits of the Moon under the fix'd Stars, and her Occultations of them: Whoſe Duration may be thus eaſily meaſured, without Clock, Watch, or any ſuch way of diſtinguiſhing Time.

As for Inſtance, Suppoſe you were on a Journey or Voyage, or ſome place where you cannot

have the conveniency of a good Clock or Watch, &c. and yet you would willingly observe the Duration of an Eclipse; which by your Table you know will happen such a Night, and near such a time of it.

Hanging up a String and Weight on a fine Pin, and letting it swing just at the Entrance of the Shadow on the Moon's Orb; let a Correspondent or Servant carefully count the Vibrations, and marking them down with a Pencil, or some such way; (moving the *Pendulum* dexterously also that way that 'tis going, when 'tis almost at rest, by a gentle push of his Hand, and by that means keeping it in constant Motion;) the Number of the Vibrations will be known, during the whole Eclipse; which note down on a piece of Paper, and measuring exactly the Length of your String in Inches, and Decimal parts of an Inch: Divide (by this Problem) 141120 by the Length of your *Pendulum*, and the Quotient will afford you a Number, whose Square Root is the Number of Vibrations, the *Pendulum* you employ'd made in one Minute. Divide therefore the Number of all the Vibrations, during the whole time of Observation, by 60, and the Quotient will be the Number of Minutes the Eclipse lasted.

N. B. 'Twill be best to use a pretty long String, because the Vibrations being by that means slower, they may be the more distinctly counted. If at such a time you are furnished with a good Foot Rule, you may let your *Pendulum* be just 39, 2, and then each Vibration will be a Second: But if you are destitute of such an Advantage, you may, as before, hang up a *Pendulum* at a venture, and by another String, or some such way, taking its exact Length, you may keep it by you. with the Number of all the Vibrations, and compute the Time afterwards at your Leisure.

PROBLEM III.

To find the Length of any String which hath a Weight hanging at it, without coming to measure it; or without making use of any Quadrant, or such like Instruments, to take Heights.

Let the String and Weight annex'd be made to swing; and at the same time hang up a *Pendulum* of any known Length, (as suppose a Yard) and set it a Vibrating likewise, so that both the *Pendulums* may swing together; to effect which, you must let the *Pendulum* you hang up go away just when the other you would measure is beginning to make any Vibration: This done, stay till the *Pendulum* you hung up hath made a Competent Number of Vibrations (as suppose about 50 or 60;) and let a Correspondent count how many Vibrations the *Pendulum*, whose length is sought, made in the same time: And let us suppose, that *That* made 10 Vibrations while your String and Plummet made 60; since, as was said before, *The Lengths of* Pendulums *are to each other as the Squares of their Vibrations*: If you divide 3600 (the Square of 60) by 100, (the Square of 10) the Quotient will be 36, which will shew you that the String sought was 36 times as long as that which you hung up; *i. e.* was in length 36 Yards, or 108 Foot.

And thus you may easily find the height of any Church or Theatre, by means of a Branch-Candlestick which hangs from the Roof: For if you hang up a String and Plummet of a Yard long, suppose, (~~or of any known length~~) and make this Candlestick and your *Pendulum* begin to swing both together (which is easily done by the help of a Correspondent:) The Vibrations that the Candlestick makes, while your *Pendulum* makes any Competent Number, will easily help you to the Length of the String or Wire, that holds the Candlestick, and consequently the height of the Church will be known likewise.

As in the former Example, Suppose the Candlestick made 10 Vibrations, while your *Pendulum* of a Yard made 60, then it is 36 Yards, or 108 Foot from the Centre of the Candlestick, to the end of the Rope or Wire that holds it to the Roof; to which, adding the height of the Centre of the Candlestick above the Ground, you have the whole height of the Church.

PROBLEM IV.

According to these Principles and Experiments on Pendulums, *it will not be difficult to estimate nearly the Depth of a deep Well, by the fall of a Stone into the Water from the Mouth: Or the Distance that any Ship at Sea, or that any Fort is off, by the Time between seeing the Flash of the Powder, and hearing the Report of the Gun: Or the Distance that any Thunder-Cloud is off,* &c.

For Sir *Isaac Newton* hath found that a Sound moves 968 Feet in a Second of Time.

'Tis asserted also by Mr. *Hugens*, and now generally agreed to, That a heavy Body descends in the first Second of Time after its beginning to fall, very near 16 Feet.

An Example to find the Depth of a Well, may serve for all.

Suppose you hang up a short *Pendulum*, that will Vibrate Quarter Seconds, (the way to find its Length hath already been shewn) and letting go the Stone and the *Pendulum* together, you find the *Pendulum* hath made 16 single Vibrations before you hear the noise of the Stones fall into the Water. Then since 16 Quarters of a Second are equal to 4 Seconds, if you account the Acceleration of the Descent of heavy Bodies to be either as the Squares of the Times, or as the Encrease of the odd Numbers, either way will give you the Number 256 for the Depth of the Well.

For since, as it is elsewhere shewn, a Body descends 16 Feet in the first Second of Time, in the fourth Second it will descend 16 times 16 Feet; for the Times being 1 and 4, the Descent will be as their Squares; that is, as 1 to 16: Wherefore Multiplying 16 by 16, you have 256, the Depth of the Well.

Or, if according to *Galilæus*'s way, you account 16 Feet for the first Second, and then 3 time 16 for the next Second, 5 times 16 for the third Second, and 7 times 16 for the fourth Second; all these Numbers added together, will make 256, the Depth as before.

Indeed some Abatement must be allowed for the Time the Noise of the Stones fall into the Water takes to reach the Ear. Wherefore since a Sound moves 968 Feet in a Second, and 256 is a little more than $\frac{1}{3}$ of that Number, a little more than

than $\frac{1}{4}$ of 16 Foot muſt be taken out of the former found Depth 256. So that the Depth of the Well may roundly be accounted 250 Feet.

But in the other Eſtimations of the Diſtance of a Cloud, Ship, or Fort, there needs no ſuch Allowance; and the bare Multiplication of 968, by the Number of Seconds between the Flaſh and the Report, will give the Diſtance of the Cloud or Ship from the Obſerver.

That Night, (*viz. April* 12.) on which our late Mighty Monarch King *William* was buried, we counted oftentimes very accurately, That the Diſtance between ſeeing the Flaſh, and hearing the Report of the Tower Guns, (which were then fired very ſolemnly and diſtinctly) was always 7 Seconds of Time. Multiplying then 968 by 7, it produces 6775, which is to be accounted the Diſtance between *Amen-Corner* and the Tower of *London*; which is one Mile, and 1495 Feet, or ſomething more than a Mile and a Quarter.

PENDULUMS *Royal*, are thoſe Clocks whoſe *Pendulum* ſwings Seconds, and goes eight Days, ſhewing the Hour, Minutes, and Seconds.

The Numbers of ſuch a Piece are calculated thus:

Firſt, Caſt up the Seconds in 12 Hours, and you'll find them to be 43200 = 12 × 60 × 60. The Swing-wheel muſt needs be 30, to ſwing 60 Seconds in one of its Revolutions: Now let $\frac{1}{2}$ 43200 = 21600 be divided by 30, and you'll have 720 in the Quotient, which muſt be broken into Quotients; the firſt of them muſt be 12 for the Great Wheel, which moves round once in 12 Hours. 720 divided by 12, gives 60, which may alſo be conveniently broken into two Quotients, as 10 and 6, or 5 and 12, or 8 and $7\frac{1}{2}$; which laſt is moſt convenient: And if you take all your Pinions 8, the Work will ſtand thus:

8) 96 (12
8) 64 (8
8) 60 ($7\frac{1}{2}$
30

According to this Computation, the Great Wheel will go about once in 12 Hours, to ſhew the Hour, if you will; the Second Wheel once in an Hour, to ſhew the Minutes; and the Swing-wheel once in a Minute, to ſhew the Seconds.

PENNATA *folia, winged Leaves*, is a Term among the Botaniſts, for ſuch Leaves of Plants as grow directly one againſt another on the ſame Rib or Stalk; as thoſe of *Aſh*, *Wall-nut-tree*, &c.

PENSION, that which in the two *Temples* is called a *Parliament*, and in *Lincolns-Inn* a *Council*, is in *Grays-Inn* termed a *Penſion*: That is, An Aſſembly of the Members of the Society, to conſult of the Affairs of the Houſe. Alſo in the Inns of Court, *Penſions* are certain annual Payments of each Member to the Houſe, for certain Occaſions.

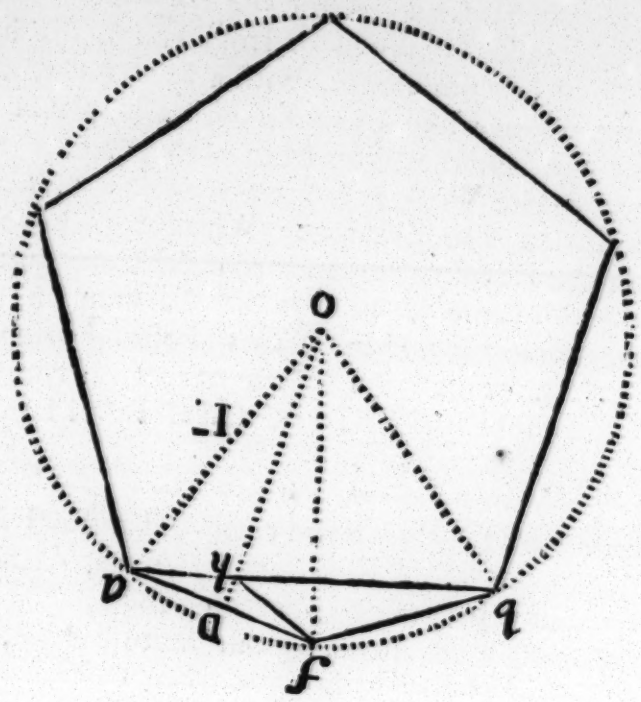
PENSION *Writ*, when a *Penſion Writ* is once iſſued, none ſued thereby in the Inns of Court ſhall be diſcharged, or permitted to come into Commons, till all Duties be paid.

PENSION *Order in* Grays-Inn, ſeems to be a peremptory Order againſt ſuch of the Society as are in Arrear for *Penſions*, and other Duties.

PENTAGON, in Geometry, is a Figure having five Sides, and five Angles: If all the Sides are equal, and conſequently the Angles, 'tis called *a Regular Pentagon*.

PROPOSITION.

The Side a b *of a* Regular Pentagon, *or which can be inſcribed in a Circle, is in Power equal to the Side of an* Hexagon *and* Decagon, *inſcribed in the ſame Circle: That is, The Square of* a b, *is equal to the Sum of the Squares of* a f *and* a o.



Let *a o*, the Side of the Hexagon, be called H; and *a f* (that of the Decagon) be called D; and *a b* be called P.

I ſay P P = H H × D D.

For the Angle at the Centre *b o a* being 72 Degrees, the equal ones, *b* and *a*, in the ſame Triangle, muſt be 54 Degrees each. Biſſect then the Angle *f o a* by the Prick'd Line *o h*; and then 'tis plain the Angle *b o h* will alſo be 54 Degrees, (*i. e.* 36 + 18 Degrees,) and conſequently the △ △ *a b o* and *o b h* are ſimilar. Wherefore *a b* : *b o* : : *b o* : *b h*: (*i. e.*) in our Notation, P : H :: H. $\frac{H H}{P}$.

Again, In the △ *b f a*, the Angles *b* and *a* are =; and alſo in the little △ *f h a*, the Angle *f* = *a*; and conſequently the 2 △ △ *b f a*: and *f h a*, are Similar; and conſequently *b a*: *a f* : : *a f* : *a h*. That is, P : D : : D : $\frac{D D}{P}$.

Wherefore of the whole Line *b a*, the 2 Parts are found to be by this Notation, $\frac{H H}{P}$ and $\frac{D D}{P}$: That is, the whole is $\frac{H H + D D}{P}$, but this Line *a b* is = P: Wherefore P P = H H + D D. *Q. E. D.*

PENTANGLE, a Figure having five Angles.

PENTAPOTES, (in Grammar,) are ſuch deficient Nouns as have but five Caſes, as *Nemo*.

PERACUTUM *Menſtruum*. See *Menſtruum Peracutum*.

PERAMBULATION *of the Foreſt*, is the Surveying or Walking about the Foreſt, or the Limits of it, by Juſtices, or other Officers thereto appointed, to ſet down the Metes and Bounds thereof, and what is within the Foreſt, and what without.

PERAMBULATIONE *facienda*, is a Writ that is ſued out by two or more Lords of Manners lying near one another, and conſenting to have their Bounds ſeverally known. It is directed to the Sheriff, commanding him to make *Perambulation*, and ſet down their certain Limits.

PERAMBULATOR, or *Walking-wheel*, is an Engine made of Wood or Iron, commonly half a Pole in Circumference, with a Movement, and a Face divided like a Clock, with a long Rod of Iron or Steel, that goes from the Centre of the Wheel to the Work: There are alſo two Hands, which (as you drive the Wheel before you) count the Revolution; and from the Compoſition of the Movement, and by the Diviſion on the Face, ſhew how many Yards, Poles, Furlongs, and Miles, you go. The Uſe of this Inſtrument is to meaſure Roads, Rivers, and all Level Lands, with great Expedition.

PERAVAYLE. See *Paravayle*.

PERCEPTION, is the clear and diſtinct Apprehenſion of any Object offered to us, without forming any Judgment concerning them.

PERCH, a Meaſure, by our Statute Law, of 16 Foot and a half in Length. See *Pole*.

PERDONATIO *utlagariæ*, is a Pardon for him who, for Contempts in not coming to the King's Court, is out-law'd, and afterwards of his own Accord, yieldeth himſelf to Priſon.

PEREMPTORY, in Law, ſignifies a final and determinate Act, without Hope of renewing or altering.

PERFECT *Concords*, in Muſick. See *Concords*.

PERFECT *Fifth*, the ſame with *Diapente*; which ſee.

PERFECT *Numbers*, are ſuch whoſe aliquot or even Parts, join'd together, will exactly return the whole Number, as 6, 28, &c. For of ſix, the half is three, the third Part two, and the ſixth Part one, which added together, make ſix; and it hath no more aliquot Parts in whole Numbers: So twenty eight, which has theſe Parts, *viz.* 14, 7, 4, 2, and 1, exactly return 28; which therefore is a Perfect Number, whereof there is but ten between one and one Million of Millions.

PERFORANS, is a Muſcle of the Fingers, ſo called becauſe its Tendons run thro' thoſe of the *Perforatus*; it's alſo called *Profundus* from its Situation; and *Tertii Internodii Digitorum Flexor*, from its Uſe. It riſeth fleſhy from near two Thirds of the Superior and Forepart of the *Ulna*, as alſo from the Ligament between the laſt named Bone and the *Radius*; and becoming a large thick bellied Muſcle, grows outwardly Tendinous, before it paſſes over the *Pronator Radii Quadratus*, and is divided into four round Tendons, which march under thoſe of the *Perforated* Muſcle, beneath the *Ligamentum Tranſverſale*; from each of theſe Tendons the *Muſculi Lumbricales* are ſaid to ariſe, after which they paſs thro' the *Fiſſures* of thoſe of the Perforated Muſcles, and proceeding over their Extremities, terminate in the Superior and Forepart of the third Bone of each Finger.

The Tendons of this Muſcle running through thoſe of the Perforated, is a no leſs uſeful than ſtupendous Artifice in Nature. For to the End the Fingers (like ſo many Leavers) ſhould be bended with great Force, it is abſolutely neceſſary the ſtrongeſt Muſcle ſhould be inſerted neareſt their Extremities, and fartheſt from their *Fulcimenta* the *Oſſa Metacarpi*: But in regard every Internode ſhould be attended with a particular Muſcle, the better to accommodate them to various Imployments, and the Origination of the Superior or *Perforatus*, is confined to the *Apex* of the Internal Extuberance of the *Os Humeri*, and upper Part of the *Radius* only; wherefore could not be a fit Inſtrument for ſo ſtrenuons an Action, and that not only in regard to its Magnitude, but by the Approach of its two Extreams when the *Cubit* or *Carpus* are bended; both which would be no ſmall Impediments in divers Actions; it's therefore neceſſary it ſhould be imployed in the Motions of the ſecond Internodes: But ſince theſe Superior Tendons would be hereby liable to interrupt the Inferior in their right Progreſs to the Extremities of the Fingers; it ſeems an Argument of great Counſel in traſmitting the latter through the Fiſſures of each of the former, whereby the Actions of both are not only diſtinctly performed, and the Extremities of the Fingers attended with the largeſt Muſcle, (whoſe Origin is below the *Os Humeri*, wherefore it's Extreams cannot approach in the Flexion of the *Cubit*,) but their Motions are preſerved, tho' the Superior Muſcle is totally divided; which indeed is a provident Contrivance of the Author of Nature, and is in it ſelf ſufficient to excite our Admiration.

PERFORANS, a Muſcle of the leſſer Toes; ſo called, becauſe its Tendons run thro' the Fiſſures in the Tendons of the *Muſculus Perforatus Pedis*: It is alſo called *Flexor tertii Internodii Digitorum Pedis*, from its Uſe. It hath an acute fleſhy Origination from the Backpart of the *Tibia*, immediately under the *Muſculus Subpoplitæus*, having a double Order of Fibres united in a middle Tendon like the *Flexor Pollicis Longus*, but ceaſeth to be Fleſhy as it paſſeth behind the *Malleolus Internus*, and running in a Channel over the Internal Part of the *Os Calcis*, under it, Imbanding Ligaments in half its Progreſs thro' the Sole of the Foot; it is divided into four Tendons, which march thro' the Perforations of the Tendons of the *Perforatus Pedis*, and are inſerted to the third Bone of every leſſer Toe.

PERFORATUS, is a Muſcle belonging to the Fingers; and ſo called, becauſe its Tendons are Perforated to admit thoſe of the Perforating Muſcles to paſs thro' them to their Inſertions: It is alſo called *Sublimis*, from its Situation, being above the Perforating Muſcles; and *Flexor ſecundi Internodii Digitorum*, from its Uſe: It riſeth Tendinous from the Internal Extuberance of the *Os Humeri*, between the *Flexores Carpi*: It alſo has a diſgregated Fleſhy Origination from the Forepart of the *Radius*, between the *Pronator Radii Teres* and *Flexor Follicis Magnus*, compoſing a Fleſhy Belly, leſſens it ſelf in leſs than half its Progreſs, where it's divided into four Fleſhy Portions, each of which ſoon becomes ſo many roundiſh Tendons, which are included in their proper Mucilaginous Membrane as they paſs under the *Ligamentum*

tum *Tranſverſale Carpi* thro' the Palm; near the firſt Internode of the Fingers each Tendon is divided to admit thoſe of the Perforated Muſcle thro' them; then joining and ſubdividing again immediately before they are inſerted to the Superior Part of the ſecond Bone of each Finger.

PERFORATUS *Pedis*, is a Muſcle of the leſſer Toes; ſo called, becauſe its Tendons are Perforated like thoſe of the Fingers. It is alſo called, *Flexor ſecundi Internodii Digitorum Pedis*, from its Uſe; and *Sublimis* from its Situation. It ſpringeth from the Inferior and Internal Part of the *Os Calcis*, between the *Muſculi Abductores* of the greater and leſſer Toes, dilating it ſelf to a Fleſhy Belly: After it hath paſſed the Middle of the *Planta Pedis*, it is divided into four Fleſhy Portions, which becoming ſo many Tendons, are divided near their Terminations, to admit the Tendons of the *Perforans* to paſs thro' them to their Inſertions: Theſe being united again, paſs underneath them to their Implantations at the upper Part of the ſecond Bone of each leſſer Toe.

PERFORATED, *i. e.* bored thro'. The Armoriſts uſe it to expreſs the paſſing or penetrating of one Ordinary (in part) thro' another; as thus:

He beareth *Or, a bend Ermine Perforated thro' a Chevron Gules.* But when there is only a Hole made thro' the Ordinary, and nothing in it to fill it up, they call it *Piercing*.

PERIAMMA, called alſo *Periapta*, is a Medicine, which being tied about the Neck, is believed to expel Diſeaſes, eſpecially the Plague. See *Appenſa*.

PERIAPTUM. *Vid. Periamma.*

PERICARPIUM, is a Medicine applied to the Wriſts, to cure an Ague, *&c.*

PERICARDIUM, is a double Membrane which ſurrounds the whole Subſtance of the Heart, and contains a Liquor to Moiſten, Lubricate, and, as ſome ſay, to Refrigerate the Heart: It hath five Holes, according to the Number of Veſſels which go out of the Heart. It adheres to the *Mediaſtinum* at the Baſis, and at the *Mucro* to the Centre, or Nervous Part of the *Diaphragma*.

PERICRANIUM, is a Membrane which infolds the Skull, ſeated next to the *Perioſtium*, covering the whole Skull, except juſt where the Temporal Muſcles lie. It is of exquiſite Senſe; and cauſes into'erable Pain when the Temporal Muſcle is wounded.

PERIÆCI, are thoſe Inhabitants of the Earth who live under the ſame Parallels, but under oppoſite Semi-circles of the Meridian, whence they have the ſame Seaſons of the Year, *viz. Spring, Summer, Autumn*, and *Winter*, at the very ſame Time, as alſo the ſame Length of Days and Nights; for 'tis in the ſame Climate, and at an equal Diſtance from the Equator: But the Changes of Noon and Midnight, are alternate one to the other.

PERIGÆON, or *Perigæum*, is a Point in the Heavens, wherein a Planet is ſaid to be in its neareſt Diſtance poſſibly from the Earth.

PERIHELION, is that Point of a Planet's Orbit, wherein it is neareſt to the Sun.

PERIMETER, is the Compaſs or Sum of all the Sides which bound any Figure, whether *Rectilineal* or *Mix'd*.

PERINDE *Valere*, a Term belonging to the *Eccleſiaſtical Law*, ſignifying a Diſpenſation granted to a Clerk, that being defective in his Capacity to a Benefice, or other Eccleſiaſtical Function, is *de Facto* admitted to it: And it hath the Appellation from the Words, which make the Faculty as effectual to the Party diſpenſed with, as if he had been actually capable of the Thing for which he is diſpenſed with at the Time of his Admiſſion. It is called a *Writ*.

PERINÆUM, is the Ligamentous Seam betwixt the *Scrotum* and the Fundament.

PERIOD, is a Full-ſtop at the End of any Sentence. A *Period* in Numbers, is a Diſtinction made by a Point or Comma after every ſixth Place or Figure; and is uſed in *Numeration* for the readier diſtinguſhing and naming the ſeveral Figures or Places: Which how to do, ſee under *Numeration*.

PERIOD, in Chronology, ſignifies a Revolution of a certain Number of Years; as the *Metonick Period*, the *Julian Period*, and the *Calippick Period*: Which ſee in their proper Places.

PERIODICAL, is the Term for whatever performs its Motion, Courſe, or Revolution, regularly, ſo as to return again, and to diſpatch it always in the ſame Period or Space of Time. Thus the *Periodical Motion* of the Moon, is that whereby ſhe finiſhes her Courſe round about the Earth in a Month; and this is in 27 Days, 7 Hours, 45 Minutes; and is called, The Moon's

PERIODICAL *Month*; which is the Space of Time that the Moon finiſhes her Revolution in.

PERIODUS *Sanguinis*, is a continued Circulation of the Blood thro' the Body; which is thus made: The Blood is carried out of the Arteries by Fibres, either of the Fleſh or of the Entrails, or the Membranous Parts, ſaith *Blanchard*; but 'tis certain it is by Capillary Arteries continued with the like ſmall Veins into the Mouth of the greater Veins, and implanted in them, as we ſee, many other little Channels in the Veins; ſo the Blood, paſſing thro' theſe out of the Arteries, is preſently ſent to the Veins, that it may be carried back again to the right Ventrincle of the Heart; and thence by the Arterious Vein to the Lungs; in which after the Blood has been accended by ſome Nitrous Particles, breathed in thither by the Air, it goes into the Venous Artery, thence into the left Ventricle of the Heart; which again empties it ſelf into the *Aorta*, or Great Artery; ſo that the Body may be nouriſhed and enlivened, it goes into every Part of it. This is *Blanchard*'s Account of the Matter. See more in the Word *Circulation of the Blood*.

PERIOSTIUM, is a Thin Membrane that incloſes immediately almoſt all the Bones in the Body, except the Teeth, Bones of the Ear, *&c.* It hath a moſt exquiſite Senſe, and probably is an *Expanſion* of the Nervous and Tendinous Fibres of the Muſcles. Its Uſe is to cover the Bones, and to ſuſtain the Veſſels which enter into them to nouriſh them. Dr. *Havers* in his Excellent Book, called, *Oſteologia Nova*, ſaith, That this Membrane conſiſts of two Sorts of Fibres, of which thoſe that lie next the Bone, are derived from the *Dura Mater*, and the others from the Tendons of the Muſcles.

PERIPATETICK *Philoſophy*, is named from thoſe, who from their Action of Walking while they *Studied* or *Taught* were called,

PERI-

PERIPATETICKS. The Chief of these was *Aristotle*; then his Successors; among whom you may reckon *Theophrastus*, *Cratippus*, *Boethius*, and all his very numerous Interpreters. But about 460 Years ago, there arose a new Set of Famous *Aristotelians*, which were called also *Peripateticks*; from them came the three chief Sects of the *Peripatetick Philosophy*. The *Thomists* from *Thomas Aquinas*, who flourished *A. D.* 1224. The *Scotists* from *Johannes Dun Scotus*, *A. D.* 1308. And the *Nominalists* from *Ocham*, who was born about *A. D.* 1310. And now a days by the *Peripatetick Philosophy*, we understand that which was founded on the Principles of *Aristotle* and his Commentators and Followers; and which therefore is as frequently called, *The Aristotelian Philosophy*.

PERIPHERY, in Geometry, is the Circumference of a Circle, or of any other *Regular Curvilineal Figure*.

PERIPHRASIS, is a Circumlocution used to avoid certain Words, whose Idea's are unpleasing; and to prevent the speaking of something that would produce ill Effects.

PERIPEUMONIA, is an Inflammation of the Lungs and Breast, accompanied with a sharp Fever, hard Breathing, a Cough, and an heavy Pain. *Blanchard*.

PERITERE, in Architecture, is a Place encompassed round with Columns, and with a kind of Wings about it; here the Pillars stand without, whereas in the *Peristyle* they stand within.

PERISCII, are the Inhabitants of the two *Frozen Zones*, or those that live within the Compass of the *Arctick* and *Antarctick* Circles; for as the Sun never goes down to them after he is once up, but always round about, so do their Shadows. Whence the Name.

PERISSOLOGY, is a Discourse fill'd up with unnecessary and superfluous Words.

PERISTALTICK *Motion*, is a *Vermicular* or *Wormlike* Motion of the Intestines, whereby the Excrements are voided. Also the Motions of the Vessels, whereby Humours, as Water, Chyle, the Blood, *&c.* ascend and descend, is sometimes so called.

PERISTIPHALINUS, *internus & externus*, are Muscles of the *Uvula*, the one pulling it forwards, and the other backwards.

PERISTYLE, in Architecture, is a Place or Building encompass'd with Pillars, standing round about within the Court: But this Word *Peristyle* is sometimes taken for a Row or Rank of Columns, as well without as within any Edifice; as in Cloysters and Galleries: Sometimes this was called *Antiprostyle*.

PERITONÆUM, is a Membrane (of an Oval Figure) which clothes the whole *Abdomen* on the Inside, and its Entrails on the Outside: It consists of two Tunicks, and adheres above to the *Diaphragma*, below to the *Os Ilium*; before to the Transverse Muscles, but chiefly to their Tendons about the *Linea Alba*; behind, it grows to the Fleshy Heads of these Muscles.

PERITROCHIUM, in Mechanicks is a kind of Wheel, or Circular Frame of Wood, placed somewhere upon an Axis, or Cylinder, round which a Rope is wound, in order to raise a Weight; and the Use of this *Peritrochium*, is to make the Cylinder or Axis be turned the more easily by the Means of Staves or Levers, which are fix'd in its Circumference. See *Axis* in *Peritrochio*.

PERJURY, is a Crime committed, when a lawful Oath is ministred by any that hath Authority, to any Persons in any Judicial Proceedings; who swear absolutely and falsly in a Matter material to the Issue or Cause in Question, either of their own Accord, or by the Subordination of others. *Note*, If a Man call me *Perjured Man*, I may have my Action upon the Case; but for calling me a *Forsworn Man*, no Action lies. And *Pejury* is excepted out of the Act of *General Pardon*.

PERMEATING, is penetrating into, and passing thro' the Pores of any Body. Mr. *Boyle* had a *Smoaking Liquor*, which he called, *The Peremeating Menstruum*, and its Operations, *The Penetrant*, or *Permeating Fumes*. It was made of equal Parts of *Flos Sulphuris*, *Sal Armoniack*, and good Quick Lime, all powdered, and well mingled together, and then distilled by Degrees of Fire in a Retort, till the Sand which contains the Retort, become almost red-hot; for then will come over a Liquor which will be continually smoaking, and consequently must be kept well stop'd. With this Fuming Liquor he made several Experiments to evince the Porosity of Bodies; by discovering, that tho' Coins, *&c.* were wrap'd up close in Leather, *&c.* yet the Fumes of this *Permeating Menstruum* would get thro' them, and discolour the Metal. *Vid. Essay of Porosity of Body*, p. 36, 37.

PERMUTATIONE *Archdiaconatus & Ecclesiæ eidem annexæ cum Ecclesia & præbenda*, is a Writ to an Ordinary, commanding him to admit a Clerk to a Benefice, upon Exchange made with another.

PER *my & per toute*, in Law, a Joint-Tenant is said to be seised of the Lands that he holds jointly *Per my & per tout*; that is, he is seised by every Parcel, and by the whole.

PERNIO, is a preternatural Swelling, caused by the Winter Cold, especially in the Hands and Feet, which at last breaks out.

PERONA, is also called *Fibula*, because it joins the Muscles of the Leg; whence the first and second Muscle in the Leg is called *Peronæus*. It is the less and slender Bone, which is fastened outwardly to the greater Bone of the Leg, called *Tibia*.

PERPENDICULUM *Chronometrum*, the same with the *Pendulum*.

PER *quæ Servitia*, is a Writ Judicial, issuing from the Note of a Fine, and lieth for Cognisee of a Mannor, Seigniory, chief Rent, or other Services, to compel him that is Tenant of the Land at the Time of the Note of the Fine levied, to Attorn unto him.

PERQUISITE, is any Thing gotten by a Man's own Industry, or purchased with his own Money, different from that which descends to him from his Father or Ancestors.

PERQUISITES *of Court*, in Law, signifies those Profits that grow to a Lord of a Mannor, by vertue of his *Court Baron*, over and above the certain yearly Profits of his Land, as Fines of Copyholds, Hariots, Amerciaments, Waifes, Strays, *&c.*

PERSICK *Order of Architecture*, is where the Bodies of Men serve instead of Columns to support the *Entablature*, or rather the Columns are in that Form.

The

The Riſe of it was this; *Pauſanias* having defeated the *Perſians*, the *Lacedæmonians*, as a Mark of their Victory, erected Trophies of the Arms of their Enemies, and then repreſented the *Perſians* under the Figures of Slaves ſupporting their *Porches*, *Arches*, or *Houſes*.

PER MINIMA, a Term uſed in Chymiſtry and Phyſick, expreſſing the perfect Mixture of any two or more Bodies: *v. gr.* If Silver and Lead be melted together, they will mingle and be united with one another *per minima*: That is, all the ſmalleſt Particles of one Metal will be mingled and united with thoſe of the other.

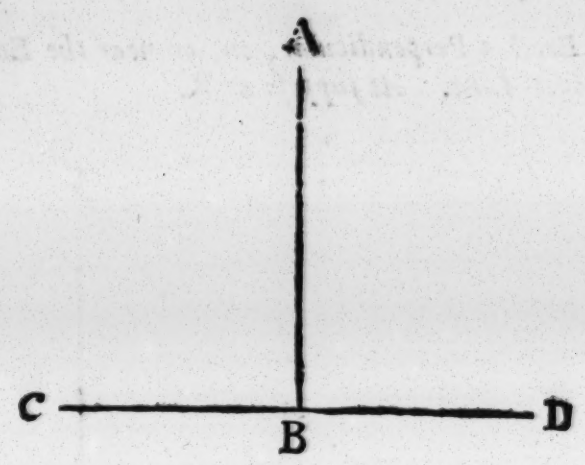
PERNICITY, a Word uſed by ſome Philoſophick Writers of *Celerity*, or extraordinary ſwiftneſs of Motion.

PERONÆUS *primus*, a Muſcle of the *Tarſus*, by ſome it is called *Longus*, it being the firſt that offers it ſelf to view, and the longeſt Muſcle ſeated on the *Fibula* or *Os Peronæ*.

It ariſes Externally Tendinous, and Fleſhy Internally from above half the Superior part of the ſaid Bone, and marching ſomewhat backwards, becomes a ſtrong, flat Tendon, four Fingers breadth in length above the Inferior Appendage of the ſaid *Fibula*, called *Malleolus Externus*; paſſing behind which in a Channel, like a Rope in a Pulley; and from thence being inflected forwards, together with the Tendon of the following Muſcle, they paſs under an imbanding Ligament as they run over the *Os Calcis*, but this Tendon declining from its Companion, marches over the *Os Cuboides*, under the *Muſculus Abductor Minimi Digiti*, and over the *Oſſa Cuneiformia*, in the Bottom of the Foot, and under the Tendons and Muſcles bending the Toes, and is Inſerted to the Superior and Hindmoſt part of the *Os Metatarſi* of the Great Toe. The Tendon of this Muſcle being conveyed over the Hindmoſt part of the *Malleolus Externus*, as on a Pulley, is an Elegant Contrivance in Nature, whereby the Ball of the Great Toe (as that part is commonly called to which it is Inſerted) is directed towards a Perpendicular bearing of the Weight of the Body on the Leg, in ſtanding on Tip-toe, by pulling the Foot and Toes ſomewhat outwards.

PERONÆUS *ſecundus*, a Muſcle of the *Tarſus*, by ſome called *Semi-fibulans*: It has an Acute Fleſhy beginning above the middle of the External part of the *Fibula*, under the Fleſhy Belly of the *Peronæus primus*; it alſo continues its Fleſhy beginning from the Poſterior ſharp edge of the ſaid *Fibula*, and becoming a Fleſhy Belly, grows Tendinous as it runs under the *Malleolus Externus*, together with the Tendon of the *Peronæus primus*, and is Inſerted to the Superior and External part of the *Os Metatarſi* of the Little Toe. The proper Action of this Muſcle, is to pull the Foot and Toes outwards.

PERPENDICULAR, in Geometry; when a Right Line ſtandeth ſo upon another, that the Angles on either ſide are equal; then this Right Line which ſo ſtandeth erected, is *Perpendicular* to that upon which it ſtandeth.



Thus: The Line A B, is *Perpendicular* to the Line C D, when the Angles on either ſide are equal: That is, If the Angle A B C = to the Angle A B D, and either of theſe Angles is equal to a Right one.

A Right Line is ſaid to be

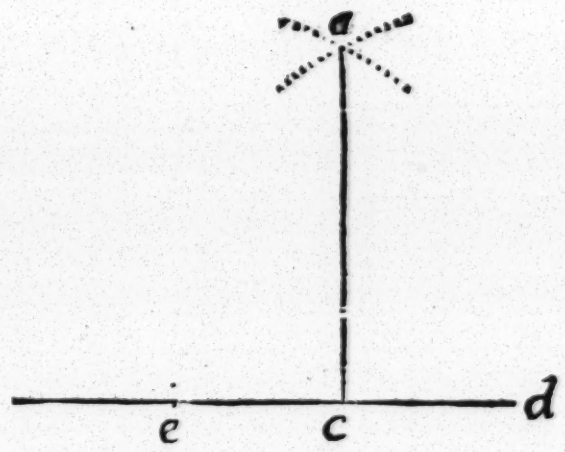
PERPENDICULAR *to a Plane*, when 'tis Perpendicular to all the Lines it meeteth with in that Plane.

One Plane is

PERPENDICULAR to another, when a Line in one Plane is Perpendicular to the other Plane.

PROBLEM I.

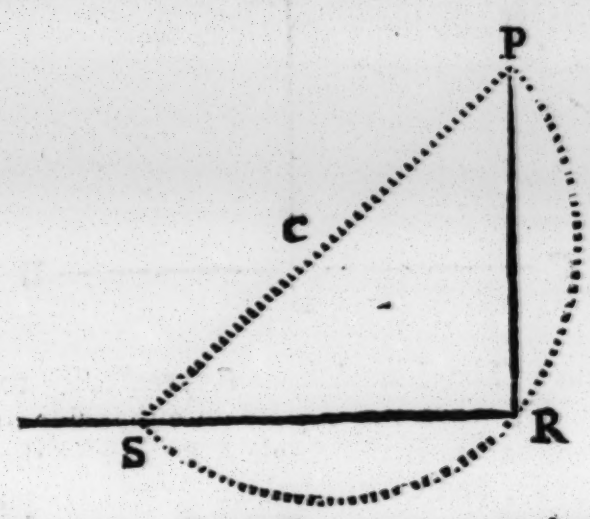
To Erect a Perpendicular on any aſſigned Point of a given Right Line. As ſuppoſe on the Point c.



On each ſide of the given Point *c*, cut off *c e* = *c d*; and with the Diſtance *d e*, (or any other greater than *d c*) deſcribe two Arches from *d* and *e*, interſecting each other in *a*, join *a c*; which ſhall be the *Perpendicular* required. 11 *Euclid.*

PROBLEM II.

To Erect a Perpendicular, on, or near the End of a given Line. As ſuppoſe at R.

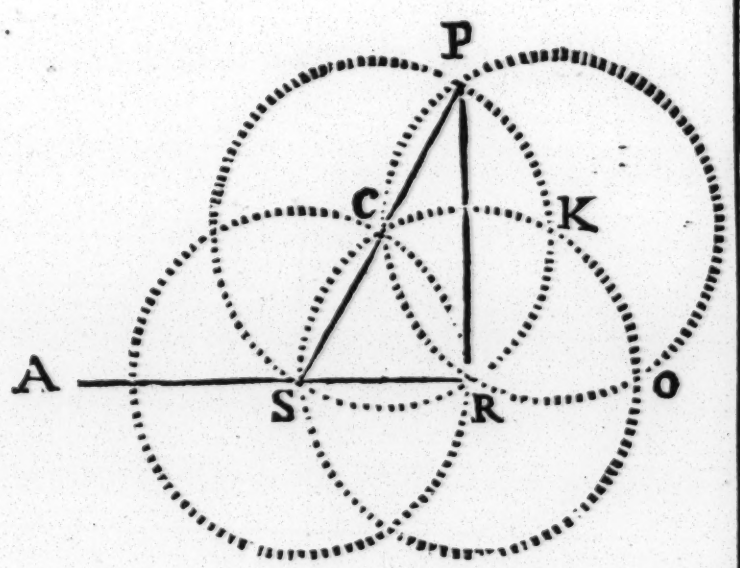


Open your Compaſſes to any convenient diſtance, and ſetting one Foot in C, draw the Circle P R S. Lay a Ruler from S, thro' C, it will find the Point P in the Circumference; from whence draw P R, and 'tis done.

For the Angle P R S, being in a Semi-circle, muſt be a Right one; (by 31 *è* 3 *Eucl.*) and conſequently P R muſt be *Perpendicular* to S R.

The ſame may be otherwiſe performed thus:

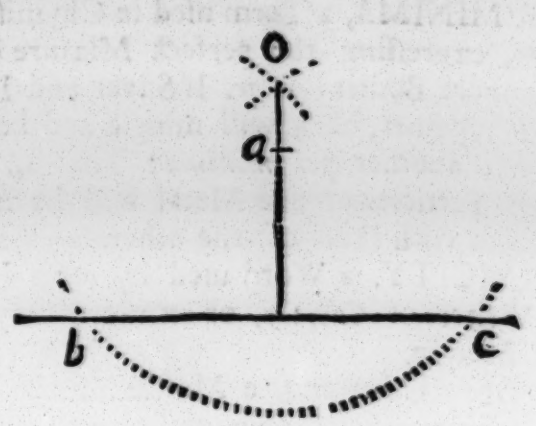
Suppoſe on A R, *the Perpendicular* P R *were to be Erected at the End* R.



With any convenient opening of your Compaſſes, one Foot being placed in R, draw the Circle O C S; then with the ſame Diſtance, ſet one Foot in S, and croſs the Circle in C, as alſo in K; then on the Centres C and K, draw (with the ſame Diſtance) two more Circles cutting each other in P; I ſay P R, will be Perpendicular to A R. For the Angle P R S, is a Right one, being in the Semi-circle P K R S.

PROBLEM III.

To let fall a Perpendicular on a given Line, from a given Point. As a



Set one Foot of the Compaſſes in *a* the Point given, and with the other croſs the given Line in the Points *b* and *c*: Then ſetting the Compaſſes in *b* and *c*, draw two Arks, croſſing each other below in *o*: Then lay a Ruler from *a* to *o*, and 'tis done.

The Demonſtration depends on the 9th *è* 1 *Euclid.*

PERPENDICULAR, or *Right Plane*, is where a *Plane*, (like a well made Wall) inclines and leans on one ſide, no more than it doth on the other.

PERPENDICULAR, to a Parabola, is a Right Line cutting the Parabola in the Point in which any other Right Line touches it, and which is alſo its ſelf Perpendicular to that Tangent.

PERPETUAL *Cauſtick*. See *Infernal Stone*.

PERPETUITY, a Term uſed in Law, where an Eſtate is ſo deſigned to be ſettled in Tail, *&c.* that it cannot be undone or made void.

PER SE, a Term of Art often uſed; as in Logick, we ſay a Thing is conſidered *Per ſe*, when 'tis taken in the Abſtract, and without Connexion with other things, which would confound the Notion, and hinder its being clear.

In Chymiſtry a Thing is ſaid to be Diſtilled *Per ſe*, when 'tis without the uſual Additaments of other things with it.

We ſay alſo a Man performs any Action, or Executes any Office *per ſe*, when he doth it *himſelf in Perſon*, and not by a *Deputy* or *Subſtitute*.

PERSEUS, a Conſtellation in the Northern Hemiſphere, conſiſting of 38 Stars.

PERSONAL *Verb*, in *Grammar*, is one that is Declined or Conjugated with all the Three Perſons, and in both Numbers; whereas an *Impersonal Verb* is only uſed in the Third Perſon Singular.

PERSONABLE, in Law, ſignifies as much as enabled to maintain Plea in a Court, thus: The Defendant was adjudged Perſonably to maintain his Action. Alſo the Tenant pleaded, that the Wife was an Alien Born in *Portugal*, without the Allegiance of the King; and Judgment was demanded, Whether he ſhould be anſwered: The Plaintiff ſaith, She was made *Perſonable* by Parliament;

liament; that is, as the *Civilians* would ſpeak it, *Habere perſonam ſtandi in judicio*. *Perſonable* is alſo as much as to be of Capacity to take any thing granted or given.

PERSONAL, in Law, when 'tis join'd with the Subſtances, Things, Goods, or Chattels; as Things *Perſonal*, Goods *Perſonal*, Chattels *Perſonal*, ſignifies any moveable Thing belonging to a Man, be it quick or dead: Thus, they ſay, Theft is an unlawful Felonious Taking-away another Man's moveable *Perſonal* Goods.

PERSONAL *Tythes*, are *Tythes* paid of ſuch Profits as come by the Labour of a Man's Perſon, as by Buying and Selling, Gains of Merchandize and Handicrafts, *&c.* See *Tythes*.

PERSONALITY, is an Abſtract of *Perſonal*: the Action is in the *Perſonality*, *viz.* It is brought againſt the right Perſon, or the Perſon againſt whom in Law it lies.

PERSONS *ne Prebendaries ne ſeront chargeé as quinſim*, &c. is a Writ that lies for *Prebendaries*, or other Spiritual Perſons, being diſtrained by the Sheriff or Collectors of Fifteens, for the Fifteenths of their Goods, or to be contributary to Taxes.

PERSPECTIVE, is that Part of the Mathematicks which give Rules for the repreſenting of Objects on a plain Superficies, after the ſame Manner as they would appear to our Sight, if ſeen thro' that Plain, it being ſuppoſed as tranſparent as Glaſs.

Perſpective is either *Speculative* or *Practical*.

Speculative Perſpective, is the Knowledge of the Reaſons of the different Appearance of certain Objects, according to the ſeveral Poſitions of the Eye that beholds them.

Practical Perſpective, is the Method of Delineating that which is apparent to our Eyes, or that which our Underſtanding conceives in the Forms that we ſee Objects. See Vol. II.

PERSPECTIVE *Lineal*, is the Diminution of thoſe Lines in the Plan of a Picture, which are the Repreſentation of other Lines very remote.

PERSPECTIVE *Aereal*, is a proportional Diminution of the Teints and Colours of a Picture, when the Objects are ſuppoſed to be very remote.

PERSPECTIVE *Military*, is when the Eye is ſuppoſed to be infinitely remote from the Table or Plain.

PERSPICUOUS, is that which is clear and tranſparent, as that the Light may be ſeen freely thro' it. See *Diaphanous*.

PERSPIRATION, a breathing through, as Sweat through the Inviſible Pores of the Body.

PERTICA, a Sort of Comet, the ſame with *Veru*.

PESSARY, is an Oblong Medicine, which being made of the Length of the Middle-Finger, is thruſt up into the Neck of the Womb, and is good againſt ſeveral Diſeaſes incident to it.

PESSULUS, the ſame with *Peſſary*.

PESSUS, the ſame.

PESTILENTIAL *Fever*, is that which does not only afflict the Patient with a bare Diſtemper or Heat ariſing from Putrefaction, *&c.* but alſo with a Malignant and Venomous Quality. It differs from the Plague, as a Species or Sort from the Genus or Kind; becauſe a *Peſtilence* may ſometimes happen without a *Fever*. *Blanchard.*

PESTOLOIDES, is a Sort of Urine which ſeems to have little Leaves or Scales in it. *Blanchard.*

PETALA, is a Term in Botany, ſignifying thoſe fine coloured Leaves that compoſe the Flowers of all Plants. And from hence Plants are diſtinguiſhed into *Monopetalous*, whoſe Flower is all in one continued Leaf; and *Tripetalous*, and *Pentapetalous*, when the Flower conſiſts of three or five Leaves; and *Polypetalous* when of many, without determining the Number.

PETARD, in Fortification, is an Engine of Metal in the Form of an High-crown'd Hat, with narrow Brims, which being filled with very fine Powder, well primed, and then fix'd with a *Madrier* or Plank, bound faſt down, with Ropes running through Handles, which are round the Rim of the Mouth of it, to break down Gates, Port-cullices, Draw-bridges, Barriers, *&c.* This Engine is from 7 to 8 Inches deep, and 5 broad at the Mouth; the Diameter at the Bottom or Breech is an Inch and a half, and the Weight of the whole Maſs of Metal is from 55 to 60 Pounds, generally requiring about 5 Pounds of Powder for the Charge. They are alſo uſed in Countermines to break through into the Enemies Galleries, and to diſappoint their Mines.

PETECHIALIS, is a Malignant Fever, called alſo *Pulicaris*, becauſe it makes the Skin look as tho' it were Flea-bitten.

PETIGO. See *Lichen*.

PETIT *Cape*. See *Cape*.

PETIT *Larceny*. See *Larceny*.

PETIT *Treaſon*, in Common Law, is when a Servant kills his Maſter, a Wife her Husband, a Secular or Religious Man his Prelate or Superior, to whom he owes Faith and Obedience: In how many other Caſes it may be committed, ſee *Cromp. Juſtice of Peace*.

PETITIO *Principii*, *Begging of Principles*, is a precarious ſuppoſing a Thing to be true, or taking it for granted, when it really remains either dubious, or elſe is expreſly denied. This frequently is called *Begging the Queſtion*, when a Man ſuppoſes what he ſhould *prove*.

PETREFACTION, is properly the changing of a mix'd Body into a Stoney Subſtance, when it had no ſuch Nature before; and the Action by which this is performed, is called,

PETREFICATION, and the Thing ſo chang'd is ſaid to be *Petrefied*. 'Tis juſtly queſtionable, Whether there be any ſuch Thing as *this* in Nature, or not? *Petrefaction* indeed now-a-days is a mighty modiſh Word, for every Thing almoſt that is found upon the Surface, or dug out of the Earth, paſſes with ſome Perſons by this Name. But what is there that really and truly deſerves the Name of *Petrefaction*? When the *Petrefying* Waters, as they are called, (which are nothing but Waters impregnated with a great deal of Stoney Matter, which in their Paſſage through the Earth became diſſolved in them:) When theſe, I ſay, incruſtate Ruſhes, Graſs, or Sticks, all over with a Stoney Coat, by letting the Stoney Particles diſſolved in them by little and little fall down upon and adhere to them; or, it may be, inſinuate into their Pores, and depoſite themſelves there. And when after this the Vegetable Part incloſed rots and mou'ders away, and the Stoney Coat or Subſtance daily increaſes; this is not the Tranſmutation of a Vegetable Subſtance into a Stoney

or Mineral one; and therefore the new Body thus formed, is not properly a *Petrefaction* in the true Senſe of the Word.

And when many Bodies are found in the Earth, which by all poſſible ways of judging and diſtinguiſhing, approve themſelves to be Animal or Vegetable Bodies, ſuch as the Shells, Teeth, Bones, of Animals, the Foſſil-Trees, Pine-Cones, Hazel-Nuts, *&c.* which are every where found deep in the Earth. It appears odd to call theſe *Petrefactions*, and more odd to ſuppoſe them nothing but the *Sportings of Nature*; and to affirm all theſe Things to be nothing but meer *Formed Stones*, only becauſe we cannot account preſently how they came thus into the Earth, or ſolve all the Objections or Difficulties about them. But every one will have his own way of Expreſſion.

PETROSUM *Os*, is the Internal Proceſs of the Bones of the Temples, ſo called from its Hardneſs and Craggineſs: 'Tis pretty long, jetting out to the Inner Baſis of the Skull, within which it hath two Holes, and thro' one of them an Artery, and thro' the other the Auditory Nerve paſſes to the Inner Cavities of the Ear, that are excavated in this Proceſs, *viz.* the *Tympanum*, *Labyrinthus*, and *Cochlea*; and without the Skull it hath three Holes: The firſt of which is the *Meatus Auditorius*: The ſecond is narrow, ſhort, and oblique, near to the firſt, and thro' it the Jugular Vein enters the Inner Cavities: The third is ſeated betwixt the *Proceſſus Mammillaris*, and the *Styloides Appendix*, and ends in the Paſſage which goes from the Ear to the Mouth.

PETTERERO. See *Pedrero*.

PEVETTS, are the Ends of the Spindle of any Wheel in a Watch; and the Holes into which they run, are called *Pevett-Holes*.

PEYNT *fort & dure*. See *Payne fort & dure*.

PHACIA. *Vid. Lenticula*.

PHACOS, is a Spot in the Face like a Nit, whence it is called *Lenticula* and *Lentigo*.

PHAGADÆNA, is an exulcerate Cancer.

PHAGADENICK *Water*, is made by diſſolving a Dram of Sublimate Corroſive in a Pound of Lime-Water, on which it will immediately turn Yellow.

PHALACKOSIS, is the falling off the Hair.

PHALANGOSIS, is a Fault of the Eye-lids, when there are two Rows of Hair, or when the Hair grows inward and offends the Eyes.

PHALANX, according to ſome Writers, is the Order and Rank obſerved in the Finger-Bones.

PHANTASY is an Internal Senſe or Imagination, whereby any Corporeal Thing is repreſented to the Mind, or impreſſed on the Brain by its proper Image.

PHANTASTICAL *Colours*, are ſuch as are exhibited by the Rainbow, Triangular Glaſs Priſm, the Surface of very thin *Muſcovy* Glaſs, *&c.* They had this Name given 'em by the *Peripatetick Philoſophers*, who ſuppoſed them to be no real Colours. This *Kircher* well refutes in his *Mundus Subterraneus*, *Part* 2. *p.* 15, 16. and ſhews alſo the Cauſe of ſuch Colours.

PHARMACEUTIC, the ſame with *Pharmacum*.

PHARMACOPOEA, is the Doctrine or a Deſcription of Things Medicinal, in order to cure Diſeaſes.

PHARMACUM, is any Sort of Medicine againſt a Diſeaſe.

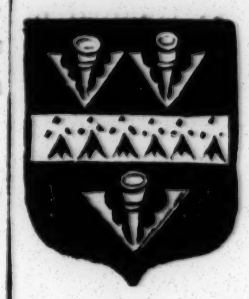
PHARMACY; is an Art of collecting, chuſing, and compounding Medicines, *viz.* the Apothecary's Art; to which may alſo be added the Chymical Analyſis of Bodies, in order to prepare good Medicines out of them.

PHARYNGETRUM is ſometimes uſed for the *Pharynx*, ſometimes for the Bone *Hyades*.

PHARYNX, is the upper Part of the Gullet, conſiſting of three Pair of Muſcles; to which ſome add another, making the Number ſeven: It is continued to the *Fauces*, (or indeed is the greateſt Part thereof,) reaching up behind to the *Uvula*, on the Sides to the *Tonſillæ*, and before to the *Epiglottis*: It is *Membranous*, but not entirely ſo, being in ſome Places Carnous and Thick. Three Pair of its Muſcles open it in the Action of ſwallowing; and the odd one is a *Sphincter* which ſerves to ſtraiten it.

PHÆNOMENON, in Natural Philoſophy, ſignifies any Appearance, Effect, or Operation of a Natural Body, which offers its ſelf to the Conſideration and Solution of an Enquirer into Nature.

PHASES, ſignifies the Appearance or the Manner of Things ſhewing themſelves, and therefore in Aſtronomy is uſed for the ſeveral Poſitions in which the Planets, (eſpecially the Moon) appear to our Sight; as obſcure, horned, half illuminated, or full of Light, which by the help of a *Teleſcope* may likewiſe be obſerved in *Venus* and *Mars*.



PHEONS, in Heraldry are the Barbed Heads of Darts or Arrows, and are uſually of this Figure.

Sable, a *Feſſe Ermine* between three *Phæons*, by the Name of *Egerton*.

PHILANTHROPY, is a generous Love for Mankind in general, or an Inclination to promote Publick Good.

PHILONIUM, is an Opiate Medicine; of which they reckon two Sorts, the *Philonium Romanum* and *Perſicum*.

PHILOSOPHICAL *Egg*, among the Chymiſts is a thin Glaſs Veſſel, or Bubble, of the Shape of an Egg, with a long Neck or Stem: 'Tis uſed in long Digeſtions.

PHILTRUM, is the Hollow Dividing the Upper Lip.

PHIMOSIS, is the ſame with *Paraphimoſis*; alſo the Inverſion of the Eye-lids through an Inflammation.

PHLEBORHAGIA, is the breaking of a Vein.

PHLEBOTOMY, opening of a Vein, or letting of Blood.

PHLEGM, or *Water*, the Fourth of the Five Chymical Principles. See *Water*.

The Inſipid Water that comes firſt in the Diſtillation of Acid Spirits, the Chymiſts call the *Phlegm*: And the more any ſuch Spirit is rectified, that is, diſtilled over again, to draw off ſtill more of this *Phlegm*, they ſay 'tis the better *dephlegmated*.

PHLEGM *of Vitriol*, is the Moiſture that is firſt drawn off when *Calcined Vitriol* is diſtilled, in order to get its Spirit and Oil, it comes off with a gentle Heat.

PHLEGMAGOGUES, are Medicines which purge or drain away that Humour which they call Phlegm.

PHLEGMON,

PHLEGMON. So the Surgeons call an hot Tumour, proceeding from an Over-affluxion of Blood to any Part.

PHLEGMONODES *Febris*, a Fever with an Inflammation of the Blood.

PHLOGOSIS, is a light Inflammation of the Eyes, with a ſmall Pain and Redneſs; which ſometimes turns into a true *Ophthalmy*, and is the Original thereof.

PHLYCTOENA, is a Pimple in the Skin, alſo a little Ulcer, like a Bubble or Bladder, in the Corneous Tunick of the Eye, and proceeding from a ſharp watry Humour. *Blanchard.*

PHONICKS, the ſame with *Acouſticks*; which ſee.

PHOSPHORUS, a Chymical Preparation, which being expoſed to the Light or Air, will ſhine in the Dark. Of this there are ſeveral Kinds whoſe Proceſs ſhall be briefly delivered.

To make the *Bolonian Phoſphorus*, ſee under the *Bolonian Stone.*

The moſt common Way (with us) is to make the *Phoſphorus* from Humane Urine. And the Hint came firſt by Chance thus:

One *Brand*, an Alchymiſt of *Hamburgh*, wiſely thinking to find the Philoſopher's Stone in Human Urine, work'd upon it in a Retort, and ſo forced over the *Phoſphorus* Matter; yet he would not communicate this Diſcovery to any one, and ſo the Secret died with him. After his Death, one *Kirkhelius*, a *Saxon* Chymiſt ſet himſelf to find it out, (having heard of ſuch a Thing,) and ſucceeded accordingly; and this Man ſhewed the Proceſs to ſeveral of his Friends.

The Honourable Mr. *Boyle* having (in part) had an Account of this *Phoſphorus*, from one *Daniel Kraff*, a *German*, about the Year 1680, publiſhed in *Engliſh* an Account of the Way of making this *Phoſphorus*, and ſeveral very Curious Experiments upon it, under the Title of *Noctiluca.* And ſince that, Mr. *Homberg* hath written largely about it, as you may ſee in the Memoirs (for the Months *March* and *April*) of the Royal Academy of Sciences at *Paris*, 1692.

The Way of Preparing it, is this:

Take a good large Quantity of the New-made Urine of Beer-drinkers, and evaporate it gently, to the Conſiſtence of Honey: Then put it in an Earthen Veſſel, cover, and place it in a Cellar for three or four Months, that it may throughly ferment and putrefie. Then mix a double Quantity of Sand, or Powder of Pots, with one part of this corrupted Urine, and put it into an Earthen Retort or Glaſs one Coated; and fitting it to a large long-neck'd Glaſs Receiver, in which was before put two or three Quarts of Water, diſtil it in a naked Fire, in a Reverberatory Furnace, gently at firſt, for about two Hours; afterwards augment the Fire gradually, 'till all the Volatil Salt and black Fœtid Oil be drawn off. Then raiſe the Fire to the higheſt Degree, and white Clouds will come into the Receiver, and fix it by little and little, on one Side of it, in the Form of a yellowiſh Skin, and another Part will precipitate to the Bottom in Powder. Keep the Fire thus violent for three Hours, 'till no more Fumes will come. Let all cool, and unlute the Veſſels; and throwing more Water into the Receiver, ſhake all well about to looſen what will ſtick to the Sides; and then pour it all into a large Glaſs Veſſel, where it will ſettle; the Volatile Salt will diſſolve in the Water, but the *Phoſphorus* and the Oil will ſink to the Bottom. Pour off the Water, and gathering the remaining Matter together, put it into a little Glaſs Veſſel, with a little freſh Water, and digeſt it in a Sand-heat, ſtirring the Matter about from Time to Time with a Wooden Spatula; the *Phoſphorus* by this Means will ſeparate from the Oil, and ſink to the Bottom. Pour away the Oil, and make the *Phoſphorus* up while hot, into little Sticks or Pieces, which muſt be kept in a Viol of Water cloſe ſtopt.

This is the *Solid Phoſphorus*, with which, if you write any Letters on Paper, or on a Wall, they will appear Luminous in the Dark, and continue ſo a good while. If you cut off a little Bit of it, and rub it ſtrongly along a Piece of Paper with a Knife, it will actually enkindle the Paper.

The *Liquid Phoſphorus* is made by digeſting in Horſe-dung a little Bit, or ſome Scrapings, of the Solid, for two Days, in Oil or Eſſence of Cloves, Oil of Turpentine, *&c.* For after it is diſſolved in the Oil, it will impregnate it ſo, that as ſoon as ever you open the Bottle, the Matter will appear all in a Flame.

If you put a little of the *Solid Phoſphorus* into a Viol, with a little Oil of Vitriol, that is very ſtrong and well dephlegmated, and then add to it about half as much common Water as there was Oil of Vitriol, the Mixture will grow very hot, and ſmoak; and if you carry the Viol into the Dark, you will ſee the *Phoſphorus* enkindled, and ſparkle in many Places of the Viol, like Meteors, or little Falling ſtars: And if a ſmall Quantity of Oil of Turpentine be added, it will produce an actual Flame.

Lemery mentions a New-invented *Phoſphorus* of Mr. *Homberg*'s being made of one Part of Salt Armoniack, and two of Quick-lime ſlack'd by the Air; which are fluxed together in a Crucible, into a kind of Gray Glaſs, which when it is ſtruck with a Hammer, appears preſently of a light Fire.

Phoſphorus Balduini, called the *Hermetick Phoſphorus*, is thus made:

Heat read-hot about two Pounds of Chalk, let it cool, and powder it. Then take a Pint of *Aqua-fortis*, and put into it a Spoonful of your powdered Chalk; a great Ebullition will ariſe: Repeat this 'till the throwing in of the Powder makes no Ebullition at all. After this, let the Liquor ſettle, and decant it into an Earthern Pan placed in Sand, and evaporate all the Liquor, ſo there will remain a kind of Salt at the Bottom. Put this Salt into a Coppel, or a ſtrong Earthen unglazed Pan; ſet it in a gentle Sand-heat, and the Matter will ſwell. Continue this gentle Fire 'till it be ſunk down a little towards the Bottom; then cover the Pan or Coppel with a Lid that hath two or three Holes in it, and encreaſe the Fire gradually, 'till it be ſtrong enough to melt the Matter; and when 'tis melted, a yellow Vapour will exhale through the Holes in the Cover. Then take the Veſſel preſently off the Fire, and putting on another Earthen Lid, which hath no Holes in it, ſet it by to cool. Round about the

ſides of the Pan you will find a Cruſt of yellow Matter; that is the *Phoſphorus*. It muſt be kept in a Box well ſtopp'd, in a dark place. When 'tis deſign'd to be render'd Luminous, you muſt expoſe it, like the *Bolonian Stone*, to the Light, for a ſmall Space; and then removed into the Dark, it will ſhine there. If it be left in the Dark, expoſed to the Air for about Fifteen Days, it will ſhine all that while; but after that go out, and never be Luminous more.

Mr. *Boyle*, in his *Aereal Noctiluca*, p. 102. deſcribes a *Phoſphorus Balduini* much like this; and in *Phil. Tranſ.* N° 199, there is of his a yet more accurate Proceſs for this Thing.

The Learned Dr. *Slare*, in *Phil. Tranſ.* N° 150, makes an Ingenious Compariſon between *Lightning*, and the Flaſhes which in warm Weather he had often obſerved (by Night) to ariſe from ſome Pieces of the *Solid Phoſphorus*, kept in long Glaſs Bottles of Water about ¾ filled.

PHRENES. See *Diaphragma*.

PHRENESIS, the ſame with *Phrenitis*.

PHRENETICK *Nerves*, are thoſe which are called alſo *Stomachick*, and ſpring from Dr. *Willis*'s Eighth Pair, or from the common reckoned Six Pair: Thoſe deſcend between the Membranes of the *Mediaſtinum*, and ſend forth Branches into them.

PHRENICK *Veſſels*, are the Veins and Arteries that run through the *Diaphragm*, *Mediaſtinum*, and *Pericardium*.

PHRENITIS, or *Phrenzy*, is a Dotage with a continued Fever, often accompanied with Madneſs and Anger; proceeding from too much Heat in the Animal Spirits, not from the Inflammation of the Brain, as the Ancients thought. *Willis* thus defines it, namely, an Inflammation of the whole Senſitive Soul and Animal Spirits.

PHRICODES, is a dreadful Fever, in which Men are apt to fancy terrible Things.

PHROCYON, a Fix'd Star of the Second Magnitude, in the Conſtellation *Canis minor*, whoſe Longitude is 111 Degrees 23 Minutes, Latitude 15 Degrees 57 Minutes.

PHTHARTICUM, is a Corrupting Medicine.

PHTHIRIASIS, is the Louſy Diſeaſe; alſo a Scaly Scab on the Eye-brows. *Blanchard.*

PHTHISIS, is a Conſumption of the whole Body, riſing from an Ulcer in the Lungs, accompanied with a ſlow continued Fever, ill ſcented Breath, and a Cough. *Blanchard.*

PHTHOE, the ſame with *Phthiſis*.

PHYGETHLON, is a Swelling proceeding from an Inflammation of the Glandules, wherein Nature expels ſomething; as in the Plague, about the Groins. *Blanchard.*

PHILOSOPHERS *Tree*. See *Diana's-Tree*.

PHYMA, is a Swelling: There are five Sorts, *Verrucæ*, *Calli*, *Vari*, *Furunculi*, and *Hydroa*, or *Deſudationes*; of which, ſee under thoſe Words. Others reckon it a Tumour in the Glandules only, which quickly ſeparates. *Blanchard.*

PHYSEMA, an Inflammation in any part of the Body, as a Tympany. *Blanchard.*

PHYSICKS, or Natural Philoſophy, is the Speculative Knowledge of all Natural Bodies, (and Mr. *Lock* thinks, That God, Angels, Spirits, &c. which uſually are accounted as the Subject of *Metaphyſicks*, ſhould come into this Science,) and of their proper Natures, Conſtitutions, Powers, and Operations. See *Phyſiology*.

PHYSIOGNOMICKS, is a Term uſed by ſome Phyſicians and Naturaliſts for ſuch Signs as are taken from the Countenance of Perſons, to judge of their Diſpoſitions and Tempers.

PHYSIOLOGY, *Phyſicks*, or Natural Philoſophy, is the Science of Natural Bodies, and their various *Affections*, *Motions*, and *Operations*. This is either

General, which relates to the Properties and Affections of Matter or Body in general. Or,

Special and Particular, which conſiders Matter as formed or diſtinguiſhed into ſuch and ſuch Species, or determinate Combinations.

PHYSIOLOGY, is by ſome alſo accounted a Part of Phyſick, that teaches the Conſtitution of the Body ſo far as it is ſound, or in its Natural State; and endeavours to find Reaſons for its Functions and Operations, by the Help of Anatomy and Natural Philoſophy.

Mr. *Keil*, in his *Introductio ad Phyſicam*, reckons Four Claſſes or Sorts of Philoſophers which have treated of Phyſicks or Natural Philoſophy.

1. Thoſe who delivered the Properties of Natural Bodies under Geometrical and Numeral Symbols; as the *Pythagoreans* and *Platoniſts*.

2. The *Peripateticks*, who explained the Natures of Things by Matter, Form, and Privation; by Elementary and Occult Qualities; by Sympathies, Antipathies, Faculties, and Attractions, &c. And theſe did not ſo much endeavour to find out the true Reaſons and Cauſes of Things as to give them proper Names and Terms; ſo that their Phyſick is a kind of Metaphyſicks.

3. The *Experimental Philoſophers*, who by frequent and well-made Trials and Experiments, as by Chymiſtry, &c. ſought into the Natures and Cauſes of Things: And to theſe almoſt all our Diſcoveries and Improvements are due; and much more wou'd they have done, if they had not fallen into *Theories* and *Hypotheſes*, which they forced oftentimes their Experiments to maintain, whether they could or not.

4. The *Mechanical Philoſophers*, who explicate all the *Phænomena* of Nature by *Matter* and *Motion*, by the Texture of Bodies, and the Figure of their Parts; by *Effluvia*, and other ſubtile Particles, &c. And in ſhort, would account for all Effects and *Phænomena* by the known and eſtabliſhed Laws of *Motion* and *Mechanicks*: And theſe are, in Conjunction with the laſt named, *The Only True Philoſophers*.

PIA *Mater*. See *Mater tenuis*.

PICA. See *Citta*.

PICATIO. See *Dropaciſmus*.

PIEDOUCHE, in Architecture, is a little Square Baſe ſmoothed, and wrought with Mouldings, which ſerves to ſupport a *Buſt* or Statue drawn half way, or any ſmall Figure in Relief.

PICKET, in Fortification, is ſometimes uſed for a Stake, ſharp at one End, to mark out the Ground and Angles of a Fortification, when the Engineer is laying down the *Plan* of it; theſe are uſually pointed with Iron. There are alſo larger *Pickets*,

Pickets, which are drove into the Earth, to hold together *Faſcines* or Faggots, in any Work caſt up in haſte. And *Pickets* alſo are Stakes drove into the Ground by the Tents of the Horſe in a Camp, to tie their Horſes to. And *Pickets* are alſo drove into the Ground before the Tents of the Foot, where they reſt their Muskets or Pikes round about them in a Ring. When an Horſeman hath committed ſome conſiderable Offence, he is often ſentenced to *ſtand on the Picket*; which is, to have one Hand drawn up as high as it can be ſtretch'd, and then he is to ſtand on the Point of a *Picket* or Stake only with the Toe of his oppoſite Foot; ſo that he can neither ſtand or hang well, nor eaſe himſelf by changing Feet.

PICRA. See *Hiera picra*.

PIED-DROIT, in Architecture, is a Square Pillar, differing from a *Pillaſter* in this reſpect, that it hath no Baſe nor Capital: It is taken alſo for Part of the Jaumbs of a Door or Window.

PIE-*Powder-Court*, is a Court held in Fairs, to yield Juſtice to Buyers and Sellers, and for Redreſs of all Diſorders committed in them.

PIGMENTS, are ſuch prepared Materials as Painters, Dyers, *&c.* make uſe of, to impart to Bodies, or to imitate particular Colours. When Glaſs is ſtained or coloured, as in Painting on Glaſs, or for the Counterfeiting of Gems or Precious Stones, the *Pigment* is uſually of a Metaline or a Mineral Nature.

PILE, in Heraldry, ſignifies an *Ordinary*, conſiſting of a Two-fold Line, formed after the Manner of a Wedge; being probably ſomething like the Figure of the *Roman Pilum*, which was a tapering Dart, about five Foot long, and ſharpened at the Point with Steel. The *Pile* is born *invected*, *engrailed*, &c. like other *Ordinaries*, and iſſues indifferently from any Point of the Verge of the *Eſcocheon*.

He beareth a *Piles Gules*, by the Name of *Shandois*.

PILLAR, or *Column*, in Architecture, is one of the principal Things in which the Beauty and Proportion of a Fabrick doth conſiſt. A *Pillar* hath three Parts, the *Pedeſtal*, the *Shaft* or *Pillar* it ſelf, and the Ornaments: And each of theſe is again ſubdivided into three other Parts; the *Pedeſtal* hath its *Baſe*, *Dye*, and *Cornich*; the *Pillar* its *Baſe*, *Shaft*, and *Capital*; and the *Ornaments* have their *Architrave*, *Frieze*, and *Cornich*.

PILLASTERS, in Architecture, ſignify Square Pillars, that uſually ſtand behind Columns to bear up Arches: They have the very ſame Dimenſion, Chapiter, and Baſe, with the Columns, according to their ſeveral *Order*. When theſe *Pillaſters* do not ſtand alone by themſelves, they are uſually made to jet out of the Wall, a third part or a quarter of their Breadth, with reſpect to the Variety of different Works: So that ſome of them project out only a ſixth or an eighth part, and they are generally as broad at top as at bottom.

PILLOW, is that Piece of Timber in a Ship whereon the Boltſprit beareth or reſteth at its coming out of the Hull, aloft, cloſe by the Stem.

PINEALIS *Glandula*. See *Conarium*.

PINGUEDO, the ſame with *Adeps*, or the Fat of *Animals*. See *Adeps*.

PINION, in a Watch, is that leſſer Wheel which plays in the Teeth of another. Its Notches (which are commonly 4, 5, 6, 8, *&c.*) are called *Leaves*, and not *Teeth*, as in other Wheels.

PINION of *Report*, is that *Pinion* in a Watch, which is commonly fixed on the Arbor of the Great Wheel, and in old Watches uſed to have commonly but four Leaves: It driveth the *Dial Wheel*, and carrieth about the *Hand*.

The Quotient or Number of Turns to be laid upon the *Pinion of Report* is found by this Proportion: As the Beats in one Turn of the Great Wheel, to the Beats in an Hour: So are the Hours of the Face of the Clock, (*viz.* 12 or 24.) to the Quotient of the Hour-Wheel, or Dial-Wheel, divided by the *Pinion of Report*, *i. e.* the Number of Turns which the *Pinion of Report* hath in one Turn of the Dial-Wheel; that is, in Numbers.

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Or rather thus:

As the Hours of the Watch's going, are to the Numbers of the Turns of the Fuſy : : ſo are the Hours of the Face, to the Quotient of the *Pinion of Report*.

If the Hours be 12, then 16 : 12 : : 12 : 9.

But if 24, the Proportion is 16 : : 12 : 24 : 18.

N. B. This Rule may ſerve to lay the *Pinion of Report* on any other Wheel, thus:

As the Beats in one Turn of any Wheel to the Beats in an Hour : : ſo are the Hours of the Face, or Dial-Plate of the Watch, to the Quotient of the Dial-Wheel, divided by the *Pinion of Report* fixed on the Spindle of the aforeſaid Wheel.

PINNA *Auris*, is the upper and broader Part of the Ear called the Wing.

PINNATA *Folia*, in Botany are ſuch Leaves of Plants as are deeply jagged, cut, or indented in, and which have their Parts reſembling Feathers.

PIONEERS, are ſuch Kinds of Labourers as are taken up for uſe of an Army, to caſt up Trenches, and undermine Forts.

PIPE, in Law, is a Roll in the Exchequer, otherwiſe called the *Great-Roll*. See *Clerk of the Pipe*.

PITHIAS, or *Pithites*, with ſome Writers, is the Name of a Comet, or rather Meteor, of Form of a Tub: Of theſe there are divers Kinds, *viz.* ſome of an *Oval* Figure, others like a Tun or Barrel ſet Perpendicular, and ſome like one inclined, or cut ſhort off; others having a Hairy Train or Buſh, *&c.*

PINTLES in a Ship, are thoſe Hooks by which the Rudder hangs to the Stern-poſt.

PIN-*Wheel*. See *Striking-Wheel*.

PISCES, is the twelfth and laſt Sign of the *Zodiack*, being a Conſtellation conſiſting of 35 Stars.

PISCES

PISCES *Meridianus*, a Southern Conſtellation, containing 12 Stars.

PITUITA. *Vid. Phlegma.*

PITUITARIA *Glandula.* Vid. *Glandula Pituitaria.*

PITIROIDES, a Settling in the Urine like Bran. *Blanchard.*

PLACARD, is a Licenſe whereby a Man is permitted to ſhoot in a Gun, or uſe Unlawful Games.

PLACE, is that Part of Space which any Body takes up; and with relation to Space is either abſolute or relative. As Mr. *Lock* obſerves.

PLACE alſo is ſometimes taken for that Portion of Infinite Space, which is poſſeſſed by, and comprehended within the Material World, and which is thereby diſtinguiſhed from the reſt of the *Expanſion.*

PLACE is uſually diſtinguiſhed into *Internal Place*, which properly ſpeaking, is that Part of Space which any Body takes up or fills; and *External Place*, which according to *Ariſtotle*, is determined by the Surfaces or Confines of the Adjoining or Ambient Bodies: But it is better divided into *Abſolute*, which is the former *Internal Place*; and into *Relative Place*, which is the Apparent Secondary or Senſible Poſition of any Body, according to the Determination of our Senſes, with reſpect to other Contiguous or Adjoining Bodies.

PLACE *of Arms*, when taken in the general, is a ſtrong City which is pitch'd upon for the Magazine of an Army. But a

PLACE in Fortification uſually ſignifies the Body of a Fortreſs. And a

PLACE *of Arms in a Garriſon*, is a large open Spot of Ground in the Middle of the City, where the great Streets meet, or elſe between the Ramparts and the Houſes, for the Garriſon to rendezvous in, upon any ſudden Alarm, or other Occaſion. And the

PLACE *of Arms of a Trench, or of an Attack*, is a Poſt near it, ſhelter'd by a *Parapet* or *Epaulement*, for Horſe and Foot to be at their Arms, to make good the Trenches againſt the Sallies of the Enemy. Theſe Places of Arms are ſometimes covered by a *Rideau* or Riſing-ground, or elſe by a *Cavin* or Deep Valley, which ſaves the Trouble of fortifying them by Means of Parapets, Faſcines, Gabions, *&c.* They are always open in the Rear, for their better Communication with the Camp. When the Trench is carried on as far as to the *Glacis*, they make it very wide, that it may ſerve for a Place of Arms. Alſo the

PLACE *of Arms of a Camp*, is a ſpacious Piece of Ground at the Head of the Camp, to draw out the Amy in Order of Battle. But the

PLACE *of Arms* of a Troop of Horſe, or of a Company of Foot in the Camp, is that Spot of Ground on which the Troops or Company draws out.

PLACE *Geometrick*, is a certain Bound or Extent wherein any Point may ſerve for the Solution of a *Local* or *Indetermined Problem.* All the Points of a *Geometrick Place*, have the ſame Relation to the Points of the Right Line correſpondent thereunto.

PLACE *Plane*, is when the Point reſolving the Problem, is in the Periphery of a Circle: And then 'tis called, *Locus ad Circulum.* Thus, v. gr. *A Circle and any one of its Diameters being given, to find a Point without it, but on the ſame Plane with it; from whence a Right Line being drawn to one of the Ends of the Diameter, that Line ſhall be biſſected by the Circumference of the Circle.*

PLACE *ſimple*, or *Locus ad Lineum rectum*, as the Geometers call it, is when the Point that reſolves any Problem is in a Right Line. As, *To find the Centre of a Circle, whoſe Periphery ſhall paſs thro' the Ends of a Right Line given in Magnitude and Poſition:* For ſuch Centre will be in a Right Line. But a

PLACE *Solid*, is when the Point is in one of the *Conick Sections:* Thus, *To find the Centre of a Circle which ſhall touch both a Line given in Poſition, and alſo another Circle given in Poſition and Magnitude:* There muſt be a Point found in the Periphery of a *Parabola*, the *Focus* of which, is the Centre of the Circle given, when the given Line and Circle touch one another. Laſtly, a

PLACE *Surſolid*, is when the Point is in the Circumference of a Curve of an higher Gender than the *Conick Sections*; as having a Point and a Right Line given on a Plane, to find on that Plane another Point beyond that given Line; ſo that a Right Line drawn thro' thoſe 2 Points, ſhall have its Part comprehended between the ſecond Point and the given Line, alſo given it ſelf.

PLACE *of the Sun, Star, or Planet*, is the Sign of the Zodiack, and Degree of it, which the Planet is in; or it is that Degree of the Ecliptick reckoned from the Beginning of *Aries*, which the Planets or Stars Circle of Longitude cutteth; and therefore is often called, The *Longitude* of Sun, Planet, or Star:

And 'tis found by this Proportion:

As Sine of Sun's greateſt Declination is 23° 30'. — — — —	9.6006997
To Sine of this preſent Decl. 23° 15' —	9.5963154
So is Radius — — — — — —	10
To the Sine of his Longitude 81° 52'	9.9956157

Which if the Declination were North, will be in 20° 52' of *Gemini*; but if the Sun had South Declination, his Place would be in 20° 52' of *Capricorn.*

PLACENTA *Uterina*, called by ſome *Hepar Uterinum*, from its Colour, which is like that of the Liver, as it is alſo ſomething in Subſtance: But in comes nearer to that of the Spleen. It is ſoft, and hath innumerable Fibres, and ſmall Veſſels, and its Parenchyma is Glandulous almoſt every where. In Women it is Circular, but with ſome Inequality in its Circumference; in the Middle it is about two Fingers thick, but is thinner towards the Edges, and is about a Span, or a quarter of a Yard over, from one Side to the other, when the *Fœtus* is mature for the Birth: It is hollowed and ſmooth within, next the *Fœtus*, and grows every where firmly to the Chorion; but without, next the Womb, 'tis very unequal, having many Protuberances, by which it adheres to the Womb, tho' to what Part of it, is not agreed. When there is more than one *Fœtus*, 'tis ſometimes double, trebble, *&c.* and ſometimes but one with ſo many diſtinct Partitions in it. It grows

grows not from the Womb originally, but its Riſe is from the *Chorion*, which about the 9th Week, in Women, ſends forth a downy Subſtance, which ſoon grows into Knobs, turns reddiſh, and then adheres to the Womb conſpicuouſly, about the twelfth or thirteenth Week.

It hath Veſſels from a double Original, ſome from the Womb, and ſome from the *Chorion*, immediately and mediately from the *Fœtus*. From the Womb it receives Arteries, Veins, Nerves, and Lymphæducts; all which, tho' they be very large and conſpicuous in the Womb, and even in that Place where the *Placenta* joins to it, yet they are but very ſmall Capillaries in the *Placenta* it ſelf, and are diſperſed only thro' that Side of it which is next the Womb. The Veſſels that come from the *Chorion* are Arteries and Veins; and, as Dr. *Wharton* ſaith, Lymphæducts alſo. From the *Fœtus*, thro' the *Corion*, it receives the Umbilical Veſſels of the *Fœtus*: For the firſt Months of the Pregnancy it ſticks moſt firmly to the Womb; but as the *Fœtus* grows mature for the Birth, it looſens by Degrees, and at laſt, like ripe Fruit from the Tree, falls off from the Womb, and makes Part of the After-burden or Birth.

PLADAROSIS, are little ſoft Tumors which grow under the Eye-lids.

PLAIN *Chart*, is the Plat or Chart that Seamen ſail by, whoſe Degrees of Longitude and Latitude are made of the ſame Length.

PLAIN *Sailing*, is the Art of finding all the Varieties of the Ship's Motion on a Plain, where all the Meridians are made Parallel, and the Parallels at Right Angles with the Meridians, and the Degrees of each Parallel equal to thoſe of the Equinoctial; which, tho' notoriouſly falſe in it ſelf, ſuppoſing the Earth and Sea to be a Plain Flat, and each Parallel equal to the Equinoctial; yet by laying down Places accordingly, and breaking a long Voyage into many ſhort ones, a Voyage may pretty well be perform'd by it, near the ſame Meridian.

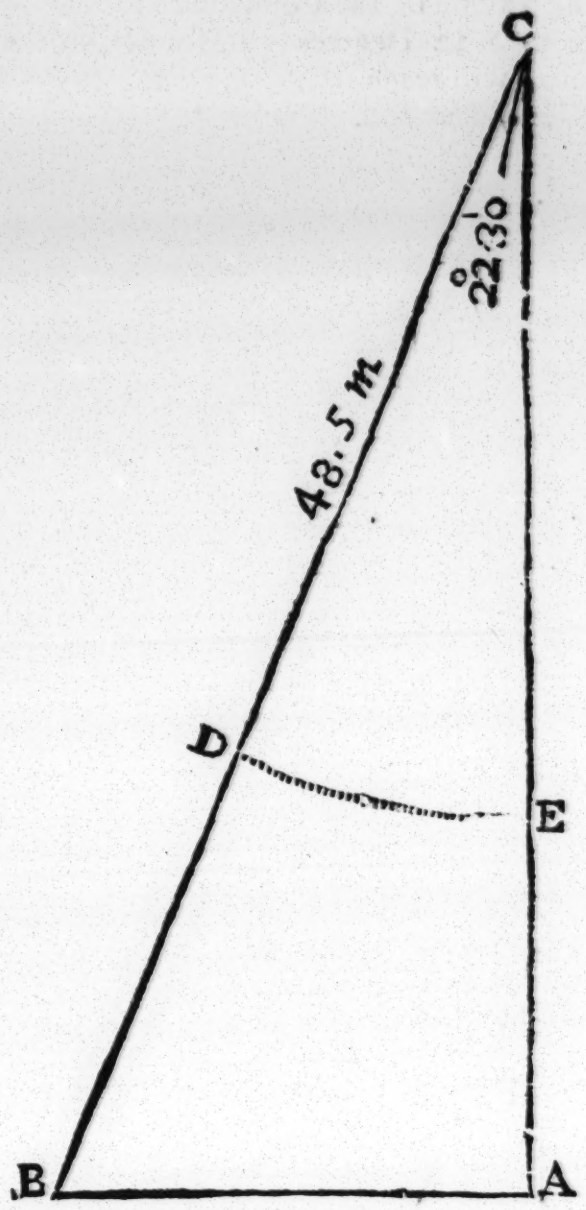
In *Plain Sailing* 'tis imagin'd, that by the *Rhumb-Line*, *Meridian*, and *Parallel of Latitude*, there always will be formed a Right-angled Triangle; and that ſo poſited, as that the Perpendicular may repreſent part of the Meridian or North and South Line, containing the *Difference of Latitude*: The Baſe of the Triangle repreſents the *Departure*; and the Hypothenuſe the *Diſtance ſailed*; the Angle at the Top is the *Courſe*, and the Angle at the Baſe the *Complement of the Courſe*: Any two of which, with the Right Angle being given, the Triangle may be protracted, and the other three Parts found: As in the following Examples.

CASE I.

The Courſe and Diſtance given, to find the Difference of Latitude, and Departure from the Meridian.

Admit a Ship from the Latitude 50° 10' North, ſails S. S. W. 48. 5 Miles: I require the Latitude ſhe is in, and her Departure or Separation.

Geometrically.



Draw A C the South and North Line, and with 60 Degrees from the *Line of Chords* from C, (becauſe the Ship ſails Southward) deſcribe D E, which make equal to 22 Degrees 30 Minutes the Courſe, and draw C B, which make alſo equal to 48.5 from any *Line of Equal Parts*: Then let fall from B, B A, perpendicular to the Meridian; ſo is the Triangle compleated, and the Lines C A, B A, may be meaſured from the ſame Scale.

By the Logarithms.

As the Radius — — — — —	10.00000
Is to the Diſtance run, B C 48.5 — —	1.68574
So is the Sine of the Courſe 22° 30 —	9.58283
To the Departure Weſting 18° 56 — —	1.26857

Then again:

As the Radius — — — — —	10.00000
Is to the Diſtance B C 48.5 Miles —	1.68574
So is Co-ſine of the Courſe S. 67° 30 —	9.96561
To the Difference of Latitude 44.8 —	1.65135

From the Departed Latitude	50° 10'	North.
Subſtract the Difference of Lat.	00 45	
Remainder is the preſent Latit.	49 25	

By Gunter's Scale.

The Extent of the Compaſſes from S. 90 Degrees, to S. 22 Degrees 30 Minutes on the *Line of Sines*, will reach from 48.5 back to 18.6, on the *Line of Numbers*.

And,

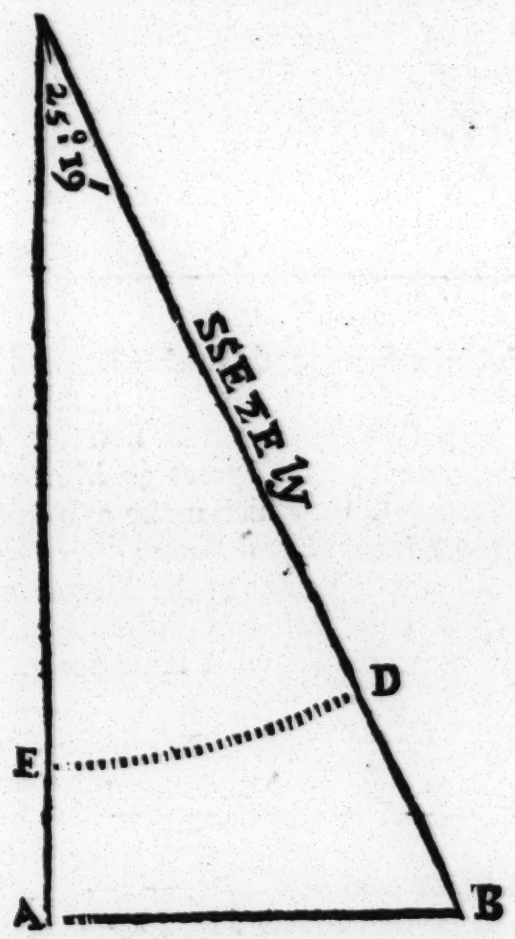
The Extent from S. 90 Degrees, 00 Minutes, to the S. 67 Degrees, 30 Minutes, on the *Line of Sines*, reaches from 48.5 backwards to 44.8, on the *Line of Numbers*.

CASE II.

The Courſe and Difference of Latitude being given; to find the Departure and Diſtance ſailed.

Admit a Ship ſail from Latitude 48 Degrees 30 Minutes S. S. E. ¼ Eaſterly till ſhe be in Latitude 47 Degrees 21 Minutes: I demand the Departure and Diſtance ſailed.

Geometrically.



Draw the North and South Line C. A. and ſubſtracting the Latitudes one from another, it leaves 69 Minutes for their Difference; makes C A equal to 69, from the *Line of Equal Parts*; from C. with 60 Degrees from the *Line of Chords*, deſcribe D E, which make equal to 25 Degrees 19 Minutes; draw C D, and raiſe the Perpendicular A B, which compleats the Triangle B A C, whoſe required Parts may be meaſured by the Scale.

By the Logarithms.

As Co-ſine of the Courſe S. 64° 41′ —	9.956148
Is to the Difference of Lat. 69 Miles —	1.838849
So is the Radius — — — —	10.000000
	11.838849
To the Diſtance ſailed B C 76.3 —	1.882701

Then,

As the Radius — — — — —	10.000000
Is to the Diſtance ſailed C B 76.3 —	1.882524
So is the Sine of the Courſe 25° 19′ —	9.631058
To the Departure A B 32.6 — — —	1.513582

By Gunter's Scale.

The Extent from S. 64 Deg. 41 Min. to S. 90 Deg. 00 Min. on the *Line of Sines*, will reach from 69 to 76.3 on the *Line of Numbers*.

And,

The Extent from S. 90 Deg. 00 Min. to S. 25 Deg. 19 Min. on the *Line of Sines*, will reach from 76.3 to 32.6 on the *Line of Numbers*.

CASE III.

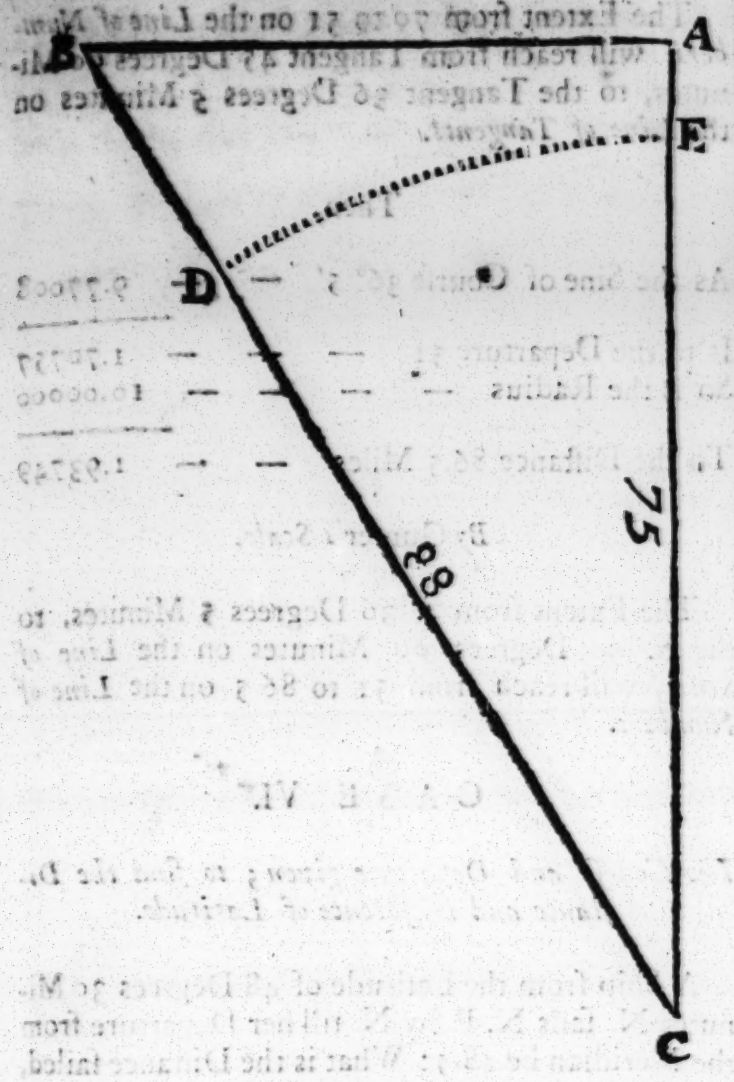
The Difference of Latitude and Diſtance ſailed given; to find the Courſe and Departure.

Admit a Ship ſail from Latitude 42 Degrees 15 Minutes North, on ſome Point between the North and Weſt 88 Miles, and then finds her ſelf in Latitude 43 Degrees 30 Minutes: I demand her Courſe and Departure.

From — — — —	43°	30′
Subſtract — — —	42	15
Remains — — —	1	15
	60	
	75 = Diff. Lat.	

Geometrically.

Geometrically.



Draw the Meridian A C, which let be made equal to 75, raiſe the Perpendicular B A; from C with 88 croſs B A in B; draw B C from C, with 60 from the *Chords* deſcribe D E, which meaſured on the *Chords* or *Rhumbs*, ſhews the *Courſe*; 2 ¾ Points from the North-weſtward, *viz.* N. N. W. ¾ Weſterly.

Note, That the Sides of Plain Triangles are meaſured by the Line of Equal Parts, but the Angles, by the Line of Chords.

By the Logarithms.

As the Diſtance run B C 88 — — —	1.94448
Is to the Radius — — — —	10.00000
So is the Difference of Lat. C A 75 —	1.87506
To the Co-ſine of the Courſe 58° 27′ —	9.933058

Whoſe Complement 31 Degrees 33 Minutes is 2 ¾ Points from the Meridian, which is N. N. W. ¾ Weſterly.

By Gunter's *Scale.*

The Extent from 88 to 75 on the *Line of Numbers*, reaches from S. 90 Degrees 00 Minutes, to 58 Degrees 27 Min. on the *Line of Sines.*

Then,

As the Radius — — — — —	10.00000
Is to the Diſtance run C B 88 — — —	1.94448
So is the Sine of the Courſe 31° 33′ —	9.71870
To the Departure A B 46 Miles Weſt —	1.66318

By Gunter's *Scale.*

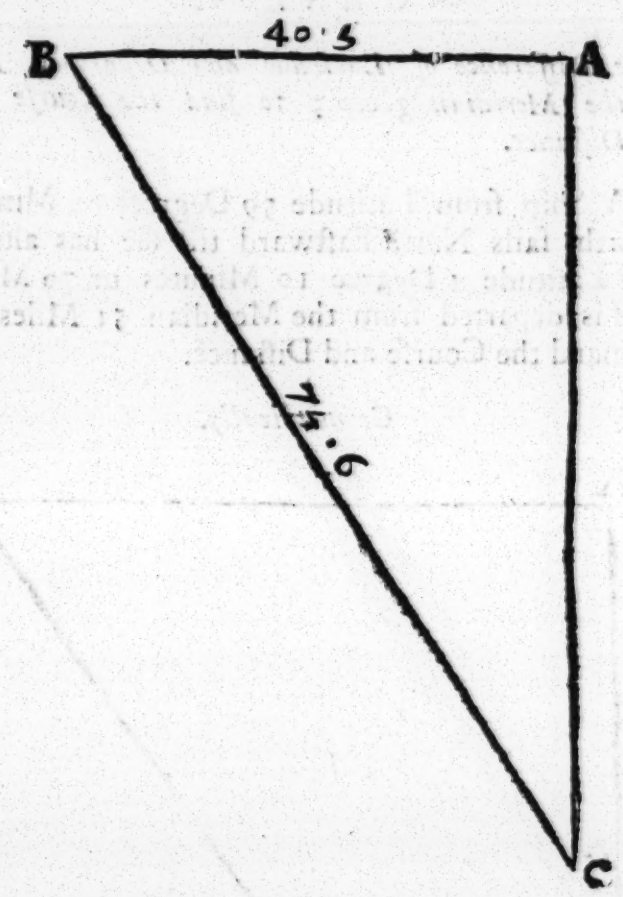
The Extent from S. 90 Degrees 00 Minutes to S. 31 Degrees 33 Minutes on the *Line of Sines*, will reach from 88 to 46 on the *Line of Numbers.*

CASE IV.

The Diſtance run, and Departure from the Meridian given; to find the Courſe and Difference of Latitude.

A Ship being in the Latitude of 59 Degrees 00 Minutes N. ſails North Weſtward till her Diſtance run be 74.6 Miles, and the Departure 40.5: I demand the Courſe and Difference of Latitude, and conſequently the Latitude the Ship is in.

Geometrically.



Draw the Meridian A C on A, (becauſe the Ship ſails Northward) raiſe the Perpendicular B A, laying thereon 40.5 Miles, the Departure from A to B; then take 74.6 in your Compaſſes, from B croſs the Meridian A C in C, and draw B C.

By Logarithms.

As the Diſtance run B C 74.6 Miles —	1.87273
Is to the Radius — — — — —	10.00000
So is the Departure B A 40.5 — —	1.60745
To the Sine of the Courſe 32° 53 —	9.73472

By Gunter's *Scale.*

The Extent from 74.6 to 40.5 on the *Line of Numbers*, reaches from S. 90 Degrees 00 Minutes, to S. 32 Degrees 53 Minutes on the *Line of Sines.*

Then

Then again:

As the Radius — — — — —	10.00000
Is to the Diſtance B C 74.6 — —	1.87273
So is the Co-ſine of the Courſe 57° 7′ —	9.92416
To the Difference of Latitude 62.6 —	1.79689

Which turned into Degrees, is 1 Degree 3 Minutes, and is to be added to 59 Degrees 00 Minutes, the Latitude ſhe departed from, becauſe ſhe raiſes the Pole; the Sum 60 Degrees 3 Minutes the Latitude the Ship is in.

By Gunter's *Scale.*

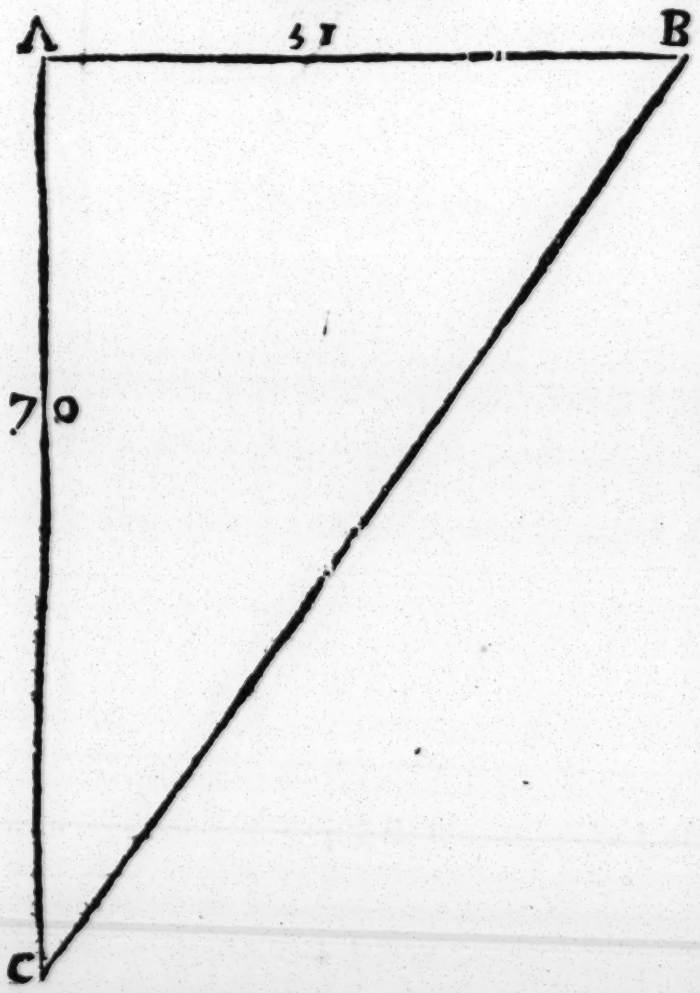
The Extent from S. 90 Degrees 00 Minutes, to S. 57 Degrees 7 Minutes, on the *Line of Sines*, will reach from 74.6 to 62.6 on the *Line of Numbers.*

CASE V.

The Difference of Latitude and Departure, from the Meridian given; to find the Courſe and Diſtance.

A Ship from Latitude 59 Degrees 00 Minutes North, ſails North Eaſtward till ſhe has altered her Latitude 1 Degree 10 Minutes or 70 Miles, and is departed from the Meridian 51 Miles: I demand the Courſe and Diſtance.

Geometrically.



Draw A C, which make equal to 70 Miles; raiſe the Perpendicular A B, which make alſo equal to 51 Miles, draw B C.

By the Logarithms:

As the Difference of Lat. A C 70 Miles	1.845098
Is to the Radius — — — —	10.000000
So is the Departure A B 51 Miles —	1.707570
To the Tangent of the Courſe 36° 5′	9.862472

By Gunter's *Scale.*

The Extent from 70 to 51 on the *Line of Numbers*, will reach from Tangent 45 Degrees 00 Minutes, to the Tangent 36 Degrees 5 Minutes on the *Line of Tangents.*

Then,

As the Sine of Courſe 36° 5′ — —	9.77008
Is to the Departure 51 — — —	1.70757
So is the Radius — — — —	10.00000
To the Diſtance 86.5 Miles — —	1.93749

By Gunter's *Scale.*

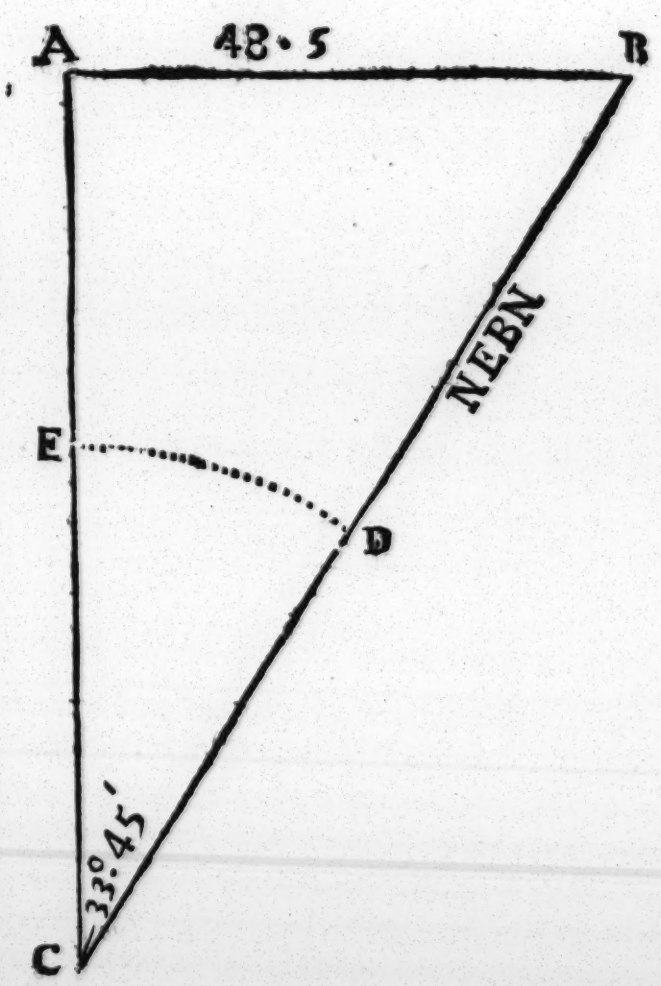
The Extent from S. 36 Degrees 5 Minutes, to the S. 90 Degrees 00 Minutes on the *Line of Sines*, will reach from 51 to 86.5 on the *Line of Numbers.*

CASE VI.

The Courſe and Departure given; to find the Diſtance and Difference of Latitude.

A Ship from the Latitude of 48 Degrees 30 Minutes N. ſails N. E. by N. till her Departure from the Meridian be 48.5: What is the Diſtance ſailed, and Difference of Latitude?

Geometrically.



Draw the Meridian A C, from C with 60 Degrees of the Chord deſcribe D E, which make equal to 33 Degrees 45 Minutes, and let the Perpendicular A B be 48.5 from the *Equal Parts.*

By

By the Logarithms.

As the Sine of the Courſe 33° 45′ — 9.744739

Is to the Departure A B 48.5 — — 1.685741
So is the Radius — — — — 10.000000

To the Diſtance C B 87.3 — — 1.941002

By Gunter's *Scale.*

The Extent from S. 33 Degrees 45 Minutes, to S. 90 Degrees 00 Minutes on the *Line of Sines*, will reach from 48.5 to 87.3 on the *Line of Numbers.*

Then,

As the Radius — — — — — 10.00000

Is to the Diſtance run 87.3 — — — 1.94101
So is the Co-ſine of the Courſe S. 56° 15′ 9.91984

To the Difference of Latitude 72. — 1.86085

By Gunter's *Scale.*

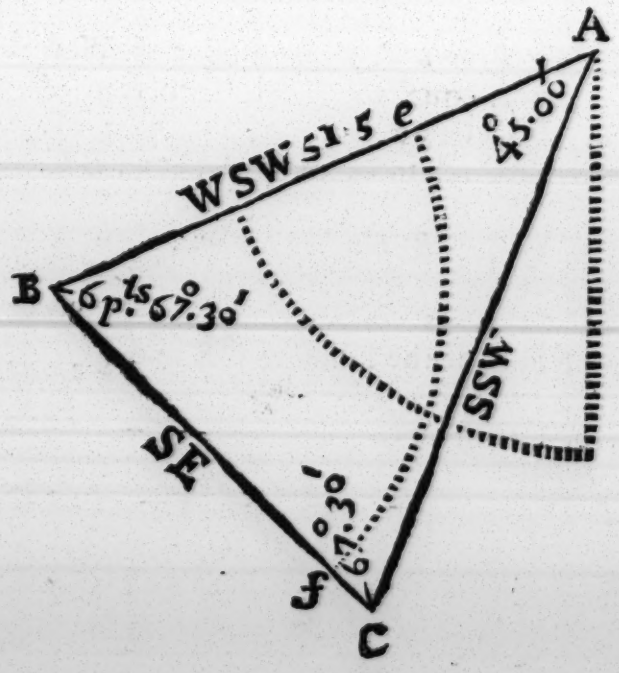
The Extent from S. 90 Degrees 00 Minutes, to S. 56 Degrees 15 Minutes, on the *Line of Sines*, reaches from 87.3 to 72.6 on the *Line of Numbers.*

Theſe are the Seven uſual Caſes of *Plain Sailing*, which you ſee are all performed by the Knowledge of Rectangl'd Plain *Trigonometry*. The Doctrine of *Oblique Plain Triangles*, is not of ſuch Neceſſary Uſe in Sailing, as that of Right-angled ones is: But however, I have here ſingled out ſome of the moſt Uſeful Caſes of it, as follows.

Plain Sailing, *where the Application of* Oblique Triangles *is required.*

Example.

Coaſting along the Shore, I ſet an Head land C, bearing off me S. S. W. I ſail W. S. W. 51.5 Miles to B, and then the Head-land C bears S. E. from me: I demand my ſeveral Diſtances to the Head-land.



Geometrically.

From A draw a S. S. W. Line, as A C, and a W. S. W. Line, as A B, and make A B = 51.5 Miles; then from B, with 60 Degrees of the Chords, deſcribe *e f*, which make equal to ſix Points, and draw *B f.*

By the Logarithms.

In the Triangle B A C, given B A 51.5 Miles and all the Angles, *viz.* The Angle A 45 Degrees, Angle B 67 Degrees 30 Minutes, and the Angle C 67 Degrees 30 Minutes; required B C and C A.

As the Sine of the Angle C 67° 30′ — 9.9656153

Is to the Diſtance A B 51.5 Miles — 1.7118072
So is Sine of the Angle at A 45° 00′ 9.8494850

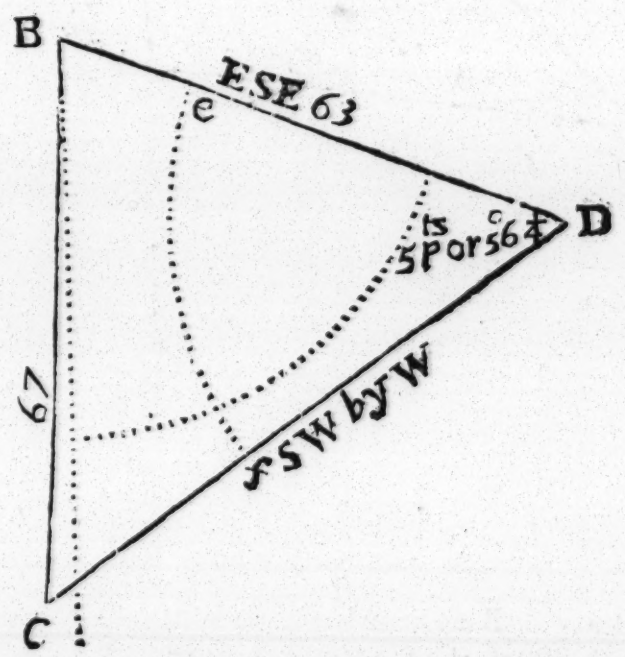
11.5612922

To the Diſtance B C 39.4 — — 1.5956769

And ſince the Angle B, is equal to the Angle C, the Side A C, will be equal to the Side A B.

Example II.

A Ship in the Parallel of 46 Degrees North at B, deſcries a Head-land at C, diſtant from her 67 Miles; ſhe Sails E. S. E. 63 Miles to D, and then the Head-land at C bears S. W. by W. from her: How did the Head-land bear from the Ship when ſhe was at B? And how far is it diſtant from her, now ſhe's at D?



Geometrically.

From B draw an E. S. E. Line B D, which make equal to 63, and from D with 60 of the Chords deſcribe *e f*, which make equal to 56° 15′, draw D *f* C: Then from B with 67 Miles, croſs D C in C, and draw B C,

By the Logarithms.

As the Diſtance B C 67 Miles *Ar. co.* —	8.17392
Is to the Sine of the Angle D 56° 15′ —	9.91984
So is the Diſtance ſailed B D, 63 Miles	1.79934
To the Sine of the Angle C 51° 26′ —	9.89310

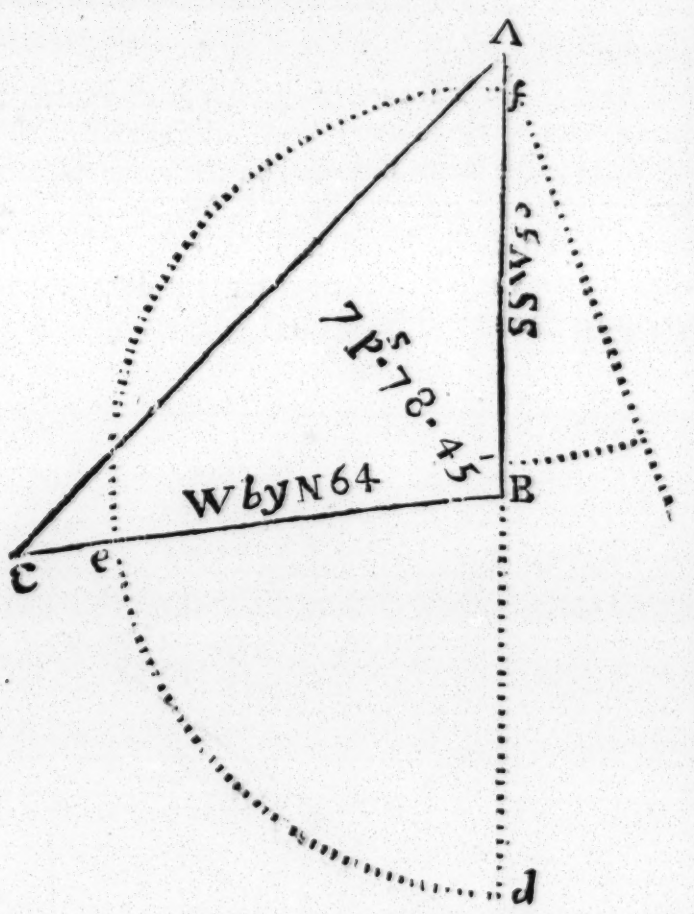
Now 56° 15′ + 51° 26′ = 107° 41′, whoſe Complement to 180°, is 72° 19′ = Angle B, 6 ½ Points, which added to E. S. E. gives the Bearng of C to be S. ½ Weſterly near.

Then,

As the Sine of the Angle D, 56° 15′ —	9.919846
Is to the Diſtance B C 67 Miles —	1.826074
So is the Sine of the Angle B 72° 19′ —	9.978978
	11.805052
To the Diſtance D C 76° 8′ — —	1.885206

Example III.

If I ſail S. S. W. 50 Miles, then W. by N. 64 Miles; I demand the Courſe and direct Diſtance from the Place of Departure?



Geometrically.

Draw A B = 50 M. a S. S. W. Line, and from B with 60 of the Chords deſcribed *d e f*; make *d e* = 7 Points, or *f e* = 9 Points, draw B C through *e*, which make equal to 64 M.

By the Logarithms.

In the Triangle C B A, there's given the two Sides C B and B A, and the contained Angle C B A, 7 Points, to find the Angles A and C, and the third Side C A.

C B =	64
A B =	50
Sum. =	114
Diff. =	14

As the Sum of the two Sides A B and B C 114 — — — — —	2.056904
Is to their Difference 14 — — —	1.146128
So is the T. of ½ Sum of the ∠ ∠ C and A, 50° 37′ — — —	10.085698
	11.231826
To the T. of ½ their Difference 80° 30′	9.174922

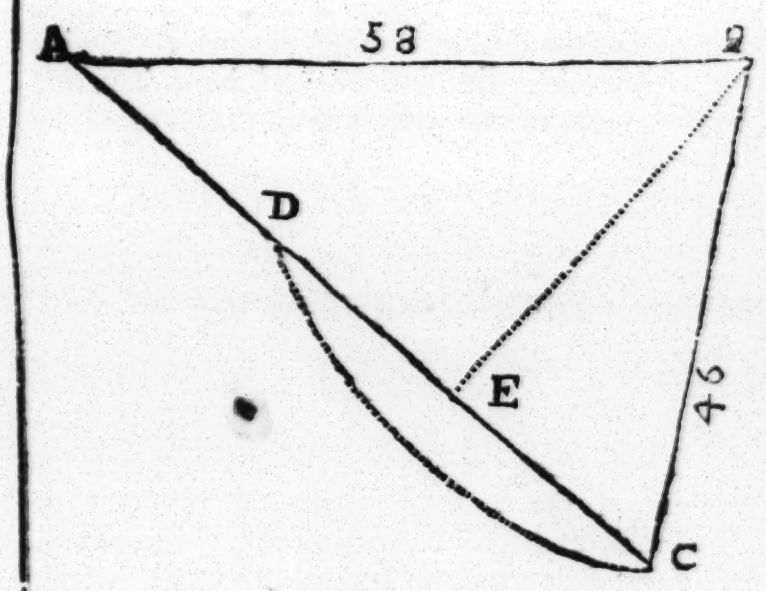
Which ſubtracted from 50 Deg. 37 Min. there remains 42 Deg. 7′ = ∠ C; but 8 Deg. 30 Min. added to 50 Deg. 37 Min. makes 59 Deg. 7 Min. = ∠ A; and ſince A B is a S. S. W. Line, A C is W. by S. ¼ Weſterly.

Then for the Diſtance A C, ſay,

As the Sine of the Angle A 59.7 =	9.9833595
Is to the Diſtance B C 64 M. — —	1.806180
So is the Sine of the ∠ B, or its Complement to 180°, 78° 45′	9.991573
	11.797753
To the Diſtance A C 73.2 M. — —	1.864158

Example IV.

Admit two Ports lying in the ſame Parallel or Latitude, to differ in Longitude 58 Miles; and a Ship having ſailed from the Weſtermoſt, between the South and Eaſt 65 Miles, to be then 46 Miles from the Eaſtermoſt: I demand the Courſe ſhe ſteered, and her Courſe to the Eaſtermoſt Port?



Geometrically.

Having drawn A B an Eaſt and Weſt Line, and made it equal to 58 M. then from A with 65 M. deſcribe an Arch, and with 46 M. from B croſs that Arch in C, draw A C and B C.

By the Logarithms.

As A C 65 Miles — — — —	8.187086
Is to the Sum of the Diſtance A B and B C 104 Miles — — —	2.017033
So is their Difference 12 Miles — —	1.079181
To A D 19.2 — — — —	1.283300

Which

Which added to A C 65, makes 84.2, whose half is 42.1 is A E.

Then,

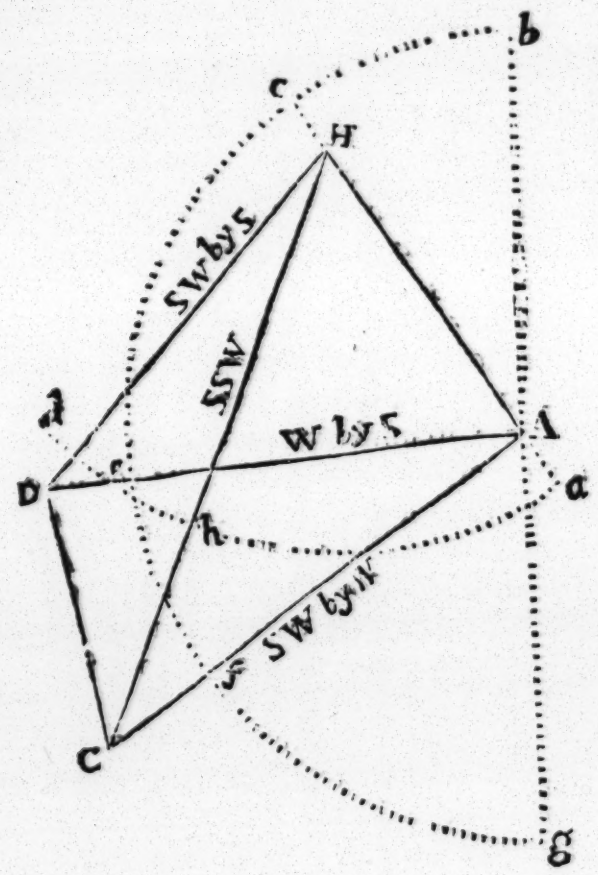
As A B 58 Miles, Ar. Compl. — —	8.236571
Is to the Radius — — — —	10.000000
So is A E 42.1. — — — —	1 624282
To the Co-sine of the Ang. A. 43° 28′	9.860853

That is,

S. E. 1 Deg. 32 Min. Easterly, the Course she steered.

Example V.

Coasting along the Shore, I set two Head-lands, the one at C, bearing S. W. by W. the other at D, bearing W. by S. I sail away N. W. by N. to H. 40 Miles, and then the Head-land at C bears S. S. W. and that at D S. W. by S. I demand how far these Head-lands are asunder, and how they bear one from another.



Geometrically.

First draw *b* A *g* a North and South Line, and with 60 of the Chords from A describe *b e g*; then make *g f* = 5 Points, *g e* = 7 Points, and *b c* = 3 Points; draw A *f* C, A *e* D, and A H *c*, make A H = 40 Miles.

Secondly, From H with 60 of the Chords describe *a d*, which make equal 6 Points; and also *a b* equal 5 Points; draw H *h* C, H *d* D, and D C. Then is D one Head-land, and C the other.

By the Logarithms.

In the Triangle H A C given the Angle H A C = 8 Points, the Angle A H C 5 Points, and the Angle A C H = 3 Points, together with the Side H A 40 Miles to find the Side C H.

Therefore,

As the Sine of the Angle H C A 33° 45′, Ar. Compl. — — —	0.255261
Is to A H 40 Miles — — —	1.602060
So is the Sine of 90° = ∠ H A C —	10.000000
To the Side H C 72 Miles — —	1.857321

Then in the Triangle D H A, there's given Angle H A D = 6 Points, the Angle A H D = 6 Points, and the Angle H D A = 4 Points, and the Side A H 40 Miles to find the Side D H. Thus:

As the Sine of the Angle H D A 45° 00′, Ar. Compl. — — —	0.150515
Is to the Side A H 40 Miles — —	1 602060
So is the Sine of the ∠ H A D 67° 30′	9.965615
To D H 52.3 Miles — — —	1.718190

Then in Triangle D H C there's given two Sides, C H = 72 Miles, and D H 52.3; and their contained Angle C H D = 1 Point, to find the other two Angles H D C, H C D, and the third Side.

As the Sum of the Sides, H C + H D 124.3, Ar. Compl. —	7.905528
Is to their Difference 19.7 — —	1.294466
So is the Tangent of half the Sum of ∠∠ H D C & H C D 84° 22′	11.005954
To the Tangent of half their Difference 58° 6′ — — —	10.209548

Now, 84 Deg. 22 Min. + 58 Degr. 6 Min. = 142 Deg. 28 Min. Angle H D C.

But 84 Deg. 22 Min. — 58 Deg. 6 Min. = 25 Deg. 16 Min. Angle H C D = N. one quarter Westerly.

Then,

As the Sine of the Angle H C D 25° 16′, Ar. Compl. — —	0.369743
Is to D H 52.3 Miles. — — —	1.718190
So is the Sine of the Angle D H C 11° 15′ — — — — —	9.290235
To D C 239 Miles the Distance between the Head-lands — —	1.378168

PLAIN *Scale*, is a thin Ruler, either of Wood or Brass, whereon are graduated the Lines of *Chords*, *Sines*, *Tangents*, *Secants*, *Leagues*, *Rumbs*, &c. and is of ready Use in most part of the *Mathematicks*, chiefly in *Navigation*: A Description thereof see under the Word *Scale*.

PLAIN *Table*, is an Instrument used in Surveying of Land.

1. The *Table* it self is a Parallelogram of Wood, 14 Inches and a half long, and 11 Inches broad, or thereabouts.

2. A *Frame* of Wood fixed to it, so as a Sheet of Paper being laid on the *Table*, and the *Frame* being forced down upon it, squeezeth in all the Edges, and makes it lie firm and even, so as a Plot

Plot may be conveniently drawn upon it. Upon one Side of this *Frame* ſhould be equal Diviſions for drawing Parallel Lines both long-wiſe and croſs-wiſe (as Occaſion may require) over your Paper; and on the other Side the 360 Degrees of a Circle, projected from a Braſs Centre conveniently placed in the *Table*.

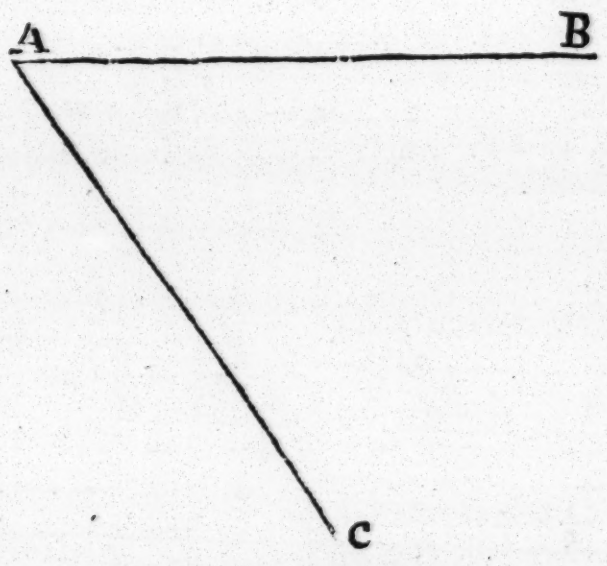
3. A *Box* with a *Needle* and *Card*, to be fixed with two Screws to the Table; very uſeful for placing the Inſtrument in the ſame Poſition upon every Remove.

4. A *Three-legged Staff* to ſupport it, the Head being made ſo as to fill the Socket of the *Table*, yet ſo as the *Table* may be eaſily turned round upon it, when 'tis not fixed by the Screw.

5. An *Index*, which is a large Ruler of Wood, (or Braſs,) at the leaſt 16 Inches long, and two Inches broad, and ſo thick as to make it ſtrong and firm; having a ſloaped Edge, called the *Fiducial Edge*, and two Sights of one Height, (whereof the one hath a Slit above, and a Thread below, and the other a Thread above, and a Slit below,) ſo ſet in the Ruler, as to be perfectly of the ſame Diſtance from the *Fiducial Edge*. Upon this *Index* 'tis uſual to have many Scales of equal Parts, as alſo Diagonals, and Lines of Chords.

To take Quantity of an Angle by the Plain Table.

As ſuppoſe A B and A C were two Hedges or Fences of a Field, and it were required to take the Angle A.



Plant your Table (fitted with the Sheet upon it) as nigh to the Angle as you can, the North End of the *Needle* hanging directly over the *Flower-de-Lis*; then make a Mark upon the Sheet of Paper at any convenient Place for the Angle A, and lay the End of the *Index* to the Mark, turning it about 'till through the Sights you eſpy B; then draw the Line A B by the Edge of the *Index*. Do the ſame for the Line A C, keeping the *Index* upon the firſt Mark: Then will you have upon your Table an Angle equal to the Angle in the Field.

When you have more Angles to take, the Method is the ſame.

The Diſtances from the Angles to the Inſtrument are meaſured by the *Chain*, and ſet off on the Table with a *Scale* and *Compaſſes*.

Whence 'tis ſo eaſie to take the Plot of a Field at one *Station*, by the *Plain Table*, that there needs no other Direction. See *Surveying*.

PLAINTIFF, is he that ſues or *complains* in an Aſſiſe, or in an Action Perſonal; as in an Action of Debt, Treſpaſs, Deceit, Detinue, and the like.

PLANCERE, in Architecture, is the under part of the Roof of the *Corona*; which is the ſuperior part of the Cornice, between two *Cymatiums*. See theſe Words.

PLANE *of a Dyal*, is the Surface on which any Dyal is ſuppoſed to be deſcribed. See a General Account of all ſuch *Planes* under the Word *Dyalling*.

PLANE *Horizontal*, in Perſpective, is a Plane which is parallel to the Horizon, and which paſſes thro' the Eye, or hath the Eye ſuppoſed to be placed in it.

PLANE *of Gravitation or Gravity*, in any heavy Body, is a Plane ſuppoſed to paſs thro' the Centre of Gravity of it.

PLANE, in Fortification, is the Repreſentation of a Work in its Height and Breadth.

PLANE *of the Horopter*, in Opticks, is that which paſſeth thro' the *Horopter*, and is perpendicular to the Plane of the two *Optical Axes*.

PLANE *Number*, is that which may be produced by the Multiplication of two Numbers one into another; thus, 6 is a *Plane Number*, becauſe it may be produced by the Multiplication of 3 by 2; for twice 3 makes 6. So alſo 15 is a *Plane Number*, ariſing from 5 being multiplied by 3: And 9 is a *Plane Number*, produced by the Multiplication of 3 by 3.

PLANE *Problem*, in Mathematicks, is ſuch an one as cannot be ſolved Geometrically, but by the Interſection either of a Right Line and a Circle; or of the Circumferences of two Circles: As, *Having the greateſt Side given, and the Sum of the other Two, of a Right-angled Triangle; to find the Triangle. To deſcribe a Trapezium that ſhall make a Given Area of Four Given Lines.* And ſuch a *Problem* can have but two Solutions, becauſe a Right Line can cut a Circle, or one Circle another but into Points. *Ozanam.*

PLANE *Geometrical*, in Perſpective, is a Plane Surface, parallel to the Horizon, placed lower than the Eye; wherein the viſible Objects are imagined without any Alteration, except that they are ſometimes reduced from a greater to a leſſer Size.

PLANE *of Reflection*, in Catoptricks, is that which paſſeth thro' the Point of *Reflection*, and is always perpendicular to the Plane of the Glaſs, or Reflecting Body.

PLANE *of Refraction*, is a Surface drawn thro' the Incident and Refracted Ray.

PLANE *Surface*, is that which lies even between its bounding Lines; and as a Right Line is the ſhorteſt Extenſion from one Point to another, ſo a *Plane Surface* is the ſhorteſt Extenſion from one Line to another.

PLANE *Vertical*, in Opticks and Perſpective, is a Plane Surface which paſſeth along the Principal Ray, and conſequently thro' the Eye, and is perpendicular to the Geometrical Plane.

PLANETS, are the *Erratick* or *Wandring Stars*, and which are not like the *Fixed ones* always in the ſame Poſition to one another. We now number the Earth among the *Primary*

Planets, becauſe we know it moves round the Sun, as *Saturn*, *Jupiter*, *Mars*, *Venus*, and *Mercury* do, and that in a Path or Circle between *Mars* and *Venus*. And the *Moon* is accounted among the *Secondary Planets*, or *Satellites* of the *Primary*, ſince ſhe moves round the Earth, as *Jupiter*'s Four *Moons* or *Satellites* do round him, and *Saturn*'s Five round about him; if *Caſſini*'s Eyes may be credited. But I could never ſee my ſelf, or meet with any elſe, who ever did ſee any but the *Hugenian Satellite*.

All the Planets, as far as we can find, have, beſides their Motion round the Sun, which makes their Year, alſo a Motion round their own Axes. which makes their Day; as the Earth's revolving ſo, makes our Day and Night.

It's more than probable that the Diameters of all the Planets are longer than their Axes: We know 'tis ſo in our Earth; and Mr. *Flamſteed* and Mr. *Caſſini* both found it to be ſo in *Jupiter*. And therefore 'twas a great Miſtake in the Ingenious Dr. *Burnet*, to aſſert, as he doth in his *Hypotheſis*, the Polar Diameter of the Earth to exceed the other.

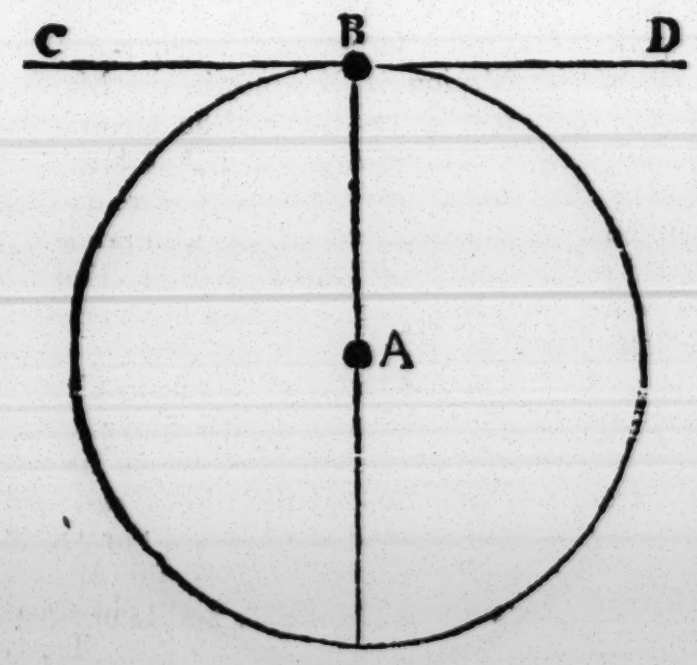
Sir *Iſaac Newton* aſſerts our Earth's Equatorial Diameter to exceed the other by about 34 Miles: And indeed elſe the Motion of the Earth would make the Sea riſe ſo high at the Equator, as to drown all the Parts thereabout.

The Learned Mr. Whiſton, *Profeſſor of Mathematicks in the Univerſity of* Cambridge, *in his New Theory of the* Earth, *accounts (from the Admirable Sir* Is. Newton's *Principles) for the Motion and Revolution of the Planets, thus:*

LEMMA X.

From the uniform Projectile Motion of Bodies in Straight Lines, and the univerſal Power of Attraction or Gravitation, the Curvilinear Motion of all the Heavenly Bodies does ariſe.

If a Body, as B, be moving uniformly along the Line D C, from D to C, and another Body A be preſent; this latter Body A muſt draw the former B from its Straight Line D C: And by doing ſo continually, while at the ſame time the Body B retains its Projectile Force along a Straight Line in in every Point of its Courſe, muſt make the Line of its real Motion become a Bent one, and change its Rectilinear into a Curvilinear Trajectory.



Hence may be learnt what is that *Conatus recedendi a centro motus* in revolving Bodies, and in what Senſe 'tis to be underſtood. For ſince all Bodies have a *Vis centripeta* or Propenſion towards one another, 'tis impoſſible they ſhould of themſelves, in as proper a Manner, have a contrary Propenſion, or *Vis centrifuga*, an Endeavour of avoiding one another. The true meaning therefore of this *Attempt* or *Endeavour* to get farther off the Centre of Motion is only this, That all Bodies being purely paſſive, and ſo incapable of altering their uniform Motion along thoſe Straight Lines or Tangents, to their Curves, in which they are every Moment, do ſtill tend onwards in the ſame Lines, and retain their Propenſion or Effort towards that Rectilinear Motion all the Time they are obliged to move in Curves; and conſequently at every Point of their Courſe, endeavour to fly off by their Tangents. Now the Parts of the Tangent, to which this Endeavour is, being farther from the Centre than thoſe of the Curves to which the Bodies are actually forced, an Attempt to go on in the Tangent may be, and is ſtiled an Attempt to go farther off, or recede from that Centre; tho' from no other Affection than that of Inactivity, or of perſevering in a Rectilinear Motion: So that tho' the *Vis centripeta*, or Power of Gravitation, be an Active and Poſitive Force, continually renew'd and impreſs'd on Bodies; yet the *Vis Centrifuga*, or *Conatus recedendi a centro motus*, is not ſo, but the meer Conſequence and Reſult of their Inactivity.

This is evident in Bodies revolving in *Ellipſes* about one of the *Foci*, in their Deſcent towards it; where the Tangent being oblique to the Radius, or Line from the Point of Contact to the *Focus*, this very *Conatus recendendi a centro motus* carrying it along the Tangent, will for ſome time make it approach nearer to the *Focus*; tho' not ſo much near as by its revolving in the *Ellipſes* it ſelf.

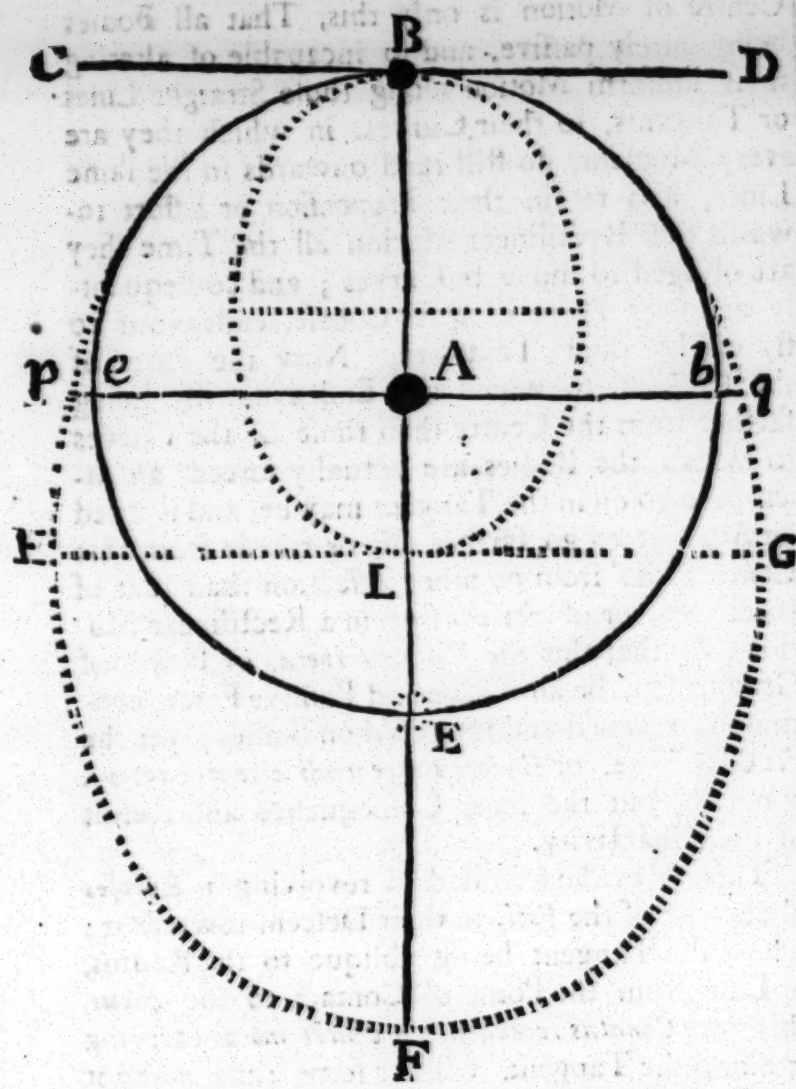
For let a Stone be let looſe from the Sling, or any Revolving Body be diſengaged from the Force which retained it in its Curve, and it will not go from the Centre, but only paſs along the Tangent in which it was moving, as if there were no ſuch Centre near it at all.

When the Projectile Motion of the *Planets* is in its Direction perpendicular to a Line from the Sun, and in its Degree of Velocity, ſo nicely adapted and contemper'd to the Quantity of the Sun's Attraction there, that neither can overcome the other, (the Force of Gravitation towards the Sun, and the Celerity of the Planets proper Motions, being perfectly *in æquilibrio*,) the Orbits of ſuch Revolving Planets will be compleat Circles; themſelves neither approaching to, nor receding from the Sun, the Centre of their Motions. And the Caſe is the ſame in the Secondary Planets about their Primary ones.

Thus 'tis ſuppoſable, That the Velocity of all the Planets about the Sun, was exactly accommodated originally to his Power of Attraction; and that their Primitive Orbits were Perfect Circles; from which at this Day they do not much differ. Thus, however, *Jupiter*'s Four Satellites or little Moons have their Motions ſo exactly proportionned to their Gravitation to him, that their Orbits, as far as the moſt nice Obſervations can judge, are perfect Circles, they keeping at an equal Diſtance from his Centre in all the Points of their Courſes about him.

When

When the Projectile Motion is not adapted to, but is either too ſwift or too ſlow for the Attraction towards the Central Body, the Orbits deſcribed will be *Ellipſes*; and in the former Caſe, when the Projectile Motion is too ſwift, the Orbit will be bigger than the Circle; and the nearer *Focus* of the *Ellipſis* will be coincident with the Central Body.



And in the latter Caſe, the Orbit will be leſs than the Circle, and the farther *Focus* of the *Ellipſis* will be Coincident with that Central Body. Thus, if the Celerity of B be exactly correſpondent to the Attractive Force of the Central Body A, neither will prevail; and the Body preſerving an equal Diſtance from the Centre, will deſcribe the Circle B *e* E *b*.

If the Celerity be greater, it will overcome the Attraction, and caſt it ſelf farther off the Centre for ſome time, and ſo revolve about it in the larger *Ellipſis* B H F G; the Central Body poſſeſſing that *Focus* A which is neareſt the Point B, where the Attraction began. But if the Celerity be ſmaller, the Attraction of the Central Body A will be too hard for it, will force it for ſome time to come nearer, and to deſcribe the leſſer *Ellipſis* B K L I; the Central Body poſſeſſing that *Focus* A which is fartheſt from the Point B, where the Attraction began: As will be very plain from the Conſideration of the Figure relating hereto.

'Tis indeed poſſible that the Celerity of Bodies may be ſo great, compared with the Force of Attraction to the Central Body, as to caſt them off with ſuch Violence, that the Attraction will never be able to bring them round, or make them revolve about it: In which Caſe the Orbits deſcribed will be one of the other Conick Sections, either *Parabola's* or *Hyperbola's*, according to the leſs or greater Violence with which the Bodies are thrown; and the Central Body will poſſeſs the *Focus* of ſuch a Figure. But no *Phænomena* of Nature perſwading us that *de facto* any of the Heavenly Bodies do deſcribe either of thoſe Lines, (tho' Comets *Ellipſes* come near to *Parabola's*;) ſeveral Bodies moving about the ſame Central one, tho' their Primitive Velocity were equal, and Direction alike, yet if they be at different Diſtances from it, they will deſcribe Figurers of different Species about it. For when that determinate Degree of Velocity, which at one Diſtance were juſt Commenſurate to the Central Bodies Attraction, and ſo would produce a Circular Orbit, muſt at a farther Diſtance be too hard for it, by reaſon of the Diminution of the Attraction there; an *Elliptical* Orbit muſt be deſcribed, whoſe nearer *Focus* would be coincident with the Central Body. In like manner, when the ſame determinate Degree of Velocity were at a nearer Diſtance, where the Central Attraction is augmented, it would be too little for the ſame; and an *Elliptical* Orbit muſt be deſcribed, whoſe fartheſt *Focus* would be coincident with the Central Body. This cannot be difficult, if you conſider that the Species of the Planetary Orbits depends ſolely on the Proportion between the Attraction towards the Central Body, and the Velocity of the Projectile Motion; as that Proportion remaining at any Diſtance whatſoever, the Bigneſs of the Orbits will be various, but the *Species* the ſame: So when that Proportion is changed, the *Species* of the Figures muſt be changed alſo; which being done, the Velocity given, by the various Force of Attraction in ſeveral Diſtances from the Centre, as well as by the various Velocities at a given Diſtance, of which before; 'tis evident the *Species* of the Orbits will be different in this as well as in the former Caſe.

And the greater Diſproportion there is between the Quantity of Attraction and the Velocity of the Revolving Bodies, the farther from a Circular; and the more Oblong and Eccentrical will the Orbits deſcribed be. And the greater Approach to Correſpondence there is, the nearer to Circular, and the leſs Oblong and Eccentrical will the ſame Orbits be.

The Circular Orbits of Planets depend not only on the exact Adjuſtment of the Projectile Velocity to the Attractive Power of the Sun, but upon the Direction of the ſame Projectile Motion, at the Original Commencing of the Attraction.

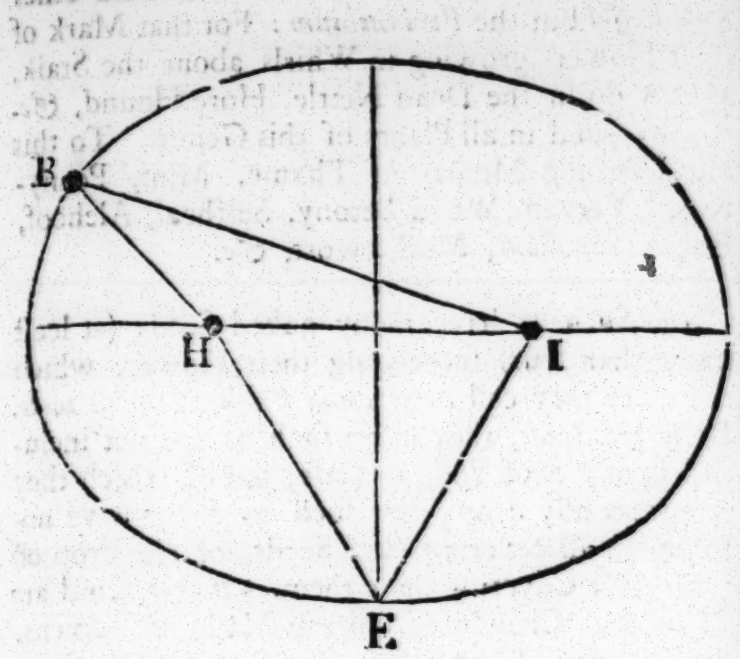
Thus where the Planet is in its own Tangent, neither Aſcending nor Deſcending, and the preceding Angle C B A is a Right one, which we have hitherto ſuppoſed; from the Correſpondence of the Velocity to the Attraction, the Orbits will be perfect Circles. Otherwiſe, when the Direction of the Motion is Oblique, in any Meaſure aſcending from or deſcending to the Central Body, and the preceding Angle C B A Obtuſe or Acute; the Planet, tho' its Velocity were exactly adapted to the Attraction of the Central Body, would revolve in an *Ellipſis*; and the Point B, where the Attraction began, would be the End of the leſſer Axis thereof.

If a Planet deſcribe an *Ellipſis* about its Central Body in the *Focus* thereof, it will move faſteſt when 'tis neareſt to, and ſloweſt when 'tis fartheſt from the ſaid Central Body or *Focus*, and agreeably in the intermediate Places. For ſeeing whereſoever the Revolving Body is, the Area is ſtill proportionable to the Time, and ſo in equal

Times

Times always equal; 'tis evident by how much the Diſtance is leſs, and the Line from the *Focus* is ſhorter, by ſo much muſt the Bodies Motion be ſwifter to compenſate the ſame; and *vice verſa*, by how much the former is longer, by ſo much muſt the latter be ſlower to allow for it.

If the Planet B deſcribe an *Ellipſis* about the Central Body in the *Focus* H, as the *Area* deſcribed by the Line BH, will be exactly Uniform and Proportional to the Time of Deſcription; ſo the Angular Motion, or Velocity of the Line from the other *Focus* B I, will be Proportional to the Time, and Uniform alſo, tho' not ſo Exactly and Geometrically.



The Law of Gravitation being ſuppoſed, if one Planet deſcribe an *Ellipſis* about the Central Body in the *Focus* H, and another deſcribe a Circle about the ſame in its Centre: If the Semi-diameter of the Circle be equal to H E, the middle Diſtance in the *Ellipſis* from the ſame Centre or *Focus*, their Periodical Times of Revolving will be the ſame; and when the Diſtances are equal, their Velocity will be ſo too.

Therefore, tho' the Planets revolve in *Ellipſes* of ſeveral *Species*, yet their Periodical Times may be as well compared with one another, and with their Diſtances from the Central Bodies, as if they all revolved in Compleat Circles.

PLANIMETRY, the ſame with *Planometria*; which ſee.

PLANISPHERE, ſignifies the Circles of the Sphere deſcribed *in Plano*, or on a Plane; or it is a Plane or Flat Projection of the Sphere. And thus the Maps either of Heaven or Earth are called *Planiſpheres*; as alſo all other Aſtrolabical Inſtruments. And all Charts or Maps for the Uſe of Mariners, are called by Mr. *Wright* the *Nautical Planiſphere*. See *Nautical*.

PLANOMETRIA, is the Menſuration of all *Plane* Surfaces or Figures.

PLANTARIS, is a Muſcle of the *Tarſus*, ſo called from its Tendon expanded in the

PLANTA *Pedis*, like that of *Palmaris* in the Palm of the Hand. It ariſes Fleſhy from the Back-part of the outermoſt Tubercle of the lower Appendage of the Thigh-Bone, immediately under the External Beginning of the *Gaſterocnemius Externus*; and deſcending obliquely between it and the *Gaſterocnemius Internus*, ſoon becomes a thin flat Tendon; and which paſſing out from between their Fleſhy Bellies, deſcends internally laterally, by their great Tendon; and marching over the *Os Calcis*, expands it ſelf on the Soal of the Foot, which it firmly adheres to, and to the Fleſhy Body of the *Muſculus flexor digitorum perforatus*, and is inſerted on both Sides the firſt Internode of each Leſſer Toe. The Action of this Muſcle is very obſcure.

PLANTS.

The Learned and Experienced Botaniſt, *Mr.* John Ray, *gives us the following Characteriſtick Notes of the chief Kinds of Plants; which make Twenty five Genders.*

1. The *Imperfect Plants*, which do either totally want both Flower and Seed, or elſe ſeem to do ſo; there having yet no Seed or Flower been diſcovered to belong to them, or at leaſt but to few of them; ſuch as Corals, Spunges, *Algæ Confervæ*, Duck-meat, or the *Lens paluſtris*, the *Fungi*, *Tubera Terræ*, the Moſſes, and ſome Liverworts.

2. Plants producing either no Flower at all, or an Imperfect one, and whoſe Seed is ſo ſmall as not to be diſcernable by the naked Eye: Some of theſe bear their Seeds on the Back-part of their Leaves; as the Maiden-hairs, Spleen worts, *Polypodium* and Ferns: Others bear it on the Stalk it ſelf, adhering there by ſmall ſingle Foot-ſtalks; as the *Lichen Terreſtris*, the *Licopodium*, or Wolfs-claw, the *Adiantum Aureum*, the *Lunaria*, *Equiſetum*, &c.

3. Thoſe whoſe Seeds are not ſo ſmall as ſingly to be Inviſible, but yet have an Imperfect or Stamineous Flower, *i. e.* ſuch an one as is without the *Petala*, having only the *Stamina* and the *Perianthium*; as Hops, Hemp, Mercurialis, Nettles, Docks, Sorrels, Arſeſmart, Knot-grais, Pondweed, Orach, Blite, Beet, Ladies Mantle, &c.

4. Such as have a Compound Flower, and emit a kind of White Juice or Milk, when their Stalks are cut, or their Branches broken off; ſuch as Lettuce, Sow-thiſtle, Hawkweed, Dendelion, Succory, Goats-beard, Nipplewort, &c.

5. Such as have a Compound Flower of a Diſcous Figure, the Seed *Pappoſe*, or winged with Down, but emit no Milk as the former do; as Colts-foot, Fleabane, Golden Rod, Ragweed, Groundſel, Cudweed, &c.

6. The *Herbæ Capitatæ*, or ſuch whoſe Flower is compoſed of many ſmall long Fiſtuloſe or hollow Flowers gathered together in a round Button, Ball, or Head, which is uſually covered with a Squammoſe or Scaly Coat, of which Kind are the Thiſtle, the greater Burdock, Blue-Bottle, Knapweed, Saw-worth, &c.

Theſe have all a Down adhering to their Seeds.

7. The *Corymbiferous Plants*, which have a compound Diſcous Flower, but their Seeds have no Down adhering to them: The Reaſon of the

Name you have under the Word *Corymbas*; of this kind, is Corn Marigold, Common Ox-Eye, Yarrow, the Daſie, Camomile, Tanſie, Mugwort, Scabious, Teaſel, Eryngo's, &c.

8. Plants with a perfect Flower, and having only one ſingle Seed belonging to each ſingle Flower; ſuch are Valerian, Corn-ſallet, Agrimony, Burnet, Meadow Rue, Fumitory, &c.

9. The *Umbelliferous Plants*, which have a *Pentapetalous Flower*, (*i. e.* one having juſt 5 ſmall *Petala* or Leaves,) and belonging to each ſingle Flower there are two Seeds lying naked and joined together. They are called *Umbelliferous*, becauſe the Plant, with its Branches and Flowers, hath an Head like a Ladies *Umbrella*, which they call *Umbella*.

This is a very large Genus of Plants, which therefore he thus ſubdivides into,

1. Such as have a broad flat Seed, almoſt of the Figure of a Leaf, or which are encompaſſed round about with ſomething like Leaves; as Cow-Parſnep, Wild and Garden Parſnep, Hogs Fennel, (*Pucedanum*,) &c.

2. Sucy as have a longiſh Seed ſwelling out in the middle, and larger than the former; as Shepherds Needle, Cow-weed, Wild Chervil, Common Speignel or Meu, &c.

3. Such as have a ſhorter Seed; as Angelica and *Alexanders*.

4. Such as have a Tuberous Root, as the Earth Nut, Kipper Nut, or Pig Nut, Water Dropwort, and Hemlock Dropwort.

5. Such as have a ſmall wrinkled channelled, or ſtriated Seed; as Stone Parſley, Water Parſnep, Burnet, Saxifrage, Caraways, Smallage, Hemlock, Meadow Saxifrage, Sampire, Fennel, Rock Parſley, &c.

6. Such as have rough, hairy, or briſtly Seed; as Mountain Stone Parſley, Wild Carrot, or Birdſneſt, Hedge and Baſtard Parſley, Hemlock, Chervil, Sea Parſnep.

7. Such as have their Leaves entire and undivided into Jags, &c. as *Perfoliata*, or Thorowwax, Sanicle, the leaſt Hares Ear, &c.

10. The *Stellate Plants*, which are ſo called, becauſe their Leaves grow on their Stalks, at certain Intervals or Diſtances, in the form of a Radiant Star. Their Flowers are really *Monopetalous*, but divided into four Segments, which look like ſo many diſtinct *Petala*, or four Leaves; and each Flower is ſucceeded by two Seeds which grow at the bottom of it.

Of this Kind is Croſs-wort, or Mugweed, with Madder, Ladies Bedſtraw, Woodruff, Cleavers, &c.

11. The *Aſperifoliæ*, or Rough-leav'd Plants: They have their Leaves placed alternately, or in no certain Order on their Stalks; they have a Monopetalous Flower cut or divided into five Partitions; and after every Flower there ſucceeds uſually four Seeds; ſuch as Cynogloſſa, or Hounds Tongue, Wild Bugloſſe, Vipers Bugloſs, Comfrey, Mouſe Ear, Scorpion Graſs, &c.

12. The *Suffrutices* or *Verticillate Plants*: Mr. *Ray*, in his laſt Edition of his *Synopſis Methodica Stirp. Britann.* ſaith, The more certain Marks or Characteriſtick Notes of this kind of Plants are, That their Leaves grow by Pairs on their Stalks, one Leaf right againſt another, their Flower is Monopetalous, and uſually in the form of an Helmet or Hood, there ſucceed four Seeds uſually to each Flower, and which have no other *Seed Veſſel* but the *Perianthium*: For that Mark of their Flowers growing in Whirls about the Stalk, as they do in the Dead Nettle, Hore Hound, &c. is not found in all Plants of this Genus. To this Head belong Mother of Thyme, Mint, Penny-Royal, Vervain, Wood Betony, Selfheal, Alehoof, Bugle, *Scordium*, Motherwort, &c.

13. Such as have many naked Seeds (at leaſt more than four) ſucceeding their Flower, which therefore they call *Polyſpermæ Plantæ Semine nudo*. By *naked Seeds*, they mean ſuch as are not included in any Seed Pod, or Caſe, out of which they ſpontaneouſly drop; but ſuch as either have nothing at all covering their Seeds, or elſe drop off with their Covering upon them. Of this Kind are Pilewort, Crowfoot, Marſh-Mallows, Avens, Strawberries, Cinquefoil, Tormentil, Meadow-ſweet, &c.

14. *Bacciferous Plants*, or ſuch as bear Berries; as Briony, Dwarf, Honyſuckle, Butchers-broom, *Solomon's* Seal, Lilly of the Valley, Nightſhade, Aſparagus, Whorts or Whortle-berries, &c.

15. *Multiſiliquous*, or *Corniculate Plants*; or ſuch as have after each Flower many diſtinct, long, ſlender, and many times crooked Caſes, or *Siliquæ*, in which their Seed is contained; and which, when they are ripe, open of themſelves, and let the Seeds drop out: Of this Kind is the Common Houſleek, Orpine, Navelwort, or Walpennywort, Bearsfoot, Marſh Marigold, Columbines, &c.

16. Such as have a Monopetalous Flower, either Uniform or Difform, and after each Flower a peculiar Veſſel, or Seed Caſe, (beſides the common Calix) containing the Seed, and this often divided or parted into many diſtinct Cells. Theſe by ſome are called *Vaſculiferous Plants*, ſuch as common Henbane, Marſh Gentian, Bindweed, Throatwort, Rampions, Toad Flax, Fox Glove, Yellow and Red Rattle, or Cock's-comb, Eyebright.

17. Such as have an uniform Tetrapetalous Flower, but bear their Seeds in Oblong Siliquous Caſes; as your Stock-gilliflower, Wall-flower, common Whitloe Graſs, *Jack* by the Hedge, or Sauce alone, common Muſtard, Charlock or Wild Muſtard, Radiſh, Wild Rocket, Ladies Smock, Scurvy-graſs, Woad, &c.

18. *Vaſculiferous Plants*, with a ſeemingly Tetrapetalous Flower, but of an Anomalous or Uncertain Kind: For this Flower, tho' it be deeply divided

divided in four Segments, is yet really Monopetalous, and falls off all together in one; ſuch as Speedwell or Fluellin, Wild Poppy, Yellow Poppy, Looſe Striſe, Spurge, and Plantain, (according to Mr. *Ray*.)

19. *Leguminous Plants*, (or ſuch as bear Pulſe,) with a *Papilionaceous Flower*. Their Flower is Difform, and almoſt in the Form of a Butterfly and Wings expanded, (whence the Name *Papilionaceous*,) conſiſting of four parts, joined together at the Edges; theſe are Peaſe, Vetches, Tares, Lentils, Beans, Liquorice, Birdsfoot, Trefoil, Reſtharrow, &c.

20. *Vaſculiferous Plants*, with a *Pentapetalous Flower*. Theſe, as the 16th and 18th Kind, have beſides the common Calyx or Cup of the Flower, a peculiar Caſe containing the Seed, and their Flower conſiſting of 5 Leaves; ſuch as Maiden Pinks, Campions, St. *John*'s-Wort, Male Pimpernel, Chickweed, Cranebill, Flax, Primroſe, Periwinkle, Centory, Wood Sorrel, Marſh Trefoil, &c.

21. *Plants with a true Bulbous Root*. A Bulbous Root conſiſts of but one round Ball or Head, out of whoſe lower Part or Baſis there go many Fibres or Strings to keep it firm in the Earth. The Plants of this Kind, when the firſt appear, come up with but one Leaf, and the Leaves are nearly approaching to thoſe of the Graſs Kind of Plants, for they have no Foot-ſtalk, and are long and ſlender: The Seed Veſſels are divided into three Partitions; their Flower is uſually *Hexapetalous*, or ſeemingly divided into ſix Leaves or Segments; ſuch as Garlick, Daffodil, Hyacinth, Saffron, &c.

22. Such as have their Roots approaching to a Bulbous Form. Theſe emit at firſt coming up but one Leaf, and in Leaves, Flowers, and Roots, reſemble the true Bulbous Plants; ſuch as *Flower de Lis*, Cuckoo-pint, Orchis, Broom-Rape, Baſtard Hellebore, Tway-blade, Winter-green, &c.

23. *Culmiferous Plants*, with a Graſſy Leaf, and an Imperfect Flower. Culmiferous Plants are ſuch as have a ſmooth hollow jointed Stalk, with one long ſharp-pointed Leaf at each Joint, encompaſſing the Stalk, and ſet on without any Foot-ſtalk: Their Seed is contained within a Chaffy Husk; ſuch as Wheat, Barley, Rye, Oats, and moſt Kinds of Graſſes.

24. Plants with a Graſſy Leaf, but not *Culmiferous*, with an Imperfect or Staminous Flower; as Cypreſs Graſſes and Ruſhes, Cats Tail, Burr Reed, &c.

25. Plants whoſe Place of Growth is uncertain and various, but chiefly Water Plants, as the Water Lilly, Water Millfoil, Water-wort, Peppergraſs, Mouſe-tail, Milkwort, Dodder, &c.

There is alſo another uſual Diviſion of Plants into *Trees*, *Frutices* or *Shrubs*, *Suffrutices* and *Herbs*; but this is rather Popular and Vulgar, than Juſt and Philoſophical.

PLASM, the ſame with a Mould in which any Metal, or ſuch like running Matter, which will afterwards harden, is caſt.

PLAT-*Baſtion*. See *Baſtion*.

PLAT-*Band*, in Architecture, is a Square-Mould which terminates the Architecture of the *Dorick Order*, or the *Faſcia* which paſſeth immediately under the *Triglyphs*, and ſerves for the ſame Uſe in this Order, as the *Cymatium* in the others. It is alſo the *Faſcia* of the *Chambranles*: And the ſame Name is alſo attributed to divers other Members of Architecture, which are deſtitute of Ornament, having only a certain Breadth without much Projecture.

PLATES, a Term in *Heraldry*. See *Balls*.

PLATFORM, in Fortification, is a Place prepared on the Ramparts for the raiſing of a Battery of Cannon; or it is the whole Piece of Fortification raiſed in a re-entring Angle. See *Battery*.

PLATFORM, in Architecture, is a Row of Beams that ſupport the Timber-Work of a Roof, and lie on the top of the Wall, where the Entablature ought to be raiſed. Alſo a kind of Terraſs Walk, or even Floor on the Top of a Building; from whence we may take a fair Proſpect of the adjacent Gardens or Fields. So an Edifice is ſaid to be covered with a *Platform*, when it hath no Arched Roof.

PLATFORM, or *Orlop*, in a Man of War, is a Place on the Lower Deck of her, abaft the Main Maſt, and round about the Main Capſtan, where, in the Time of Service, Proviſion is to take care of the Wounded Men; 'tis between the Main Maſt and the Cock-pit.

PLATISMA, is a broad Linen-cloth put upon Sores.

PLATONICK *Bodies*. See *Regular Bodies*.

PLATTOON, corruptly from the *French* Word *Pelaton*, is a ſmall Square Body of Muſqueteers, ſuch as is uſually drawn out of a Battalion of Foot, when they form the Hollow Square to ſtrengthen the Angles; and the Granadeers are generally thus poſted.

PLATTS in a Ship, are flat Ropes made of Rope-yarn, and weaved one over another; their Uſe is to ſave the Cable from Galling in the Hauſe, or to wind about the Flukes of the Anchors to ſave the Pendant of the Fore-ſheet from galling againſt them.

PLAYNT, in Law, is the propounding, or exhibiting of any Action Real or Perſonal in Writing; and the Party making this *Playnt*, is called *The Party Plaintiff*.

PLEA, in Law, ſignifies that which either Party alledgeth for himſelf in Court, and are either *Pleas of the Crown*, or *Common-Pleas*. *Pleas of the Crown*, are all of them Suits in the King's Name, againſt Offences committed againſt his Crown and Dignity, or againſt his Crown and Peace; and thoſe ſeem to be Treaſons, Felonies, Miſpriſions of either, and *Mathem*. *Common Pleas* be thoſe that are held between Common Perſons, yet by the former Definitions, they muſt compriſe all other, tho' the King be a Party. *Plea* may farther be divided into as many Branches as *Action*; which ſee, for they ſignify all one.

Then there is a *Foreign Plea*, whereby Matter is alledged in any Court, that may be tried by another.

PLEADINGS, in Law, are all the Sayings of the Parties to Suits after the Count or Declaration;

to wit; whatever is contained in the Bar, Replication, and Rejoynder, and not in the Count it ſelf; and therefore Defaults in the Matter of the Count, are not compriſed within *Miſpleading*, or inſufficient *Pleading*, but only *Miſpleading*, or inſufficient *Pleading*, committed in the Bar, Replication, or Rejoynder.

PLEDGES, in Common Law, are Sureties, either real or formal, which the Plaintiff finds to proſecute his Suit.

PLEGIIS *acquietandis*, is a Writ that lies for a Surety, againſt him for whom he is Surety, if he pay not the Money at the Day.

PLEIADES, the ſame with thoſe ſeven Stars in the Neck of the *Bull*, which are uſually thus called,

PLENA *foris factura, & plena vita*. See *Forfeiture*.

PLENARTY, in Law, is when a Benefice is full directly contrary to *Vacation*, which ſignifies the being void of a Benefice.

PLENITUDE, is when a Man has to much Blood; the ſame with *Plethora*.

PLEONSAMUS, is a Figure in Diſcourſe, when a Word not neceſſary is added, to expreſs a Vehemency in us, and a greater Certainty in the Thing; as when we ſay, I *ſaw it with theſe Eyes*: Here, *ſaw it*, is really enough in Grammar, but *with theſe Eyes*, is added, to ſhew both the Certainty of the Fact, and our Zeal and Vehemence in aſſerting it.

PLEROTICA are Medicines that breed Fleſh, and fill up Wounds.

PLETHORA, when there's more good Blood than is requiſite: It happens either to the Veſſels, when they are ſtretch'd out, and cannot hold all; or to the Strength, for ſometimes, tho' the Veſſels be not over full, the Strength is over-loaded.

PLEVIN, in Common Law, ſignifies a Warrant, or *Aſſurance*. See *Replevin*.

PLEURA, is the Skin or Membrane which covers the Inſide of the Thorax, adhering to the Ribs.

PLEURITIS, a *Pleuriſie*, is an Inflammation of the Membrane *Pleura*, and the Intercoſtal Muſcles, attended with a continual Fever, and Stitches in the Side, Difficulty of Breathing, and ſometimes Spitting of Blood; and it's either a true Pleuriſie, as this which we have deſcribed, or a Baſtard Pleuriſie, whoſe Symptoms are not ſo violent, and in ſome Things different from the former.

PLEXUS *choroides* ſeems to hang over the Pineal Glandule, as it were over a Button. It is an admirable Contexture of ſmall Arteries in the Brain like a Net.

PLEXUS *Nervoſus*, is when two or three Nerves meet together, and jut out.

PLEXUS *reticularis*. Vid. *Choroides*.

PLICA, is an Epidemical Diſeaſe in *Poland*, when their Hairs grow together like a Cow's Tail; beſides, they are Crooked-back'd, have looſe Joints, it wrenches their Limbs, and looſens them, breeds Lice, with other Symptoms.

PLINTHUS, or *Plinthis*, in Architecture, is taken for that Square Member which ſerves as a Foundation to the Baſe of a Pillar: But *Vitruvius* calls the upper part, or *Abacus* of the *Tuſcan* Pillar, a *Plinth*, becauſe it reſembles a ſquare Tile.

Moreover, the ſame Denomination is ſometimes attributed to a thick Wall, wherein there are two or three Rows of Bricks advanced in form of a *Plat-band*. This

PLINTH, *Palladio* calls the *Orle*, and *Blondell* the *Abacus*. The Word is alſo uſed for a like Member about the Capital of a Pillar; but then 'tis called always the *Plinth* of the *Capital*, and is placed juſt above the *Echinus* in the *Dorick*, and above the *Ovolo*, or quarter Round, in the other Orders.

PLOW, is an Inſtrument made of Box or Pear-tree, uſed by Seamen to take the Height of the Sun or Stars, in order to find the Latitude: It admits of the Degrees to be very large, and is much eſteemed by many Artiſts.

PLUMB-*Line*, the ſame with *Perpendicular*.

BLUMBUM *uſtum*, is a Compoſition of two Parts of Lead melted in a Pot or Crucible, with one Part of Sulphur then added to it, and kept o'er the Fire till they be burnt all out; the Matter will then be turned into a Black Powder, which they properly call by this Name *Plumbum Uſtum*.

PLUME, is the Term uſed by Botaniſts for that Part of the Seed of a Plant, which in its Growth becomes the Trunk; 'tis incloſed in two ſmall Cavities formed in the Lobes for its Reception; and is not like the *Radicle*, an entire Body, but divided at its looſe End into divers Pieces, all cloſely bound together like a Bunch of Feathers; whence Dr. *Grew* very properly gives it the Name of *Plume*. In Corn it is that Part, which, after the *Radicle* is ſhot forth, ſhoots out towards the ſmaller End of the Seed, and therefore is by ſome called the *Acroſpire*.

PLURIES, is a Writ that goeth out in the third Place, after two former Writs that had no Effect: For firſt the Original *Capias* iſſues, and if that ſpeed not, then goeth out the *Alias*, and if that alſo fails, then the *Pluries*.

PNEUMATICK *Engine*, the ſame with the *Air Pump*.

PNEUMATOCELE, is a Windy Rupture, when the Skin of the *Scrotum* is diſtended with Wind.

PNEUMATODES, is a ſhort Breathing.

PNEUMATONIPHALUS, is a Swelling in the Navel, got by Wind.

PNEUMATOSIS, is the Generation of Animal Spirits, which is performed in the Cortical Subſtance of the Brain; the little Arteries there are emptied, and the Spirits diſtil, which after they are come as far as the Middle of the Brain, they Actuate and Invigorate all the Nerves.

PODAGRA. *vid. Arthritis*, The Gout in the Feet.

POETICAL, *Riſing and Setting of the Stars*: This is peculiar to the Ancient Poetical Writers, for they refer the Riſign and Setting of the Stars, always to that of the Sun; and accordingly make three Sorts of Poetical Riſing and Setting. *Coſmical*, *Acronical*, (or as ſome write it, *Acronyctal*,) and *Heliacal*. See thoſe Words.

POINT, a Point in Geometry, is that which is ſuppoſed to have no manner of Dimenſions, but to be Indiviſible in every reſpect.

The *Ends* or *Extremites* of Lines are *Points*.

If a Point be ſuppoſed to be moved any way, it will by it Motion deſcribe a Line.

POINT *Blank*, a Term in Gunnery, ſignifying that a Shot or Bullet goes directly forward to the Mark, and doth not move in a Curve as Bombs and highly elevated Random Shots do.

POINT

POINT, in Navigation, ſignifies 11 Degrees 15 Minutes, or one 32d Part of the Compaſs: The half of which is 5 Degrees 38 Minutes, which they call a *Half Point*; and the half of this, which is 2 Degrees 49 Minutes, they call a *Quarter Point*.

The Seamen alſo call the Extremity of any Promontory (which is a Piece of Land running out into the Sea) *a Point*; which is of much the ſame Senſe with them as the Word *Cape*.

They ſay two Points of Land are one in another, when they are ſo in a Right Line one againſt another, as that the Innermoſt is hindered from being ſeen by the Outermoſt.

POINT *of Concourſe*, in Opticks, is that Point where the *Viſual Rays*, being reciprocally inclined, and ſufficiently prolong'd, meet together, are united in the middle, and croſs the Axis. This Point is moſt uſually called the *Focus*; and ſometimes the *Point of Convergence*.

POINT *of Concurrence*, a Term in Perſpective. See *Principal Point*.

POINT *of Divergence*. See *Virtual Focus*.

POINT *of Incidence*, in Opticks, is that Point on the Surface of a Glaſs, or other Body on which any Ray of Light falls: And as ſome alſo word themſelves, That Point of the Glaſs, which a Ray parts from, after its Refraction, and when 'tis returning into the *Rare Medium* again.

POINT *of Inflexion* of a Curve. See *Inflexion*.

POINT *Principal*, a Term in Perſpective. See *Principal Point*.

POINT *Senſible*, according to Mr. *Lock*, is the leaſt Particle of Matter or Space which we can diſcern; and to the ſharpeſt Eyes, is ſeldom leſs than thirty Seconds of a Circle, whereof the Eye is the Centre.

POINTING *the Cable*, is when the Strands about two Foot from the End are untwiſted, in order to make Sinnet of the Rope-yarn, and then to lay them one over the other again, making it leſs towards the End, where all is made faſt together with a Piece of Marlin, the Deſign of which is partly to keep the Cable from raveling out, but chiefly that none of the Cable may be cut off, and ſtole away.

POINT *In*, when two Piles are born in a Coat of Arms, ſo as to have their Points meet together in any part of the Eſcutcheon. They ſay, *He beareth two Piles in Point*.

POINTS *in Heraldry*, are ſeveral Places in an Eſcutcheon, diverſly named according to their Situation. See the Word *Eſcutcheon*.

POINT *Campion*,
POINT *Dexter*,
POINT *Plain*,
POINT *in Point*,
} All Abatements of Honour; which ſee under that Word.

POINTS *of Station*, in Aſtronomy, are thoſe Degrees of the Zodiack, in which a Planet ſeems to ſtand quite ſtill, and not to move at all.

POLAR *Circles*, are two Circles ſuppoſed to be drawn parallel to the *Equinoctial* or *Equator*, thro' 23 Degrees 30 Minutes Diſtance from the *Polar Points*; and that about the *North-Pole* is called the *Arctick Circle*, and the other about the *South-Pole*, the *Antarctick Circle*, becauſe oppoſite to the former.

POLAR *Dyals*, are thoſe whoſe Plane are parallel to ſome Great Circle that paſſes thro' the *Poles*, or parallel to ſome one of the Hours; ſo that the *Pole* is neither elevated above, nor depreſſed below the Plane, therefore the Dyal can have no Centre, and conſequently its *Stile*, *Subſtile*, and *Hour Lines*, are parallel. This therefore will be an Horizontal Dyal to thoſe who live under the *Equator* or *Line*.

In a *Direct Polar Dial*, the Hour Lines muſt be drawn all parallel to the Hour Line of Twelve.

The *Style* may be either a ſtrait Pin ſet upright, or a Wyer made to lie parallel to the Plane, and muſt ſtand over the Hour-Line of Twelve.

The Length of the Plane may be taken in any Inches, or Parts of Inches, reckoning the Inch to be divided into 10, or 100 Equal Parts.

Then for the *Height of the Style*, ſay,

As the Tangent of the Hour-Line 4 or 5, is to to the Logarithm of their Diſtance from the Meridian in Inches and Parts.

So is the Radius, to the *Height of the Style* in Inches and Parts.

For the *Hour-Lines*; ſay,

As the *Radius* is to the Logarithm of the *Styles Height*, in Parts of Inches.

So is the Tangent of any *Hour-Line*, to the Logarithm of the Diſtance thereof from the Meridian Line.

Example.

Suppoſe your *Polar Plane* be 12 Inches long, and it be required to put on all the Hour-Lines from 7 in the Morning unto 5 in the Afternoon.

Here you have 5 Hours and 6 Inches on either Side of the Meridian; and before you work the Operation, the Hours and Inches muſt be reduced into Degrees or Parts, allowing for every Hour or Inch 15 Degrees, or 100 Parts, ſo you'll have 75 Degrees, and 600 Parts.

Then for the *Styles Height*.

To the *Ar. Co.* of the Tangent 75° (= 5 Hours) — — — —	9.428053
Add the Logarithm of the Diſtance from the Meridian 600 Poles —	2.778151
Sum = the Logarithm of the *Styles Height*, 161 Parts. — — —	2.206204

That is, 1 Inch, and 61 Parts of an Inch.

For the *Hours Diſtance from the Meridian*.

To the Log of the *Stiles Heig.* 161 Pts.	2.206204
Add the Tang. 15° (for the 1ſt Hour)	9.428052
Sum = Radius = Logarithm of the Hours Diſtance = 43 Parts —	1.634256

After the ſame manner may you find the other *Hours Diſtance from the Meridian*.

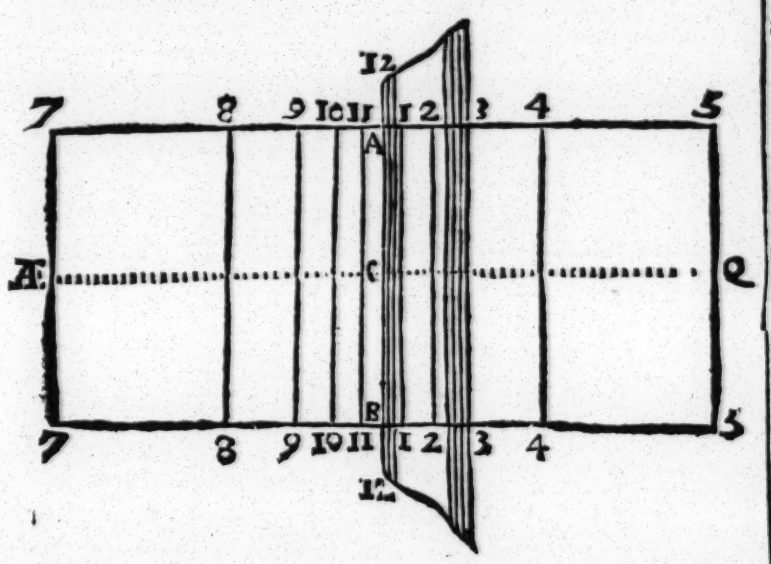
Then

Then draw them in a Table thus:

Hours.		Angles at the Poles		Tangent.	
H.	H.	G.	M.	Inch.	Parts.
12		00	00	00	00
11	1	15	00	00	43
10	2	30	00	00	63
9	3	45	00	1	61
8	4	60	00	2	79
7	5	75	00	6	00
6	6	90	00	*Infinit.*	

To project the Dyal.

First Draw on the Plane the *Meridian Line* A B, which croſs at Right Angles with Æ Q, the *Æquator*: Then from *c*, the Interſection of the *Meridian* and the *Æquator*, ſet off thoſe *Parts* from the Table both ways, and thro' theſe Points draw Lines parallel to A B, (or the Hour-Line of 12,) thoſe ſhall be the *Hour-Line I required.*



POLAR *Projection*, is a Repreſentation of the Earth, or of the Heavens, projected on the Plane of one of the *Polar Circles.*

POLARITY, is the Property of the Magnet, or of a Piece of Oblong Iron touch'd by a Magnet, to point toward the Poles of the World.

POLE, in Meaſuring, is the ſame with *Perch* or *Rod*, or as ſome call it, *Lugg*. By our Statute-Law, (*Ann.* 35 *Eliz. Cap.* 6.) this Meaſure is a Length of 16 Feet and an half, but it varies by the Uſage of ſome Countries, being in ſome Places of 18 Feet, which they call *Woodland Meaſure*; in ſome Places of 21 Feet, which is called *Church Meaſure*, (*i. e.* of ſuch Lands as did or do belong to the *Church*;) and in others of 24 Feet, and this is called *Foreſt Meaſure.*

POLE, in Mathematicks, is a Point 90 Degrees diſtant from the Plane of any Circle, and in a Line perpendicularly erected in its Centre; which Line is called the Axis. And from this *Polar Point* may Circles be deſcribed on the Globe or Sphere, as they are on the Plane from their Centre.

POLE *Star*, is a Star in the Tail of the *Little Bear*, (a Conſtellation of 7 Stars, which is called *Cynoſura*,) and is very near the exact *North Pole* of the World. The right Aſcenſion of this *Pole Star* for this Year, 1700, is 0 Hours 35 Minutes 0 Seconds of Time; and it increaſes 1 Minute 16 Seconds every 10 Years: Therefore having at any time this Star's Right Aſcenſion, and the Right Aſcenſion of the Sun, (both in time,) if you Subtract the latter from the former, (adding 24 Hours to the Right Aſcenſion of the *Pole Star* when it is leſs than the *Sun*'s,) the Remainder will be the Time when the *Pole Star* is in the Meridian. Then hang up two Strings and Plummets between the *Pole Star* and your Eye, and you will have a true *Meridian Line*, which will be of great Uſe to rectifie a Clock or Watch. And you may find the Meridian very nicely, if inſtead of the Strings above mentioned, you uſe the Sights of a good Circumferenter, or other Surveying Inſtrument.

Some Perſons have been might apt to imagine, That the Height or Elevation of the *Pole*, and alſo the Poſition of the *Circles* of the *Heavens*, in reſpect of thoſe on the Earth, hath much changed and varied: But Mr. *Caſſini* is doubtleſs right in his Aſſertion, That there is no juſt Ground for any ſuch Surmiſe: And that all the Difference which we find now in the Latitudes of Places, &c. in reſpect of the Ancient Accounts, ariſes from the former Obſervations not being well made; as indeed we may judge they cannot have been, ſince they had no ſuch good Inſtruments to do it withal, as the Modern Aſtronomers have.

Yet he thinks it very probable, that there may be ſome little Variation in the Height of the *Pole*, in one and the ſame Place; but this not exceeding two Minutes, and which will in Proceſs of Time quite vaniſh, after 'tis arrived to its higheſt Difference. Vid. *Memoires de Mathemat.* & *de Phyſique*, July, 1693.

POLE *of a Glaſs* (in *Opticks*) is the thickeſt part of a Convex, but the thinneſt of a Concave Glaſs, and if the Glaſs be truly ground, will be exactly in the middle of its Surface: This is ſometimes called, The *Vertex* of the Glaſs.

POLES *of the World*, are two Points in the Axis of the *Æquator*, each 90 Degrees diſtant from its Plane; one pointing *North*, which therefore is called, The *North* or *Arctick Pole*; the other *Southward*, which therefore is called, The *South* or *Antarctick Pole.*

Whether any People live directly under the Pole or not, is a Queſtion; but Mr. *Halley* hath proved, That the *Solſticial Day*, under the *Pole*, is as hot as under the Equinoctial, when the Sun is Vertical to them, or in their Zenith; becauſe for all the 24 Hours of that Day under the Pole, the Sun's Beams are inclined to the Horizon with an Angle of 23 ½ Degrees: Whereas under the Equinoctial, tho' he become Vertical, yet he ſhines no more than 12 Hours, and is abſent 12 Hours: And beſides, for 3 Hours 8 Minutes of that 12 Hours he is above the Horizon there, he is not ſo much Elevated as under the *Pole.*

POLES *of the Ecliptick* are Points in the *Solſtitial Colure* 23 Degr. 30 Minut. diſtant from the *Poles of the World*; and thro' theſe all Circles of Longitude in the *Heavens* do paſs, as the Hour Circles do thro' the *Poles* of the *Æquator.*

To find the *Pole* of any Circle. See *Spherick Geometry.*

POLEMICAL, is a Word uſed in reference to that part of Theology which relates to Controverſie; which becauſe of the Wars, Jars, and Squabbles, that uſually ariſe about Controverted Points, is called *Polemical Divinity.*

POLICY

POLICY *of Assurance*, is a Form of Security, mentioned in 43 *Eliz. cap.* 12, & 14; and also in 14 *Car.* 2. *cap.* 23. and given by a certain Society of Men formed into a kind of Corporation, to any Person to Insure the safe Return of the whole or any part of a Ship; to Insure Houses against Fire; so that if they are burnt down, they shall be Rebuilt at the proper Charge of the Insurers; and to Insure Mens Lives in Offices when they have paid great Sums for the same; and lastly, to Insure to Persons paying so much Money at once, or becoming constant Contributors to the Office or Society of Assurance, a Remainder of so much Money after the said Contributor or Subscriber's Death. This Policy of Assurance is under the Seal of the Office, and entitles the Person Benefitted by it, to make good his Claim according to the Tenor of the Articles or By-Laws of that Society of which he was a Member.

POLLUX, a fix'd Star in the *Twins*, of the Second Magnitude, whose Longitude is 108 Degrees 47 Minutes, Latitude 6 Degrees 38 Minutes.

POLYACOUSTICKS, are Instruments contrived to Multiply Sounds, as Multiplying-glasses or Polyscopes do Images of Objects.

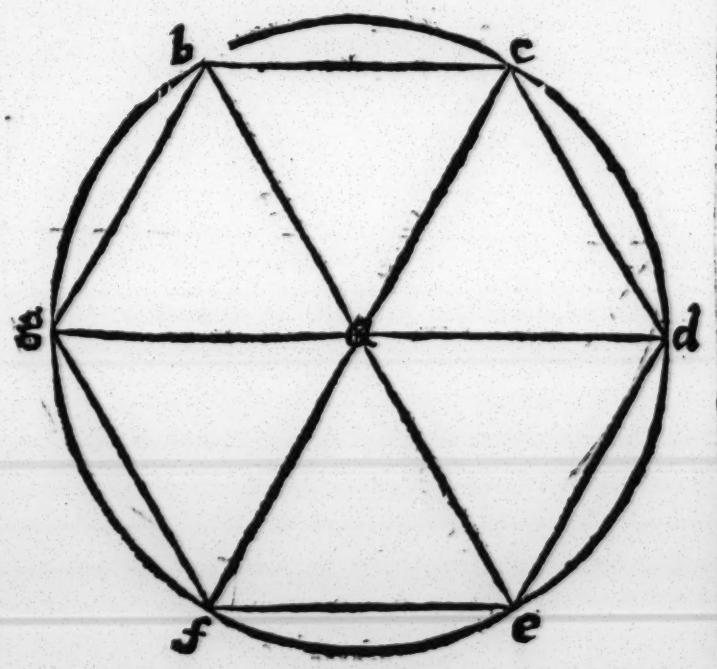
POLYEDRON, the same with *Polyhedron*.

POLYGON, a Term in Geometry, signifying in the general any Figure of many Sides and Angles; tho' no Figure is called by that Name, unless it have more than four or five Sides.

And if all the Sides and Angles be equal, then 'tis called a *Regular Polygon*.

For its Superficial Content, see *Area*.

Every *Polygon* may be divided into as many Triangles as it hath Sides.



If you take a Point, as *a*, any where within the *Polygon*, and from thence draw Lines to every Angle, *a b*, *a c*, *a d*, &c. for they shall make as many Triangles as the Figure hath Sides.

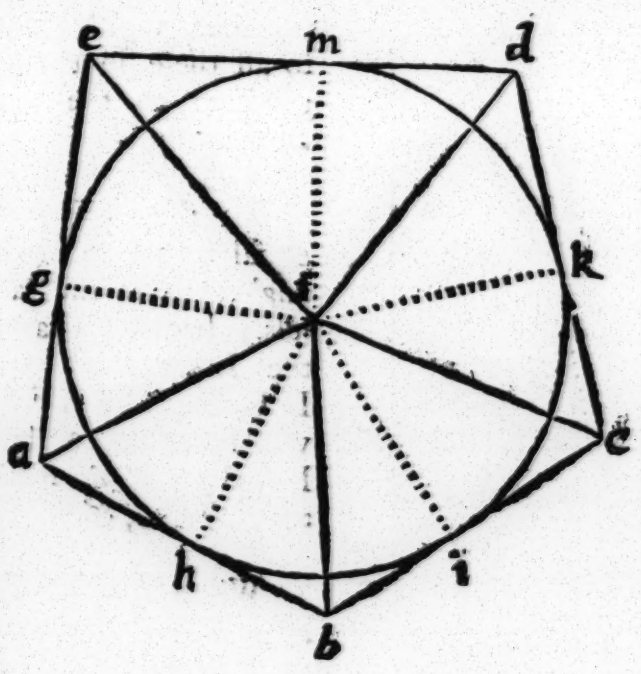
The Angles of any *Polygon* taken together, will make twice as many Right ones, except four, as the Figure hath Sides.

Thus, if the *Polygon* have six Sides, (as in the Figure above) the double of that is 12; from whence take 4, there remains 8. I say, that all the Angles *b*, *c*, *d*, *e*, *f*, *g*, of that *Polygon* taken together, are equal to 8 Right Angles.

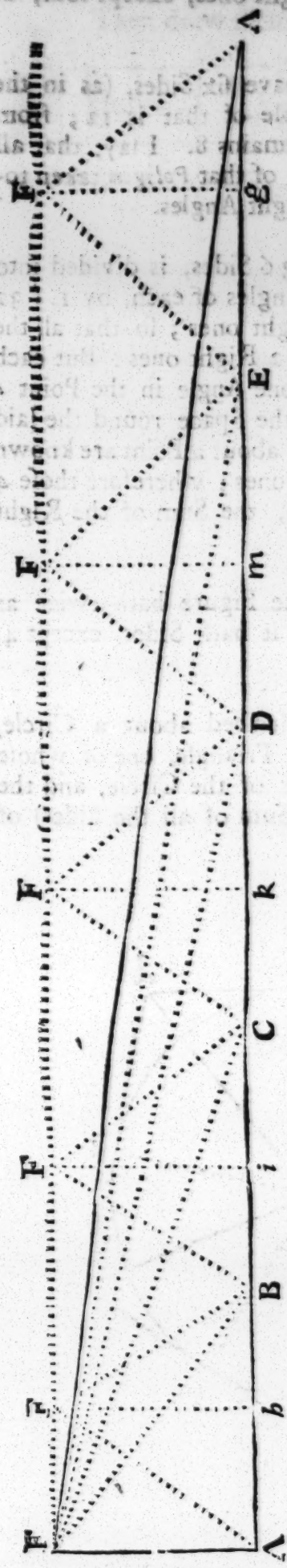
For the *Polygon* having 6 Sides, is divided into 6 *Triangles*; and the 3 Angles of each, by 1. & 32 *Eucl.* are equal to 2 Right ones; so that all the Angles together make 12 Right ones: But each of these *Triangles* hath one Angle in the Point *a* and by it they compleat the Space round the said Point; and all the Angles about a Point are known to be equal to 4 Right ones; wherefore those 4 taken from 12, leave 8, the Sum of the Right Angles of the *Hexagon*.

So that 'tis plain, the Figure hath twice as many Right Angles, as it hath Sides, except 4. *Q. E. D.*

Every *Polygon* circumscribed about a Circle, is equal to a Rectangled Triangle, one of whose Legs shall be the Radius of the Circle, and the other the *Perimeter* (or Sum of all the Sides) of the *Polygon*.



Let



Let the Line F A be equal to *Radius f h*, and to it at Right Angles draw the Infinite Line A B C D, &c. out of which take A *h* = to *a h*, *b* B = *b h*, B *i* = *b i*, and *i* C = *i c*, &c. So that the whole Line A B C D E A, may be equal to the whole Compaſs or *Perimeter* of the *Polygon a b c d e a*.

Alſo draw F F parallel to A A; ſo that all the Perpendiculars F *h*, F *i*, F *k*, &c. may be equal to the Radius *f h*, *f i*, &c.

'Tis then plain, That the Triangle A F B will be equal to the Triangle *a f b* in the *Polygon* and the △ B F C = △ *b f c*, alſo the △ C F D = △ *e f d*, &c. So that all theſe Triangles taken together, will be equal to all theſe in the *Polygon*, or to the whole *Polygon*.

But the △ F A A is equal to all the 5 Triangles within the Parallels; becauſe drawing the Lines B F, C F, D F, &c. The △ F A B, will be equal to the △ F A B; the △ F C B = △ F C B, &c.

Wherefore the Triangle F A A is equal to the *Polygon*, which was to be proved.

COROLLARY I.

Hence every *Regular Polygon* is equal to a *Rectangle Triangle*, one of whoſe Legs is the Perimeter of the *Polygon*, and the other a Perpendicular drawn from the Centre to one of the Sides of the *Polygon*.

COROLLARY II.

And every *Polygon* circumſcribed about a Circle, is bigger than it; and every *Polygon* inſcribed, is leſs than the Circle, as is manifeſt; becauſe the thing containing, is always greater than the thing contained.

COROLLARY III.

The Perimeter of every *Polygon* circumſcribed about a Circle, is greater than the Circumference of that Circle; and the Perimeter of every *Polygon* inſcribed is leſs.

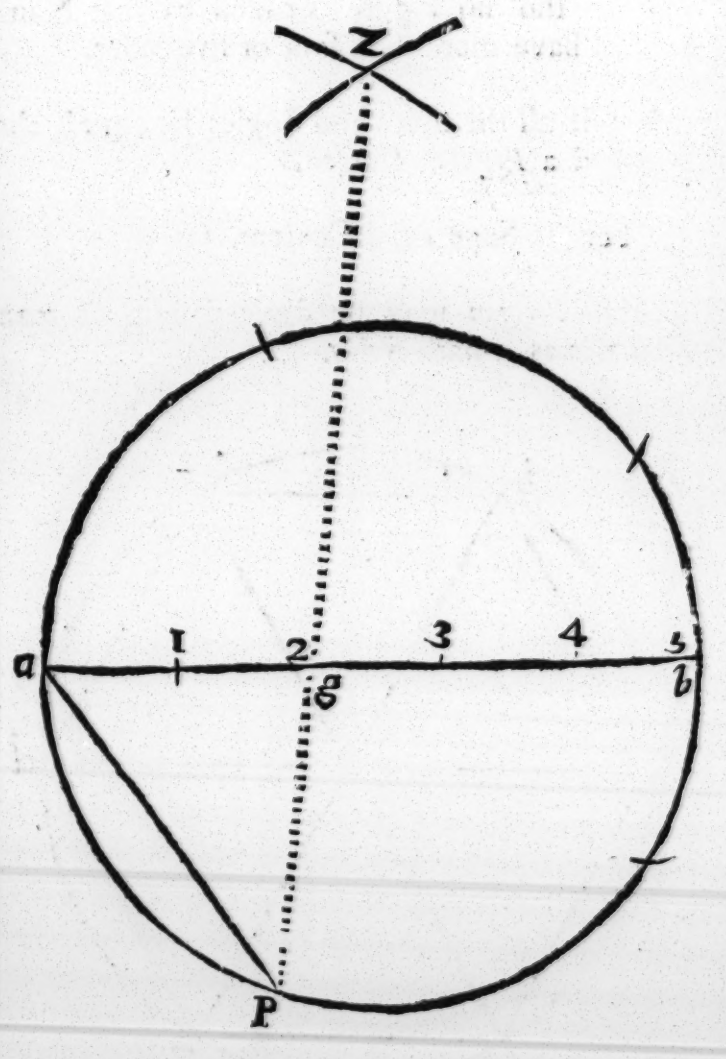
Hence,

A *Circle* is equal to a *Right Angled Triangle*, whoſe *Baſe* is the *Circumference* of the *Circle* and its Height the *Radius* of it.

For this *Triangle* will be leſſer than any *Polygon* conſcribed, and greater than any inſcribed, (becauſe the Circumference of the *Circle*, which is the Baſe of the *Triangle*, is greater than the Compaſs of any inſcribed:) Therefore it will be equal to the *Circle*. For if this *Triangle* be greater than any thing that is bigger than the *Circle*, and leſſer than any thing that is leſſer than the *Circle*; it follows, that it muſt be equal to the *Circle*.

This is called the *Quadrature* or *Squaring of the Circle*; that is, to find a Right-lined Figure equal to a Circle; upon this Suppoſition, That the *Baſis* given, is equal to the *Circumference* of the *Circle*, but actually to find the Right Line equal to the *Circumference* of a *Circle*, is not yet diſcovered *Geometrically*.

To inſcribe any Polygon *in a Circle.*



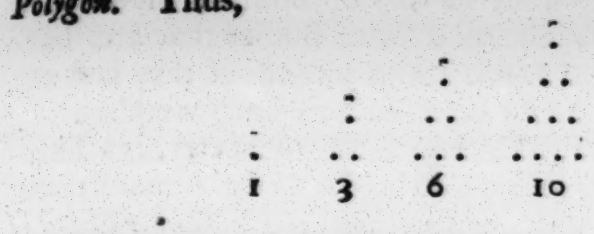
Divide *a b*, the Diameter of the Circle, into as many equal Parts as the *Polygon* is to have Sides; (viz. 5.) and then with the Length of that whole Diameter make two Arks interſecting each other above, as in *z*; and lay a Ruler from *z* thro' *g*, the ſecond Diviſion of the Diameter, which will find below the Point *p*. So is the Chord *a p* the Side of the *Polygon* required; which here is a *Pentagon*.

POLYGON,

POLYGON *Exterior*, in Fortification, is the Diſtance of one Point of a Baſtion from the Point of another, reckoned all round the Work.

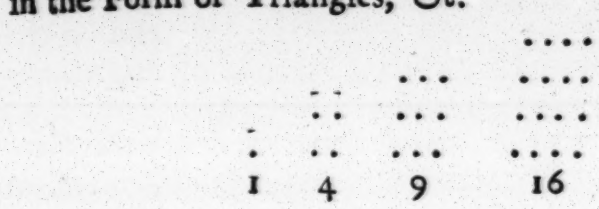
POLYGON *Interior*, is the Diſtance between the Centres of any two Baſtions, reckon'd all round as before.

POLYGONAL *Numbers*, are ſuch as are the Sums or Aggregates of *Series* of Numbers in Arithmetical Progreſſion, beginning with Unity; and ſo placed, that they repreſent the Form of a *Polygon*. Thus,



1 3 6 10

are Triangular Numbers, becauſe they are the Aggregates of a certain Number of Points placed in the Form of Triangles, *&c.*



1 4 9 16

are Quadrangular Numbers, *&c.*

POLYGRAM, is a Geometrical Figure conſiſting of many Lines.

POLYHEDROUS *Figure*, in Geometry, is a Solid contained under or conſiſting of many Sides; which, if they are *Regular Polygons*, all Similar and Equal, and the Body be inſcribable within the Surface of the Sphere, 'tis then called a *Regular Body*. See that Word.

POLYNOMIAL, or *Multinomial Roots*, in Mathematicks, are ſuch as are compoſed of many Names, Parts, or Members; as,

$$a + b + d + c.$$

In *Philoſ. Tranſ.* N. 230. you have a curious Method of raiſing an Infinite *Multinomial* to any Given Power; or of extracting any Given Root out of ſuch Power: Which was diſcovered from Sir *Iſaac Newton*'s Theorem for raiſing a *Binomial* to any Given Power, or Extracting the Root of the ſame, by that Ingenious and Excellent Algebraiſt Mr. *Abr. de Moivre*.

POLYPETALOUS *Flower*, is the Term in Botany for the Flower of a Plant which conſiſts of more than Six diſtinct Flower-leaves ſet round to form it; and which fall off ſingly.

POLYPUS, is a Swelling in the Hollow of the Noſtrils, and is Two-fold; either like a Tent, and then it goes by the general Name of *Sarcoma*; or ſuch an one that has a great many diſtinct Branches or Feet, which extend either to the Outſide of the Noſe, or the Inſide of the Mouth. Their Colour is White, oftentimes Reddiſh, and ſometimes Black and Livid.

Excreſcencies of this Nature happen not only in the Noſtrils, but ſometimes in the Heart, and in the Cavities of the thicker Membrane of the Brain. *Blanchard.*

POLYSCOPES, or *Multiplying Glaſſes*, are ſuch as repreſent to the Eye one Object as many.

POLYSPASTUM, a Term in Mechanicks, the ſame with the *Trochlea* or *Pully*.

POLYSPERMÆ *Plantæ*, are ſuch Herbs or Plants as have more than Four Seeds ſucceeding each Flower, and this without any certain Order or Number.

Theſe Mr. *Ray* makes to be a diſtinct kind of Herbs, calling them *Herbæ ſemine nudo Polyſpermæ*: Where by *Semine nudo* he means ſuch Seeds as do not put off, ſpontaneouſly the Integuments or Coverings which they either have, or appear to have, but fall covered with it from the Mother-Plant.

Theſe kind of Herbs he divides into Two ſorts.

I. Such as have a *Calyx* or *Perianthium* to their Flower; and this conſiſting either of,

1. *Three Leaves*; the Flower alſo being *Tripetalous*, or having but Three Leaves: As, the *Plantago Aquatica*, and the *Sagittaria*, both Water-Plants.

Or where the Flower is *Polypetalous*, and the *Calyx* falling together with the Flower; as in the *Chelidonium minus*; or remaining after the Flower is dropt, as in the *Hepatica Mobilis*.

2. *Five Leaves*; in ſome *Deciduous* with the Flower, as in the *Ranunculus*, In others *Perennial*, as in the *Helleborus niger ferulaceus*; or *Annual*, as in the *Flos Adonis*.

3. *Eight Leaves*; as the *Malva* and *Alcea*.

4. *Ten Leaves*; as the *Carrophylla, Fragraria, Pentaphyllum, Tormentilla, Argentina, Althæa*, and *Pentaphylloides*.

II. Such as have no *Calyx* or *Perianthium*; as the *Clematis, Pilipendula, Ulmaria, Anemone Nemorum, Pulſatilla*, &c.

POMIFEROUS *Herbs*, are (according to Mr. *Ray*) ſuch as have the largeſt of Fruit of any Plants whatever, and this covered with a thick hard Rind or Bark; by which they are diſtinguiſhed from the *Bacciferous Herbs*, which only have a thin Skin over the Fruit.

Theſe kind of Plants have a naked *Monopetalous* Flower, divided into Five Jaggs or Partitions, and growing on the top of the ſucceeding Fruit. And theſe either are,

1. *Capreolate*, or creeping along the Ground, *&c.* by means of their Tendrils, (*Capreoli*) as the *Cucurbita, Melo, Cucumis, Cepo, Belſamina, Anguria*, and *Colocynthis*. Or,

2. Without *Capreoli* or Tendrils; as the *Cucurbita Clypeata*, or *Melo-Cepo, Clypeiformis*.

POMIFEROUS *Trees*, ſee *Trees*) are ſuch as have their Flower on the top of the Fruit, and their Fruit in the Form of an Apple or Pear.

POMPHOLIGODES, Urine with many Bubbles upon it; which are frequent, if the Body be puft up or painted. *Blanchard.*

POMUM *Adami*, is a Protuberance in the Foreſide of the Throat; ſo called, becauſe 'tis fooliſhly thought a piece of the Apple ſtuck in *Adam*'s Throat, as part of his Puniſhment, and hence derived to his Poſterity. *Blanchard.*

In Reality 'tis only the Convex part of the firſt Cartilage of the *Larynx*, called *Scutiformis*. This is greater in Men than Women.

PONE, is a Writ, whereby a Cauſe depending in the County Court, or other Inferior Court, is removed into the Common-Pleas.

PONE *per Vadium*, is a Writ to the Sheriff to take Surety of one for his Appearance at a Day aſſigned.

PONENDIS *in Aſſiſis*, is a Writ founded upon the Statute of *Weſt.* 2 *cap.* 38. and upon the Statute *Articuli Super Chartas*, cap. 9. Which Statutes ſhew what Perſons Sheriffs ought to impannel upon *Aſſiſes* and Juries, and what not.

PONENDUM *in Ballium*, is a Writ commanding a Priſoner to be bailed, in Caſes Bailable.

PONENDUM *Sigillum ad exceptionem*, is a Writ whereby the King willeth the Juſtices, according to the Statute of *Weſtm.*2.to put their Seals to Exceptions laid in by the Defendant againſt the Plaintiff's Declarations, or againſt the Evidence, Verdict, or other Proceedings before the Juſtices.

PONS *Cerebri*, (by ſome) is a Congeries or Heap of innumerable Filaments divaricated out of the Solider Subſtance of the Brain, whence all the Nerves take their Riſe.

PONTAGE, is a Contribution towards the Maintenance or Re-edifying of Bridges. It may alſo ſignifie Toll taken to this Purpoſe of thoſe that paſs over Bridges.

PONTIBUS *Reparandis*, is a Writ directed to the Sheriff, *&c.* willing him to charge one or more to Repair a Bridge, to whom it belongeth.

PONTON, in Fortification, is a Bridge made of two Boats, at ſome Diſtance one from another, both covered with Planks; as alſo the Internal Space betwixt them. They have Props and Rails on each ſide; and the whole Structure ought to be ſo ſolid, as to be able to tranſport the Horſe, together with Cannon and Baggage, as well as the Infantry.

PONT *Volant*, or the *Flying Bridge*, uſed in Sieges, is made of two ſmall Bridges laid one over another; and ſo contrived, by the means of Cords and Pulleys placed along the ſides of the Under Bridge, that the Upper can be puſhed forwards 'till it joins the Place where it is to be fixed; But however the whole Length of both theſe Bridges muſt not be above Four or Five Fathom long, leſt they ſhould break with the Weight of the Men. Theſe are chiefly uſed to ſurpriſe Outworks or Poſts that have but narrow Moats.

POOP *of a Ship*, is the Floor or Deck over the Round-houſe or Maſter's Cabin, being the higheſt or uppermoſt part of her *Hull*, *a-ſtern*.

POPLITEA *Vena*, is the Vein of the Ham, and ſometimes reaches down the back of the Leg even to the Heel. This comes from the *Iliacal* Branches of the *Vena Cava*; which, after they deſcend as low as the Thighs, are called *Crurales*.

POPLITEUS, by ſome called *Subpopliteus*, is a Muſcle of the Leg, which ariſeth with a ſhort ſtrong Tendon from the External Head of the Inferior *Appendix* of the *Os Femoris*; from whence deſcending obliquely over the Juncture, becomes Fleſhy, and expanding it ſelf, is ſo inſerted to the Superior part of the *Tibia* internally, immediately below its Superior *Appendix*. This aſſiſts the other Muſcles in bending the *Tibia*, and alſo Antagonizeth the *Biceps*, by turning the Foot and Toes outwards when we ſit with our Knees bended.

PORES, are ſmall Interſtices, Spaces, or Vacuities between the Particles of Matter that conſtitute every Body, or between certain Aggregates or Combinations of them. Thus, for Inſtance, thoſe little imperceptible Holes in the Skin, thro' which the Sweat and Vapours inſenſible breath out of the Body, are called *Pores*; and the having of ſuch Holes or *Pores* in any Body, is called *Poroſity* or *Porouſneſs*.

The Honourable Mr. *Boyle* has written a Particular *Eſſay* on the *Poroſity* of Bodies; in which he proves, That the moſt Solid Bodies that are, have ſome kind of *Pores*. And indeed, if they had not, all Bodies would be alike *Specifically* weighty.

PORIME, (Gr. πόρισμα) in Geometry, is a Theorem or Propoſition ſo eaſie to be demonſtrated, that 'tis almoſt ſelf-evident; as, *That a Chord is all of it within the Circle*. And on the contrary they call that an *Aporime*, which is ſo difficult as to be almoſt impoſſible to be demonſtrated; as the *Quadrature of the Circle* is now, and as the Squaring of any Aſſigned Portion of *Hippocrates* his Lunes was, 'till a little while ago.

PORISME, *Proclus* and *Pappus* define this Geometrical Term to ſignifie a kind of Theorem, in the form of a Corollary, which is dependant upon, or deduced from ſome other Theorem already demonſtrated. And 'tis commonly uſed to ſignifie ſome General Theorem, which is diſcovered from finding out ſome Geometrical Place: As, for Inſtance, if a Man hath found out by Algebra, or any other Method how to Conſtruct a *Local Problem*; and from that Place ſo conſtructed and demonſtrated, hath deduced ſome General Theorem, that Theorem is by the Geometrick Writers called a *Poriſm*. Of theſe *Poriſms*, Mr. *Ozanam*, in his *French Mathematical Dictionary*, gives many uſeful Inſtances; which ſee.

PORISTICK *Method*, in Mathematicks, is that which determines *when*, *by what way*, and *how many different ways*, a Problem may be reſolved.

POROCELE, is a Rupture proceeding from Callous Matter, or the Stone. *Blanchard*.

POROTICA, are Medicines, which, by drying, thickening, and aſtringent Qualities, turn part of the Nouriſhment into Brawny, Callous Matter. *Blanchard*.

POROSITY. See *Pores*.

PORTA, the ſame with *Vena Portæ*.

PORT *the Helm*, a Sea-Term, ſignifying to put the Helm to the Left or *Larboard* ſide of the Ship; but however they never ſay *Larboard the Helm*, but always *Port it*; tho' they ſay *Starboard the Helm*, when it is to be put to the Right ſide of the Ship. A Ship is ſaid to *Heel a-port*, when ſhe ſwims not upright, but leans to the Left ſide. The Word

PORT, alſo ſignifies a Haven or Harbour; as alſo the Holes in a Ship's ſide thro' which her Great Guns are put out.

PORT-*Laſt*, the ſame as the *Gun-wale* of a Ship; therefore they ſay a *Yard is down a Port-Laſt*, when it lies down on the Deck.

PORTABLE *Barometer*, was firſt invented by the Honourable Mr. *Boyle*, and was effected by making the *Torricellian* Experiment in a long Glaſs Tube, ſealed at the top, and bent near the bottom up again, parallel to the longer Leg: For by this means the Quick-ſilver in the open and ſhorter Leg, ſupplied the Place of the ſtagnant Mercury in the Baſon or Ciſtern. The Inſtrument

ment was all of one piece, and might eaſily be carried from Place to Place without ſpilling the Mercury. By which means, Obſervations of the Weight of the Atmoſphere might be readily made on the Tops of Hills, Bottoms of Mines, &c.

But this open Tube could not be carried about with ſo much Eaſe and Safety as thoſe *Portable Barometers* which are *now* in Uſe, and which are made by Mr. *John Partrick*, Torricellian Operator in the *Old Baily*, with very great Exactneſs and Neatneſs: For in theſe there is an Invention to ſcrew the Mercury quite up to the Sealed end of the Tube, by which means it will not ſwag up and down in the Carriage, and ſo by its great Weight endanger the breaking of the Tube.

PORTCULLICE, *Herſe*, or *Sarazine*, in Fortification, ſignifie ſeveral great Pieces of Wood laid or joined acroſs one another like an Harrow, and at the Bottom it is pointed at the end of each Bar with Iron. Theſe formerly uſed to hang over the Gate-ways of Fortified Places, to be ready to let down in Caſe of a Surprize, when the Enemy ſhould come ſo ſoon, as that there is no Time to ſhut up the Gates. But now a-days the *Orgues* are more generally uſed, as being found to be much better. See *Orgues*.

PORTICO, or *Porch*, in Architecture, is a long Place cover'd either with a vaulted Roof, or an even Floor, ſupported by Pillars. But this Word may be applied to ſignifie all manner of Diſpoſitions of Columns in a Gallery.

PORTIONER, where a Parſonage is ſerved ſometimes by two, or ſometimes by three Miniſters alternately. The Miniſters are called *Portioners*, becauſe they have but their Portion, or Proportion of Tythes or Profits of the Living.

PORTMOTE, ſignifies a Court kept in Haven Towns, as *Swainemote* in the Foreſt, and is called the *Portmote Court*.

PORUS *Bilarius*, or *Meatus Hepaticus*, is a Pipe or Channel paſſing directly from the Liver to the *Ductus Communis*, and which tranſmits the Bile from the Liver, by the Intervention of ſome ſmall Glandules. Within the Liver, its Trunk and Branches are inveſted with a double Coat: A *Proper* one which it retains alſo without the Liver; and another common to it and the *Porta*, called *Capſula Communis*, which it hath from the Membrane of the Liver. In this Common Coat, this *Porus* and the *Porta* are ſo cloſely enwrapped, that at firſt they appear but one Veſſel; but if you hold them up to the Light, you will diſcover Veſſels of two Colours; and then you may dexterouſly rip up the *Capſula*, and ſo lay them open. Its Roots within the Liver are equally divided with thoſe of the *Porta* every where, except in that little Space where the Roots of the *Veſica* are ſpread in the Right ſide of the Liver; and they are both larger and more numerous than thoſe of the *Veſica*, drawing Choler from all Parts of the Liver almoſt. And this *Porus Bilarius* ſeems to be a more neceſſary Part than the Gall-Bladder, or *Veſica*; becauſe in many Creatures, as Red and Fallow Deer, Horſes, &c. the *Veſica* is wanting, but none want this. Without the Liver, 'tis as wide again as the *Meatus Cyſticus*, with which it joins at two Inches Diſtance from the Liver; and ſo both make up the *Ductus Choledochus Communis*. The *Porus* hath no Valve in its whole Progreſs; only the *Ductus Communis*, at its Entrance into the Inteſtines, having pierced the Outer Coat, paſſes between *that* and the Middlemoſt Coat, for about the 12th part of an Inch; and then piercing *that* alſo, marches down farther between it and the Inner Coat of the Gut, for about half an Inch, and at laſt opens with a round Mouth into the Inteſtine: So that this Oblique Inſertion (like that of the Ureters into the Urinary Bladder) ſerves inſtead of a *Valve*, to hinder any thing from Regurſitating out of the Guts into this Duct: And this is farther prevented alſo by the flaggy, looſe Conſtitution of the Inner Tunick of the Guts; which, when any thing would enter, the Mouth of the *Porus* claps cloſe upon it, and ſtops it. There are no *Anaſtomoſes* between the Roots of this Duct and thoſe of the *Porta*, as have been often ſaid; For the Extreme Capillary Twigs of the *Porus* terminate in the *Parenchyma* of the Liver, out of whoſe Glandules they imbibe the Choler, there ſeparated from the Blood.

POSITION, or *Site*, is an Affection of Place, and expreſſes the Manner of any Bodies being in a Place: This therefore is not *Place*, nor indeed hath it any Quantity; as Sir *Iſ. Newton* well obſerves in *Princip. Mathem.* p. 6.

POSITION, or the *Rule of Poſition*, otherwiſe called the *Rule of Falſhood*, is a Rule in Arithmetick, wherein any Number is taken to work the Queſtion by, inſtead of the Number ſought; and ſo by the Error or Errors found, we find the Number required.

This *Rule of Falſe Poſition* is of two kinds, *viz.* *Single* and *Double*.

POSITION *Single*, is when there happens in the Propoſition ſome Partition of Numbers into Parts Proportional; and then at one Operation the Queſtion may be reſolved, by this Rule.

Imagine a Number at pleaſure, and work therewith according to the Tenor of the Queſtion, as if it were the true Number; and what Proportion there is between the Falſe Concluſion and the Falſe Poſition, ſuch Proportion hath the Given Number to the Number ſought: Therefore the Number found by Argumentation ſhall be the firſt Term of the *Rule of Three*, and the Number ſuppoſed ſhall be the ſecond Term, and the Given Number ſhall be the third Term.

Example.

Three Men, *A.* *B.* and *C.* conſent to buy a Ship for 220 *l.* So that *B.* muſt pay twice as much as *A.* and *C.* four times as much as *B.* How much muſt each Man pay?

Anſwer. Suppoſe *A.* paid 8 *l.* then (according to the Queſtion) *B.* muſt pay 16 *l.* and *C.* four times as much, *i. e.* 64 *l.* But all theſe Numbers added together, make no more than 88 *l.* whereas there ſhould be 220 *l.* Yet by the help of this Number, I ſay, If 88 *l.* come of 8 *l.* of what comes 220 *l.* wherein the Work is gain'd 20 *l.* for the Part of *A.* Then *B.* muſt pay 40 *l.* and *C.* 160; which added together, give 220 *l.* the Number propounded.

		Position falſe.	*Concluſ. true.*
Poſition	8	88 *l.* : 8 *l.* : : 220 *l.* : 20 *l.*	*A.*
Double	16	40	*B.*
Quadruple	64	160	*C.*
	88	220	Proof.

If there be a Fraction or Fractions in the Queſtion, then for more Facility in Proceeding take ſuch a Number for the *Poſition* as may be equally parted by the Parts expreſt in the Queſtion.

In Queſtions propounded, it happens ſometimes that a Number ſtands unalterable by the Fractions given, and ſo may be ſubſtracted from the Sum given, and ſet by 'till the Operation be made with the reſt, and then reſtored again.

POSITION *Double*, is when there can be no partition in the Numbers to make a Proportion: Therefore you muſt make a Suppoſition twice, proceeding therein according to the Tenor of the Queſtion; and if either of the ſuppoſed Numbers happens to ſolve the Propoſition, the Work is done; but if not, obſerve the Errors, andwhether they be greater or leſſer than the Reſolution requireth, and mark the Errors accordingly, with the Signs + or −

Then multiply contrariwiſe the one *Poſition* by the other Error; and if the Errors be both too great, or both too little, ſubſtract the one Product from the other, and the one Error from the other, and divide the Difference of the Products by the Difference of the Errors.

But if the Errors be unlike, as the one +, and the other −, add the Products, and divide the Sum thereof by the Sum of the Errors added together: For the Proportion of the Errors is the ſame with the proportion of the Exceſſes or Defects of the Numbers ſuppoſed, to the Numbers ſought.

Example.

Two Men, *A.* and *B.* diſcourſing of their Money; *A.* ſays to *B.* *If I had two of your Pieces, I ſhould have twice as many as you have*; to which *B.* replies, *If I had two of yours, I ſhould have juſt as many as yau have*: How many had each?

Suppoſe *A.* had 16, to which 2 being added makes 18, which is twice 9; but having taken 2 from thence, it muſt be by this Suppoſition that *B.* had 11: Wherefore 2 taken from 16, and added to 11, makes 13 for *B.* and *A.* 14. But they ſhould be equal; therefore the Poſition is erroneous, and the Error too much by 1.

Again, Suppoſe *A.* had 20, then 20 + 2 = 22. that is twice 11; but from thence 2 being taken, *B*, muſt have 13. Now 2 from 20, and put to 13, gives 15 for *B.* and leaves 18 for *A.* which is not equal; therefore the Error again is 3 too much.

Then multiplying 16 the firſt Poſition, by 3 the ſecond Error, and alſo 20 the ſecond Poſition, by 1 the firſt Error; the Product 20 is taken from the Product 48, (becauſe the Errors are both + and the remainder 28 is the Dividend; and the leſſer Error 1 ſubſtracted from the greater Error 3, leaves 2 for the Diviſor; the Quotient of which Diviſion will be 14, the Number ſought for *A.* and then by conſequence *B.* muſt have 10: For 2 taken from 10, and added to 14, make 16 = twice 8; 2 taken from 14, and put to 10, makes 12 both alike.

First		Second
Poſition	16 \ / 20	*Poſition.*
Error	1+ 3+	*Error.*
	20 48	

Products 48 − 20 = 28 (14 *A.*
Errors 3 − 1 = 2 (10 *B.*

Proof.

14 + 2 = 16 } half.
10 − 2 = 8 }
14 − 2 = 12 } equal.
10 + 2 = 12 }

If the Suppoſitions had been 12 and 10, the Errors being both −, the Operation would have ſtood thus, as before, becauſe the Errors are alike.

First		Second
Poſition	12 \ / 10	*Poſition.*
Error	1− 2 −	*Error.*
	10 24	

Products 24 − 10 = 14 (14 *A.*
Error 2 − 1 = 1 (10 *B.*

But if the Suppoſitions are 20 and 10, then the Errors being found unlike; the Sum of the Products muſt be the Dividend, and the Sum of the Errors the Diviſor.

First		Second
Poſition	20 \ / 10	*Poſition.*
Error	3+ 2 −	*Error.*
	30 40	

Product 30 + 40 = 7 (14 *A.*
Errors 3 + 2 = 5 (10 *B.*

Note, 1. That as well in the *Single* as in the *Double Rule of Poſition*, tho' the Number ſuppoſed be never ſo falſe, a Reſolution may be had thereby: Yet for more Eaſe in the Operation, ſuppoſe a Number that may be parted equally into ſo many Parts as are neceſſary to the Reſolution of the Queſtion.

2. Let the Second *Poſition* be always *Homogeneal*, or of the ſame kind with the firſt; that is, belong both to one Man, one Thing, &c.

3. If both the Errors be equal in Numbers, and yet their Signs unlike, half of both the *Poſitions* is the Sum deſired.

4. All the Propoſitions reſolved by *Single Poſition*, will be reſolved by *Double Poſition*.

POSI-

POSITIVE of Degree of Comparison in Grammar, is that which signifies the Thing simply and absolutely, without comparing it with others; it belongs only to *Adjectives*.

POSITIVE *Levity*. See *Levity*.

POSITIVE *Quantities* in *Algebra*, are such as are of a Real and Affirmative Nature, and either have, or are supposed to have the Affirmative or Positve Sign + before them, and 'tis always used in opposition to the *Negative Quantities*, which are defective, and have this Sign— before them.

POSSE *Comitatus*, a Term in Law, signifying the Aid and Attendance of all Knights, Gentlemen, Yeomen, Labourers, Servants, Apprentices, and all others, above the Age of Fifteen Years within the County; except Women, Ecclesiastical Persons, and such as are decrepid, or labour of an Infirmity: And the Statute of 2 *H.* 5. *cap.* 8. says, *That Persons able to Travel, shall be assistant in this Service*, which is used where a Possession is kept upon a Forcible Entry, or any Force of Rescue used, contrary to the Command of the King's Writ, or in opposition to the Execution of Justice.

POSSESSION, in a Legal Sense, is taken twofold, *Actual* and *in Law*: *Actual Possession* is, when a Man actually enters into Lands and Tenements to him descended. *Possession in Law*, is when Lands or Tenements are descended to a Man, and he hath not as yet actually entred into them. As for Example.

Before or until an Office be found of Lands Escheated by an Attainder, the King hath only a *Possession in Law*, and not in *Deed*: There is also a Unity of *Possession*, which the *Civilians* call *Consolidationem*. If the Lord purchase the Tenancy held by *Heriot Service*, then the *Heriot* is extinct by Unity of *Possession*; that is because the Seigniory and the Tenancy are now in one Man's *Possession*.

POSSESSIVES, in Grammar, are such *Adjectives* as signifie the Possession of, or Property in some Thing.

POSTEA in Law, is the Return of the Proceeding by *Nisi prius*, into the Court of *Common-Pleas*, after a Verdict, and there afterwards Recorded.

POST-*Brachiale*, vid. *Metacarpus*.

POST *Diem*, is the Return of a Writ after the Day assigned, for which the *Custos Brevium* hath four Pence, whereas he hath nothing if it be return'd at the Day; sometimes it is taken for the Fee it self.

POST *Disseisin*, is a Writ given by the Statute of *Westminst.* 2. *cap.* 26. and lies for him that having recovered Lands or Tenements by *Præcipe quod reddat* upon the Default or Reddition, is again disseised by the former Disseisor.

POST *Fine*, in Law, is a Duty belonging to the King, for a Fine, formerly acknowledged before him in his Court, which is paid by the Cognisee, after the same is fully passed, and all things performed touching the same; the Rate thereof is so much, and half so much as was paid to the King for the Fine, and is Collected by the Sheriff of the County, where the Land, *&c.* lies whereof the Fine was levied, to be answered by him into the Exchequer.

POST *Terme*, is a Return of a Writ, not only after the Day assigned for the Return thereof, but after the *Term* also; for which, the *Custos brevium* takes the Fee of Twenty Pence; sometimes also it is taken for the Fee it self.

POSTERN, in Fortification, is a false Door usually made in the Angle of the *Flank*, and of the *Curtain*, or near the *Orillon* for private Sallies.

POSTICUM, is the *Postern-Gate*, or *Back-Door* of any Fabrick.

POSTULATES, or *Demands* in *Mathematicks*, &c. are such easy and self-evident Suppositions as need no Explication or Illustration to render them Intelligible. As,

That a Right Line may be drawn from one Point to another.

That a Circle may be described on any Centre given, of any Magnitude, &c.

POSTULATION, (in the Law) is made upon the Unanimous Voting of any Person to a Dignity or Office, of which he is not capable by the Ordinary Canons or Statutes, without special Dispensation.

POTANS, or *Potence*, a Part of a Watch; see under *Balance*.

POTENT, or *Potence*, the Term for a Cross in Heraldry, formed into this Figure.

He beareth *Sable*, *a Cross Potent*, *Or*, by the Name of *Aleyn*.

This form represents the upper end of a Crutch; for Anciently Crutches were called *Potents*.

POTENT, *Counter Potent*, a Term in Heraldry: See *Vairy Copy*.

POTENTIAL *Coldness*, is a Relative Quality which some Drugs, Simples, or Compound Medicines are supposed to be endowed with: And therefore you will find frequently in some Old Books, or in the Writings of such as follow the Old Physicians, that such a Plant or Drug, is cold in the 2d or 3d Degree: The meaning of which, is, not that such a Plant is actually Cold to the Touch, but that it is Cold in its Effects and Operations, if taken Inwardly. And whenever such an Effect doth follow the taking of such Medicine, Mr. *Boyle* thus accounts for it according to the Mechanical Philosophy, *viz.* That this Body, which they call *Potentially Cold*, is made up of *Corpuscles* of such a Size, Shape, *&c.* that being disjoined and resolved by the *Menstruum* of the Stomach, or the Fluids it may elsewhere meet with, they do so intimately associate themselves with the small parts of the Blood and other Liquors, as by clogging and impeding them to lessen their wonted Agitation; and perhaps also to make them act in a peculiar way, as well as less briskly on the Nervous and Fibrous parts of the Body: The Perception of which *Imminution*, or perhaps *Change* of Motion in the Organs of Feeling, is that, which being referred to the Body that produced it, is called *Potential Coldness*.

Hence, if it be supposed that in Agues some Morbifick Matter of a viscous, or not easily dissipable Texture, be harboured in some part of the Body, and requires such a Time to be made fluid and resolvable, which is an *Hypothesis* generally received, the Cold Fits in these Diseases, will be plausibly accounted for.

Also the Shiverings and Cold arising from the taking of most Poisons, may hence be solved; and that lesser Degree of it which seizes *Hypochondriack* and *Hysterical* Persons.

POTENTIAL *Mood in Grammar*, is the same in form with the *Subjunctive*; but differs in this

That

That it hath always Implied in it, either *Possum, Volo*; or *Debeo*; as *Roget Quis*, that is, *Rogare potest*, a Man may ask. 'Tis sometimes called, The *Permissive* Mood, because it implies often a Permission or Concession to do a thing: As

Habeat, valeat, vivat cum illa. Terent.

POUR *fair proclamee, que null inject fimes ou ordures en fosses, on rivers pres Cityes*, &c. is a Writ directed to the Mayor, Sheriff, or Bailiff, of a City or Town, commanding them to proclaim, That none cast Filth into the Ditches or Places near adjoyning, and if any cast already, to remove it.

POUR *Party*, is a Term in Law, contrary to *pro indiviso*; for to make *Pour party*, is to divide and sever the Lands that fall to *Parcener*, which before Partition they hold jointly, and *pro indiviso*.

POUR *Seisir Terres la feme que tient en Dower*, &c. was a Writ whereby the King Seised upon the Land, which the Wife of his Tenant that held *in Capite*, deceased, hath for her Dowry, if she Married without his Leave; and is grounded upon the Statue of the King's Prerogative.

POUR *Suivant*, signifies the King's Messenger attending upon him in his Wars, or at the Council Table, Exchequer, in his Court, or his Chamber, to be sent upon any Occasion or Message; as for the Apprehending of a Person Accused, or Suspected of any Offence: Those that be used in Martial Causes, are called *Pursuivant at Arms*, others are used upon Messages in time of Peace, and especially in Matters touching Jurisdiction.

POURVEYANCE, is the providing, Corn, Fuel, Victual, and other Necessaries for the King's House.

POURVEYOR, signifies an Officer of the King or Queen, or other great Personage, that provideth Corn and other Victual for their House.

POWCHES, so the Seamen call small Bulkheads made in the Hold of a Ship, to stow Corn, Goods, or the like, that it do not shoot from one side to the other.

POWERS in *Algebra*, are Numbers arising from the Squaring or Multiplication of any Number or Quantity by it self, and then that Product by the Root or first Number again; and this Third Product by the Root again; and so on *ad Infinitum*; as, 2, 4, 8, 16, 32, 64, 128, 256, &c. Where 2 is called the Root or First Power, 4 is the Square or Second Power, 8 is the Cube or Third Power, 16 is the Biquadrate or Fourth Power, &c. And these Powers in Letters or Species, are expressed by repeating the Root as often as the Index of the Power expresses, thus; a is the Root or First Power, $a\,a$ the Square or Second Power, $a\,a\,a$ the Cube, $a\,a\,a\,a$ the Biquadrate or Fourth Power. And to avoid the tediousness of repeating the Root so often when the Powers are high, we only put down the Root with the Index of the Power over it, thus: a^9, that is the ninth Power of a; b^{16}, b^{94}, are the sixteenth or the ninety fourth Powers of b.

POWERS, *Mechanicks*, are the Six Mechanical Faculties; the Ballance, the Leaver, the Wheel, the Pulley, the Wedge, and the crew; which are usually stiled the Six *Mechanick Powers*. The Force also or Strength brought for the moving of any Weight by any Engine, is called the *Power*. And the design of Mechanicks, is to teach Men how to add such a fitting Supplement to the Power, as that it may move any Weight required, with facility and cheapness, and in as little room as may be. See Vol. II.

POWERS *of Lines*, or Quantities are their Squares, Cubes, &c. or other Multiplications of the parts into the whole, or of one part into another.

POYNING's *Law*, is an Act of Parliament made in *Ireland* by *Hen.* 7. and so called, because Sir. *Edward Poyning* was Lieutenant there, when it was made; whereby all the Statutes in *England* were made of Force in *Ireland*, which before that time were not, neither are any now in force there which were made in *England* since that time.

PRACTICE in Arithmetick, is a Rule which expeditiously and commodiously answers Questions in the *Rule of Three*, when the first Term is 1, or Unity, and 'tis so called from its readiness in the *Practice* of Trade and Merchandise.

Of this Rule there are several Ways of Operation; As by

Reduction, or bringing the Price of the Pound, Ell, Yard, &c. into the Lowest Denomination of usual Money: The way to do which, see under the Word *Reduction*. And this way of Practice will be clear from these two Examples.

1. *At* 1 s. 2 d. *the Pound, what comes* 152 *Pounds to?*

Bring all into Pence, and say, 1 : 14 :: What shall 152 give?

Answer.

$152 \times 14 = 2128$ *d*, which reduced, gives 8 *l.* 17 *s.* 4 *d.*

2. *If* 1 *Pound cost* 3 s. 6. *d. what shall the Great Hundred and* 5 *Pound cost?*

Reduce 3 *s.* 6 *d.* into Six-pences, *i. e.* 7 Six-pences; and because the Great Hundred is 112 *l.* the Pounds will be 117. Then the Question will stand thus.

1 : 7 : : 117 : $117 \times 7 = 819$ Six-pences; that is, 20 *l.* 9 *s.* 6 *d.*

The other more usual way of *Practice*, is by Aliquot Parts. For if the Price fall out to be the Aliquot Parts, or even parts of a Pound, or a Shilling, then the Work may be shortened much; thus.

The Even parts of a Shilling are these: 6 *d.* the $\frac{1}{2}$, 4 *d.* the $\frac{1}{3}$, 3 *d.* the $\frac{1}{4}$ part, 2 *d.* the sixth part, 1 *d. ob.* the $\frac{1}{8}$ part, and 1 *d.* the $\frac{1}{12}$ part.

Therefore if any Question, wherein 1 is in the First place, be proposed, and if any of these parts be in the Second; you may find the Fourth Term, by taking the one part of the Third, as in this Example.

At 6 d. *the Yard, Pound or Ounce, what comes* 74 *Yards to?*

Answer.

Answer.

1 *l.* 17 *s.* By taking the half of 74, which is 37 *s.* or 1 *l.* 17 *s.*

At 3 d. *the Yard, what comes* 74 *Yards to?*

Answer.

18 *s.* and 6 *d.* By dividing 74 by 4.

But if the Queſtion fall not right upon any of theſe aliquot Parts, then you muſt work oftner; as,

At 10 d. *the Pound, what will* 133 *Pound give?*

Answer.

5 *l.* 10 *s.* 10 *d.* By dividing 133 by 2 (for 6 *d.*) 'twill be 66 *s.* and 6 *d.* And then by 3 (for 4 *d.*) which makes 44 *s.* 4 *d.* in all 110 *s.* 10 *d.* or 5 *l.* 10 *s.* 10. *d.*

And ſo for 8 *d.* take 4 *d.* twice; for 9 *d.* take 3 *d.* thrice; for 11 *d.* take 6 *d.* 3 *d.* and 2 *d.*

The ſame may be done with the Aliquot Parts of a Pound: And to make this more plain and eaſie, you have here a compleat Diviſion of the even and uneven Parts of a Pound; as alſo the even and uneven Parts of a Shilling.

Even Parts of a Pound.		Parts.	Uneven Parts of a Pound.	Divided into Even Parts.			Parts.		
s.	*d.*		*s.*	*s.*					
10	00	½	19	10	5	4	2	4	5
6	8	3	18	10	4	4	2	5	5
5	00	4	17	10	5	2	2	4	10
4	00	5	16	10	4	2	2	5	10
3	4	6	15	10	5		2	4	
2	06	8	14	10	4		2	5	
2	00	10	13	4	4	5	5	5	4
1	08	12	12	10	2		2	10	
1	03	16	11	5	4	2	4	5	10
1	00	20	9	5	4		4	5	
0	10	24	8	4	4		5	5	
0	08	30	7	5	2		4	10	
0	06	40	6	4	2		5	10	
			3	2	1		10	20	
Even parts of a Shilling.			of a Shilling.	*d.*					
6	*d.*	½	11	*d.*	6	3	2	2	4	6
4		3	10		6	4		2	3	
3		4	9		3	3	3	4	4	4
2		6	8		4	4		3	3	
1		12	7		4	3		3	4	
1	*ob.*	8	5		3	2		4	6	

The Uſe of this Table *is eaſily known from what hath been ſaid before.*

PRÆCIPE *in Capite*, was a Writ iſſuing out of the Court of *Chancery*, for a Tenant holding of the King in Chief, as of his Crown, and not as of any Honour, Caſtle, or Mannor.

PRÆCIPE *Quod reddat*, is a Writ of great Diverſity, both in its Form and Uſe; for which, ſee *Ingreſſus* and *Entry*. This Form is extended as well to a *Writ of Right*, as to other Writs of *Entry* or *Poſſeſſion*. It's ſometimes called a *Writ of Right Cloſe*, as a *Præcipe in Capite*, where it iſſueth for a Tenant holding of the King in Chief, as of his Crown; and not of the King, as of any Honour, Caſtle, or Mannor: And ſometimes a *Writ of Right Patent*, as when it iſſues out of the *Chancery*

very Patent, that is open to any Lord's Court, for any of his Tenants deforced againſt the Deforcer, and muſt be determined there.

PRECARIÆ, are Days Works, which the Tenants of ſome Mannors are bound, by reaſon of their Tenure, to do for their Lord in Harveſt; called in ſome Places *Bind-days*, or *Bidden-days*.

RPÆCORDIA, are all the Intrails in the Cheſt or Thorax.

PRÆDICAMENT, in Logick, is a certain Claſs or Determinate Series or Order, in which Simple Terms or Words are ranged: Of theſe they uſually account Ten Heads, *viz.* Subſtance, Accident, Quantity, Quality, Action, Paſſion, Relation, the Situation of Bodies as to place, their Duration as to Time, their Site or Poſition, and their Habit or External Appearance

PRÆMUNIRE, is a Writ that lies where any Man ſues another in the Spiritual Court for any thing that is determinable in the King's Court; for which great Puniſhment is ordained by divers Statutes, *viz.* That he ſhall be out of the King's Protection, and put in Priſon without Bail or Mainpriſe, 'till he have made Fine at the King's Will, and that his Lands and Goods ſhall be forfeited if he come not within two Months: And his Proviſors, Procurators, Attorneys, Executors, Notaries, and Maintainers, ſhall be puniſhed in the ſame manner. See the *Statute*. And upon divers other Offences is impoſed, by Statutes lately made, the Penalty they incur who are attainted in *Præmunire*: As by 13 *Eliz.* cap. 8. they who are aiding to make a corrupt bargin, whereupon Uſury is reſerved for above Ten Pound in the Hundred for a Year, *&c.*

PRÆPARANTIA *Vaſa*, in Anatomy, the Preparing Veſſels, are the Spermatick Veins and Arteries which go to the Teſticles and *Epididymes*: (which ſee.) They were ſo called by the Ancients, as thinking they prepared the Seed.

The Arteries are two, and ſpring from the Trunk of the *Aorta*, about two Fingers Breadth uſually, beneath the *Emulgents*; and not from its Side, but out of its Fore-part: The Right whereof climbing over the Trunk of the *Vena Cava*, runs obliquely to the Vein on the ſame ſide; and the Left marches to the Vein of that ſide.

The Veins alſo are Two: The right ariſes uſually from the Trunk of the *Vena Cava*, a little below the *Emulgent*; the Left from the *Emulgent* it ſelf; for otherwiſe it muſt have gone over the *Aorta*, whereby it might have been in danger of being broken; or at leaſt, by the continual Pulſe of the Artery, the Recourſe of the Venal Blood might have been hindred or retarded.

Both theſe Arteries and Veins, a little after their Origin, do meet together, and are included in one common Membrane made of the *Peritonæum*; and then they run ſtraight through the Region of the Loins above the Muſcles *Pſoæ* on each ſide, and above the Ureters; and as they go, they beſtow little Slips here and there on the *Peritonæum*, between whoſe Duplicatures they deſcend, and ſo arrive at its Proceſſes.

The Veins divide very often into many Branches, and then inoſculate and unite again; but the Arteries go along by one Pipe only on each ſide, until within three or four Fingers breadth of the Teſticles, where each is divided into two Branches; the Leſs whereof runs to the *Epididymis*, the Larger to the Teſticle: And as they came down between the Membranes of the *Peritonæum*, ſo they paſs into the *Scrotum* between them; not perforating the Inner in the Proceſſes, as in Dogs and other Creatures, (wherein the Proceſſes of the *Peritonæum* are hollow like a Quill) but in Man the inner Membrane of the *Peritonæum* ſhuts the Hole, leſt the Inteſtines ſhould fall down through it into the *Scrotum*.

It hath been formerly believed, that there are divers Inoſculations between theſe Veins and Arteries in their Paſſage, whereby the Venal and Arterial Blood are mixed together; but ſince the Circulation of the Blood hath been known, that is diſcovered to be impoſſible, becauſe the Blood in the Arteries deſcends, and that in the Veins aſcends. And indeed the Blood for the Elaboration of the *Semen*, and for the Nouriſhment of the Teſticles, flows down by the Arteries only, and that in an even and undivided Courſe without any of thoſe Vine-like Tendrils, thoſe Turnings and Windings which have formerly ſo much been ſpoken of; as *De Graef* by his own frequent Inſpection teſtifies. And the Veins bring back from the *Teſtes* what remains of the Blood after this; which Veins indeed do come out from their innermoſt Membrane with almoſt innumerable Roots, by which they imbibe the refluent Blood; and they are moſt admirably interwoven and inoſculated with one another 'till about four Fingers breadth above the Teſticles, which Space is called *Corpus, Pyramidale, Plexus, Pampiniformis*, and *Varicoſus*: But theſe Veins are ſo far from Preparing the *Semen*, that they only bring back what is Superfluous from the making of it. Nor indeed can the Arteries juſtly merit the Name of *Preparing Veſſels*, becauſe the Blood they convey to the Teſticles acquires no ſenſible Alteration 'till it come thither. However the Old Names are continued, but 'tis neceſſary to give this Caution about the Uſe of theſe Veſſels.

PRÆPOSITION, in Grammar, is an Indeclinable Word, by which a Noun and a Verb are joined together, in order to ſignifie the Cauſe of any thing, the Time, Place, Conjunction, Privation, *&c.* 'Tis called *Præpoſition*, becauſe 'tis moſt frequently in the Latin Tongue placed before other Words; and this either ſeparately, as *Ad patrem*; or conjunctively, as *Admiror*.

PRÆSEPIA, the Holes of either Jaw, wherein are contained the Teeth.

PRAGMATICAL. A Word commonly in *Engliſh* taken in an ill Senſe, and is ſpoken of a Medler, Buſie body, or fooliſh Prater and Tatler about Impertinent Things that do not belong to him. But in Phyſicks, or Natural Philoſophy, the Word is ſometimes uſed in a good Signification, and ſignifies the ſame as Practical, Mechanical, or Problematical. Thus *Stevinus*, in his *Hydroſtatical Elements* calls ſome Mechanical or Practical Experiments, which he pretends to inſtruct his Reader how to make, by the Name of *Pragmatical Examples*; and in the ſame Senſe 'tis ſometimes uſed by other Naturaliſts.

PRAY-*Age*. See *Age-prior*.

PREAMBLE, in the General, is taken for the Introduction or Beginning of any Diſcourſe: And by the Lawyers, the Beginning of an Act is called *The Preamble*.

PREBEND, is the Portion which every Member or Canon of a Cathedral Church receiveth in the Right of his Place for his Maintenance: And

And these *Prebends* are either *Simple*, or *with Dignity*. *Simple Prebends* are those that have no more but the Revenue towards their Maintenance. *Prebends with Dignity*, are such as have Jurisdiction annex'd to them, according to the divers Orders in every several Church.

PREBENDARY, is he that hath a *Prebend*, and is so called, *a Præbendo auxilium aut consilium Episcopo vel Decano.*

PRECE *Partium*, is when a Suit is continued by the Assent or Agreement of both Parties.

PRECEPT, in Law, is diversly taken, as sometimes for a Commandment in Writing sent out by a Justice of Peace, or other like Officer, for the bringing of a Person or Records before him. Sometimes it is taken for the Provocation, whereby one Man incites another to commit a Felony, as Theft, Murder, *&c.*

PRECESSION *of the Equinox*: In the New Astronomy, the Fix'd Stars are supposed to be immovable, and that the Earth turns round the Sun by its Annual Motion; so that its Axis makes always an Angle of 66 Degrees and an half with the Plane of its Orbit. Now if this Axis were always exactly directed to the same Point of the Heavens, or moved always precisely parallel to it self, as it doth nearly; then the Fix'd Stars would appear to have no other Motion but the Diurnal one. But because in Reality the Axis of the Earth doth a little vary from such an exact Parallelism, and doth not point always precisely to the same Star when it is in the same Place of its Orbit, but makes a small Angle with a Line imagined to lie in the Position it had formerly in the same Place: Hence it happens that the Equinoctial Points, or the common Intersections of the Equator and Ecliptick, do retrocede or move backwards from East to West, about 50 Seconds each Year; and this Motion backwards is by some called the *Recession of the Equinox*, by others the *Retrocession*; and the advancing of the Equinoxes forward by this means is called the *Procession* of them.

PRECIPITATE. Whatever is gotten out of the Pores of a Menstruum, in which it was dissolved, and by some means is precipitated or made fall down to the bottom of the Vessel, may properly be called *Precipitate*. See *Precipitation*. But the Chymists and Writers of Pharmacy commonly give this Name by way of Eminence to the Mercury dissolved in Acid Menstruums, and then afterwards precipitated down to the bottom in fine Pouders, of which they reckon these following;

1. *White Precipitate*, which is Mercury dissolved in *Aqua-fortis*; or, which is better, Spirit of Nitre; and then precipitated to the bottom with Salt Water, and a little Spirit of Sal-Armoniack. But if instead of Salt Water, and that Volatile Spirit, you had used hot Urine, a Pouder would have fallen down, which may be called,

2. *Rosie Precipitate*, since it will be of a Pale Rose Colour.

3. *Red Precipitate*, is Mercury dissolved in Spirit of Nitre, and then the Moisture is evaporated in a Sand-Heat; and then the Fire being gradually encreased to the Third Degree, the Matter turns Red. Tho' this be called a *Precipitate*, 'tis improperly so here, being no Precipitation at all. If the Spirit of Vitriol be dropt into a little of this *Red Precipitate*, it presently turns it White; but Spirit of Sal-Armoniack will turn it Grey.

There is also another sort of *Red Precipitate* which the Chymists call *Philosophical Precipitate*, and often *Precipitate per se*; which is by including Running Mercury in a Matrass, which is set in a Sand-Heat for Forty Days; or 'till all the Mercury be reduced to a Red Pouder.

4. *Green Precipitate*, is made by mingling the Dissolutions of Mercury and Copper together, both made in Spirit of Nitre; the Mixture is evaporated to Driness, and then the Mass at the bottom is poudered, and hath distilled Vinegar poured upon it, and digested with it for Twenty four Hours, or 'till the Liquor looks Green, and a little Bluish; then the Liquor is poured off, and more Vinegar put on, and so repeated 'till all be dissolved: Then all these Dissolutions are mixed and evaporated in a Sand-Heat 'till the Matter be of the Consistence of Honey; then taken off the Fire, it will harden as it cools, and grow pulverizable. The Pouder of it is this *Green Precipitate*, as improperly so named as the other *Red ones.*

5. *Yellow Precipitate.* See *Turbith Mineral.*

If Sublimate Corrosive be dissolved in Water, a little Oil of Tartar, *per Deliquium*, poured into the Solution, will make a *Red Precipitate*; and Spirit of Sal-Armoniack will give from some more of the same Solution a *White Precipitate*; and Lime-water will give the Solution a Yellow Colour, as you may see in the *Phagædenick Water*: And a little Spirit of Vitriol will clear off these Precipitates and Colours, and render the Liquor greatly transparent and colourless like Fair Water.

All these Precipitates, or any other, may easily be revived into Running Mercury, by mixing them with Quick-lime, and then distilling, as in Reviving Mercury from *Cinnabar*; which see.

PRECIPITATION, in Chymistry, signifies the Falling-down of the Particles of any Metalline or Mineral Body, which are kept suspended in that Menstruum which dissolved it, by the pouring in of some *Alkalizate*, or other contrary Liquor; or by putting something else into it, which is more easie for the *Menstruum* to dissolve. Thus if Silver be dissolved, and its Particles kept suspended in *Aqua-fortis*, Spirit of Nitre, *&c.* some Oil of Tartar *per Deliquium*, or even Salt Water, will presently make the Acid let go the Silver, and it will fall down or precipitate to the bottom in a White Pouder: Or if into the Solution of Silver you had put a Plate of Copper, this Metal being easier to work upon than the Silver, the Acid will fall to dissolving of it, and consequently let go the Silver, which will soon precipitate or fall down to the bottom, and cover the Copper Plate all over with White Scales. See the Word *Depart.*

Mr. *Boyle* defines Precipitation in General to be an Agitation or Motion of an Hetrogeneous Liquor, which in no long time will make the Parts of it subside, and that usually in the Form of a Pouder or other Consistent Body.

This Noble Gentleman proposes, That the Corpuscles contained or kept suspended in any

Solvent or Menſtruum, may be precipitated down by either or both of theſe two General ways: 1. By adding to the Weight or Bulk of the diſſolved and floating Particles, and thereby rendering them unfit any longer to accompany the Particles of the Menſtruum in their Inteſtine Motion: Or, 2dly, by weakening the Suſtaining Power of the Menſtruum, and thereby diſabling it to keep the diſſolved Particles from ſwimming any longer in it. See more in his Excellent Diſcourſe upon the Mechanical Cauſes of Precipitation.

PREDIAL *Tythes*, are thoſe which are paid of Things ariſing and growing from the Ground only, as Corn, Hay, Fruit of Trees, *&c.*

PREDICABLE, in Logick, is a common Term or Word that may be attributed to more than one Thing. Thus the Word Triangle refers to any Figure having but three Sides and Angles, whether it be Rectilineal or Spherical.

PREDY, a Sea-word, ſignifying the ſame with *Ready*. *Predy the Ship*, or *Predy the Ordnance*, is, as much as to make Things ready for a Fight. *Predy the Hold*, is lay or ſtow every thing there in its due order and proper place.

PRIEST's *Cap*, a Term in Fortification. See *Bonnet a Preſtre*.

PRELUDE, in Muſick, ſignifies any Flouriſh that is Introductory to Muſick which is to follow after.

PREMISSES. See *Habendum*.

PREMIUM. A Term uſed by Merchants for that Sum of Money which the Enſured gives the Enſurer for the Enſuring the Safe Return of any Ship or Merchandiſe.

PRENDER, is the Power or Right of taking a Thing before it is offered.

PRENDER *de Baron*, is uſually taken in Law for an Exception, to diſable a Woman from purſuing an Appeal of Murder againſt the Killer of her former Husband.

PREPENSED, in Law, is when a Man is ſlain upon a ſudden Quarrel; yet if there were Malice *prepenſed* formerly between them, it makes it *Murder*; as it is called in ſome Statutes *prepenſed Murder*.

PREROGATIVE *Court*, is the Court wherein all Wills are proved, and all Adminiſtrations taken that belong to the Archbiſhop by his *Prerogative*; that is, in Caſe where the Deceaſed had Goods of any conſiderable Value out of the Dioceſs wherein he died; and that Value is commonly 5 *l.* except it be otherwiſe by Compoſition between the ſaid Archbiſhop and ſome other Biſhop, as in the Dioceſs of *London* it is 10 *l.*

And if any Contention grow between two or more, touching any ſuch Will or Adminiſtration, the Cauſe is properly debated in this Court; the Judge whereof is termed *Judex Curiæ Prærogativæ Cantuarienſis*, the *Judge of the Prerogative Court of Canterbury*.

The Archbiſhop of *York* hath alſo the like Court, which is termed *His Exchequer*; but far Inferior to this in Power and Profit.

PRESBITÆ, are thoſe Men who by Old Age, or other Accidents, have the Globe of the Eye ſo flat, that the produced Viſual Rays paſs the *Retina* before they unite; whereby there can be no diſtinct Viſion, ſince the diſtinct Baſe falls too far off beyond the *Retina*: Therefore this Defect is to be helped by Convex-Glaſſes or Spectacles, which will make the Rays converge ſooner, and, if they are well fitted, exactly on the *Retina*.

PRESCRIPTION, in Law, is when a Man claims any thing, becauſe he, his Anceſtors or Predeceſſors, or they whoſe Eſtate he hath, have had or uſed it all the time whereof no Memory is to the contrary. But one cannot preſcribe againſt a Statute, except he have another Statute that ſerves for him.

PRESENTATION, a Term in Law, properly uſed for the Act of a Patron, offering his Clerk to the Biſhop, to be inſtituted in a Benefice of his Gift.

PRESENTEE, is the Clerk that is ſo preſented by the Patron. Alſo the King's *Preſentee* is he whom the King preſents to a Church.

PRESENTMENT, in Law, is a meer Denunciation of the *Jurors* themſelves, or ſome other Officer, as *Juſtice*, *Conſtable*, *Searcher*, *Surveyor*, &c. (without any Information) of an Offence Inquirable in the Court whereunto it is preſented.

PRESSING *to Death*. See *Peine fort & dure*.

PREST, is uſed for a Duty in Money to be paid by the Sheriff, upon his account, in the *Exchequer*; or for Money left or remaining in his Hands.

PRESUMPTION, in Law, is of Three ſorts; 1. *Violent*, which is many times a full Proof; as if one be killed in a Houſe, and a Man is ſeen to come out of the Houſe with a bloody Sword, and no other Perſon was at that time in the Houſe: This, tho' but a *Preſumption*, is as a Proof. 2. *Probable*, which hath but a ſmall Effect. 3. *Levis, ſeu temeraria*, which is of no Prevalency at all. So in caſe of a Charter or Feoffment, if all the Witneſſes to the Deed be dead; the *Violent Preſumption*, which ſtands for a Proof, is Continual and Quiet Poſſeſſion.

PRETENCE. See *Eſcutcheon of Pretence*.

PRETENSED *Right or Title*, is where one is in Poſſeſſion of Lands or Tenements, and another who is out, claims and ſues for it: Here the *Pretenſed Right and Title* is ſaid to him who doth ſo claim and ſue.

PREVARICATE, in Law, is when a Man falſly and deceitfully ſeems to undertake a Thing, *ea intentione*, that he may deſtroy it.

PRICK. To *prick* the Chart or Plot at Sea, ſignifies to make a Point in their Chart whereabout the Ship is now, or is to be at ſuch a time, in order to find the Courſe they are to ſteer, *&c.*

PRIMA *Naturalia*, the ſame with *Atoms*, or *Minima Naturalia*; which ſee,

PRIMARIUM *Latus*, in Geometry, is a Right Line in any Conick Section, drawn through the Vertex of the Section, and parallel to the Baſe of the Cone.

PRIMARY *Planets* (according to ſome) are the Three Superior Planets, *viz*, *Saturn*, *Jupiter*, and *Mars*; but more properly a *Primary Planet* is one that moves round the Sun, as its Centre; whereas a *Secondary Planet* moves round ſome other Planet.

PRIME *Figure*, is that which cannot be divided into any other Figures more ſimple than it ſelf; as a *Triangle in Planes*, the *Pyramid in Solids*: For all Planes are made of the Firſt, all Bodies or Solids compounded of the Second.

PRIME *Numbers*, in Arithmetick, are thoſe made only by *Addition*, or Collection of Unites, and

and not by *Multiplication*: So an Unite only can measure it; as 2, 3, 4, 5, *&c.* and is by ſome called a *Simple*, by others an *Uncompound* Number.

PRIME *of the Moon*, ſignifies the *New Moon*, at her firſt Appearing, or about three Days after the *Change*, at which time ſhe is ſaid to be *primed*.

PRIME *Verticals*, or *Direct Erect North or South Dials*, are thoſe whoſe Planes lie parallel to the *Prime Vertical Circle*. But ſince every Plane hath that Pole raiſed or depreſſed thereon, which lieth open to it: Therefore this Plane (if a *Direct South*) hath the South Pole elevated, and conſequently the Style (whoſe Height muſt be the Complement of the Latitude of the Place) will point downwards.

Wherefore, *To find the Hour's Diſtance from the Meridian upon this Plane*, the Proportion is,

As the *Radius* is to the Sine of the Style's Height, or Co-Latitude;
So is the *Tangent* of the Hour, or Angle at the Pole.
To the *Tangent* of the ſeveral Hours Diſtance from the *Meridian*.

By this *Canon*, the Hours requiſite for the Plane, as alſo the Half Hours, Quarters, *&c.* being calculated and ſet in a Table; the *Dial* is deſcribed after the ſame manner as the *Horizontal Dial*; which ſee.

North Direct Erect Dials, are but the Backſide of the *South*, becauſe lying in the ſame *Azimuth* with it: Therefore, 'tis no more but turning the *South Dial* upſide down, and leaving out the Superfluous Hours between 5 and 7, and 4 and 8, and the *North Dial* is made. Only note, That the Style muſt point upwards to the North Pole.

PRIMER *Seiſin*. The Firſt Poſſeſſion or *Seiſin* was heretofore uſed as a Branch of the King's Prerogative, whereby he had the Firſt Poſſeſſion; that is, the entire Profits for a Year of all the Lands and Tenements whereof his Tenant (that held of him *in Capite*) died *ſeiſed* in his Demeſne as of Fee, his Heir then being at full Age, until he do his Homage; or if under Age, until he were of Age. But all the Charges ariſing by *Primer Seiſin*, are taken away by the Statute made 12 *Car.* 2. cap. 24.

PRIMING *Iron*, is a ſmall ſharp Iron which is thruſt into the Touch-hole of a Great Gun, and pierces into the Cartridge that holds the Pouder, that ſo they may put in the Prime-pouder or Touch-powder to fire off the Piece.

PRIMOGENITURE, in Law, is the Title of an Elder Brother in Right of his Birth.

PRIMORES *Dentes, ſeu Inciſivi Dentes*, are the Four Foremoſt Teeth in each Jaw; they are pretty-broad, ſharp at their Ends, a little convex outwards, and hollow inwards: They have each a pretty long Root, a little crooked, and divided into two, by which means they have the greater Force in cutting off the Aliments, which is their proper Uſe.

PRIMUM *Mobile*, in the *Ptolemaick Aſtronomy*, is ſuppoſed to be a vaſt Sphere, whoſe Centre is that of the World, and in Compariſon of which the Earth is but a Point: This they will have to contain all other Spheres within it, and to give Motion to them, turning its ſelf and all them quite round in Twenty four hours.

PRINCIPAL, in Common Law, ſignifies the ſame with *Heirloome*.

PRINCIPAL *Ray*, in Perſpective, is the Perpendicular one which goes from the Spectator's Eye to the Vertical Plane or the Table. And the Point where this Ray falls on the Table, is called from hence the

PRINCIPAL *Point*, which ſome Writers call the *Centre of the Picture*, and the *Point of Concurrence*.

PRINCIPLE, a Word very commonly and very variouſly uſed; ſometimes it ſignifies the ſame as a Maxim, an Axiom, or a good Practical Rule of Action: Thus we ſay, a Perſon is *a Man of Principles*, when he always acts according to the Eternal Rules of Morality, Virtue and Religion.

Sometimes it ſignifies a Thing Self-evident, and as it were Naturally known, and then 'tis uſually called, a *Firſt Principal*; as that, *Nothing can Exiſt and not Exiſt at the ſame time*: That, *Where there is no Law, there is no Tranſgreſſion*: That *a Whole is greater than a Part*.

Sometimes it hath the ſame ſenſe with Rudiments or Elements; as when we ſay, the *Principles* of *Geometry*, *Aſtronomy*, *Algebra*; we mean the Doctrine or Rules of thoſe Sciences.

And in Chymiſtry particularly, 'tis taken for firſt Conſtituent and Component Particles of all Bodies, out of which they are made, and into which they are by Fire, as they ſay, reſolvable again. Thus *Salt*, *Sulphur*, and *Mercury* are the three Famous Chymical Principles, which they call *Hypoſtatical*; and the Chymiſts did formerly pretend, that they could by their Art reſolve all Natural Bodies into theſe; and that theſe Principles could be drawn Simple, Pure, and Uncompounded from Metals, *&c.* But ſince this Art hath been more commonly ſtudied and conſequently much better known, it is found to be a Falſity, as Mr. *Boyle* excellently ſhews in his *Sceptical Chymiſt*; and *Lemery* hints in many places of his good *Courſe of Chymiſtry*.

The Modern Chymiſts agree that there are five kinds, or different ſorts of Bodies, which may by Fire be drawn from many mix'd Natural Bodies, and therefore which may in a large ſenſe be called *Principles*; as *Earth*, *Salt*, *Spirit*, *Phlegm*, and *Oil*, tho' theſe can never be drawn, perfectly Pure and Unmix'd; nor have we any reaſon to believe they are the Conſtituent Principles of the Bodies they are drawn from; and out of many Bodies hardly ever a one of them can be drawn; and therefore they are not truly and properly the Elements or Conſtituent Principles of natural Bodies, nor indeed do we know any ſuch.

Of theſe the *Spirit*, *Oil* and *Salt*, are called the *Active* Principles; and the *Water* and the *Earth*, the *Paſſive* ones.

Mr. *Boyle* ſheweth by many Experiments in his *Sceptical Chymiſt*, in the Diſcourſe about the *Producibleneſs of Chymical Principles*, in his Chymical Paradox at the end of his *Noctiluca*, and in many other places that theſe Chymical Principles are Producible and Deſtructible, and that they are manifeſtly Tranſmutable into one another. For

by diſtilling what the Chymiſts call Eſſential Oil of Aniſeeds 36 times over, and ſome other Oils of Vegetable above 50 times, he found that there would be produced above half the firſt Weight of the Oil in the form of a Black Pitch. That an acid and volatile Spirit and Salt were to be gained in a conſiderable quantity; and upon the whole it appeared that theſe Reſulting Bodies of ſuch very different Forms were produced by the Action of the Fire tranſmuting part of the very Subſtance of the Oil into them.

That in general may be called a Principle which is the firſt cauſe of any Things *Exiſtence*, or *Production*, or of its becoming *Known* to us.

The Ariſtotelian or Peripatetical Principles are the Four Elements, *Earth*, *Water*, *Air*, and *Fire*.

The *Epicurean Principles*, are Magnitude, Figure, and Weight.

Mr. *Boyle* thinks as the World now is (for they can't account for its Creation) that the Mechanical Principles, Matter, Motion, and Reſt, are Principles ſufficient to ſolve all the Phænomena of Nature.

The *Carteſian Principles* are theſe three following; *Firſt*, A moſt Subtle Matter very ſwiftly agitated, fluid, and keeping to no certain Figure but which ſuits it ſelf to the Figure of thoſe Bodies that are about it; The *Second* are very ſmall Globules, that is, Bodies exactly round, and very ſolid, continually whirling about, and which do not only like the Firſt *Principles*, fill up the Sores of Bodies, but alſo conſtitute the pureſt Subſtance of the *Æther* and *Heaven*. The *Third Principle* is a Matter conſiſting of more thick and Branchy Parts, full of Angles and unfit for Motion, of which the Earth, Water, Air, and all mixed Bodies do conſiſt.

Now they ſuppoſe theſe Three Elements to be thus produced: The whole World being a Plenum and the Particles, or Atoms, of all Matter ſolid, as ſoon as Motion was ſuperinduced into the World, theſe Atoms being of ſeveral Shapes, and Sizes, would begin to rub and grind one againſt another.

By which means, ſome would come to be ground or turn'd round Globules; and theſe conſtitute their Second Element. The ſmall Chips, Shavings, or Duſt, that comes off in the forming of theſe Globules, is the Matter of their Firſt Element; and theſe muſt needs be in every ripid Motion. But thoſe Particles which are not yet turned into Globular Figures, will be variouſly angled, and not ſo fit for Motion as the others; and therefore will conſtitute a Third Element very different from the others.

PRIORITY, in Law, ſignifies an Antiquity of Tenure, in compariſon of another not ſo ancient, as to hold by Priority, is to hold of a Lord more anciently than of another.

PRISAGE, is that Cuſtom or Share that belongs to the King, out of ſuch Merchandice, as are taken at Sea by way of Lawful Prize.

PRISM, is a ſolid Figure, contained under ſeveral Planes, whoſe Baſes are Polygons, equal, parallel, and alike ſituated. Alſo a Triangular ſolid glaſs, thro' which the Sun's Rays being tranſmitted are refracted into the vivid Colours of the Rain-bow.

The Surface of a Right *Priſm*, is equal to a Parallelogram of the ſame height, having for its Baſe a Right Line equal to the Periphery of that *Priſm*. The ſame may be ſaid of a Cylinder, becauſe it is but a *Priſm* of Infinite Sides.

The Solid Content of a *Priſm*, is found by Multiplying the Area of its Baſe by its Perpenddicular Altitude.

A *Priſm* is a Triple of a Pyramid of the ſame Baſe and Height. See *Proportion of Solids*, where 'tis demonſtrated.

PRISMOID, is a ſolid Figure, contained under ſeveral Planes whoſe Baſes are rectangular Parallelograms, parallel and alike ſituate.

PRIVILEDGE, is by *Cicero* defined to be *Lex private homini irrogata*. Others ſay it is, *Jus ſingulare*, whereby a private man, or a particular Corporation, is exempted from the rigour of the Common Law. It is uſed ſometimes in the Common Law, for a place that hath any ſpecial Immunity.

PRIVILEDGE, is either Perſonal or Real: A *Perſonal Priviledge*, is that which is granted to any Perſon either againſt or beyond the Courſe of the Common Law: As for Example, A Member of Parliament may not be arreſted nor any of his Servants, during the ſitting of the Parliament; nor for a certain time before and after. A *Priviledge Real*, is that which is granted to a place, as to the *Univerſities*, That none of either may be called to *Weſtminſter-Hall*, upon any Contract made within their own Precincts, or proſecuted in other Courts. And one belonging to the Court of Chancery cannot be ſued in any other Court, certain Caſes excepted; and if he be, he may remove it by *Writ of Priviledge*.

PRIVY, in Law, ſignifies him that is partaker, or hath an Intereſt in any Action or Thing, as *Privy of Blood*, be thoſe that are linked in Conſanguinity; every Heir in Tail is *Privy* to recover the Land intailed. The Author of the *New Terms of Law*, maketh divers ſorts of *Privies*, *viz.* Privies *in Eſtate*, Privies *in Deed*, Privies *in Law*, Privies *in Right*, and Privies *in Blood*. Others mention four kinds of *Privies*, viz. *Privies in Blood*, as the Heir to his Father. *Privies in Repreſentation*, as Executors or Adminiſtrators to the deceaſed. *Privies in Eſtate*, as he in the Reverſion, and he in the Remainder, when Land is given to one for Life, to another in Fee, for that their Eſtates are created both at one time. The fourth is *Privy in Tenure*, as the Lord by eſcheat, that is, when the Land eſcheateth to the Lord for want of Heirs.

PRIVY-SEAL, is a Seal that the King uſeth to ſuch Grants, or other things, as paſs the *Great Seal*; firſt they paſs the *Privy-Signet*, then the *Privy-Seal*; and laſtly the *Great-Seal of England*. The *Privy-Seal* is ſometimes uſed in things of leſs conſequence, that never paſs the *Great-Seal*, no Writs ſhall paſs under the *Privy-Seal*, which touch the Common Law.

PROBATE, *of Teſtaments*, is the exhibiting and proving Wills and *Teſtaments* before the Eccleſiaſtical Judge, delegated by the Biſhop, who is Ordinary of the Place, when the party dies. And the Ordinary is known by the quantity of Goods that the deceaſed hath out of the Dioceſs wherein he departed; for if all his Goods be in the ſame Dioceſs, then the Biſhop of the Dioceſs, or the Archdeacon, according as their compoſition leads, hath the *Probate of the Teſtament*: But if the Goods be diſperſt in divers Dioceſſes, ſo that there be any ſum of note (as five pounds ordinarily) out of the Dioceſs where the party lived; then is the

the Archbiſhop of *Canterbury* the Ordinary by *Prerogative*.

This *Probate* may be made in two ſorts, in *Common form* or *per teſtes*. *The proof in common form* is only by the Oath of the Executor or Party exhibiting the Will, who ſweareth upon his belief, that the Will exhibited by him, is the laſt Will and *Teſtament* of the deceaſed. The proof *per teſtes* is when over and beſides his own Oath, he alſo produces Witneſſes, or makes other proof to confirm the ſame, and that in the preſence of ſuch as may pretend any intereſt in the Goods of the deceaſed, or at leaſt in their abſence, after they have been Lawfully ſummoned to ſee ſuch a Will proved, if they think good. And the latter courſe is taken moſt commonly when there is fear of ſtrife or diſpute about the deceaſed's Goods. For ſome hold that *a Will proved in common form* only may be called in queſtion any time within thirty Years after: And where a will diſpoſes of Lands and Tenements of Freehold, it is now frequently *proved by Witneſſes* in *Chancery*.

PROBATOR, in Law ſignifies an Accuſer, or Approver, or one who undertakes to prove a crime charged upon another.

PROBE, a Chirurgical Inſtrument to ſound the Depth and Circumſtances of Wounds or Ulcers.

PROBLEM, is a Propoſition which relates to Practice; or which propoſes ſomething to be done; As to make a Circle paſs through three given Points not lying in a Right Line: To find the Compaſs, *&c.*

PROCATARCTICA, is the pre-exiſtent Cauſe of a Diſeaſe, which co-operates with others that are ſubſequent; whether it be external or internal, as Anger, or Heat in the Air, which beget ill Juice in the Blood and cauſe a Fever. *Blanchard.*

PROCEDENDO, is a Writ whereby a Plea or Cauſe formerly called from a Baſe Court to the *Chancery*, *Kings-Bench*, or *Common-Pleas*, by *Writ of Priviledge* or *Certiorari*, is releaſed and ſent down again to the ſame Courts to be proceeded in there, after it appeareth that the Defendant hath no cauſe of *Priviledge*, or that the matter compriſed in the Bill not well proved.

PROCESSE, in Law, is the manner of proceeding in every Cauſe, being the Writs and precepts that go forth upon the Original upon every Action, being either Original or Judicial. Sometimes that only is called the *Proceſs*, by which a man is called into the Court, becauſe it is the beginning or principal part thereof, by which the reſt of the buſineſs is directed. The difference between *Proceſs* and *Precept*, or *Warrant* of the Juſtices, is this, the *Precept* or *Warrant* is only to attach and convent the party before any Indictment or Conviction, and may be made either in the name of the King or the Juſtice: But the *Proceſs* is always in the King's Name, and uſually after an Indictment.

PROCESS, in Chymiſtry ſignifies the whole exact Courſe of any Operation or Experiment.

PROCESSION, in Cathedral and Conventual Churches, the Members formerly had their ſtated Proceſſions, wherein they walked two and two in their moſt Ornamental Habits, with Hymns, Muſick and other ſuitable expreſſions of Solemnity, and reſpect to the occaſion. In every Pariſh there was a Cuſtomary *Proceſſion* of the Pariſh Prieſt, the Patron of the Church with the Chief *Flag*, or Holy Banner, and the other Pariſhioners in *Aſcenſion Week*, to take a Circuit round the Limits of the Mannor, and pray for a Bleſſing on the Fruits of the Earth. To this we owe our preſent Cuſtom of *Perambulation*, which is ſtill in moſt places called *Proceſſioning*, and going in Proceſſion, tho' we have loſt the Order, and almoſt the Devotion, as well as the Pomp and Superſtition of it.

PROCESSUM *continuando*, is a Writ for the continuance of a *Proceſs*, after the Death of the Chief Juſtice, or other Juſtice in the Writ of *Oyer* and *Terminer*.

PROCESSUS, *vid. Apothyſis.*

PROCESSUS *Ciliaris*. See *Ciliare Ligamentum.*

PROCESSUS *Memmillares*. See *Papillarum Proceſſus.*

PROCESSUS *Peritonæi*, are as it were two oblong Pipes, or Channels, one on each ſide the *Os Pubis*, reaching to the Skin of the *Scrotum*, thro' the Holes of the Tendons of the Oblique and Tranſverſe Muſcles, in which Production, or *Didymi*, as the Ancients called them, the Seminary Veſſels deſcend, and beſtowing one Tunicle on the *Teſtes*, they contain them like a Bag. By the Holes of theſe Proceſſes, the Muſcles called *Cremaſteres* do alſo deſcend.

PHROCESSUS *Styliformis*, or *Styloides*, is a kind of External Proceſs of the *Oſſa Temporum*, being ſmall and long, having the Horns of the *Os Hyoides* tyed to it, it is a ſlender and long Appendix, and in Infants is Cartilaginous, but in Adult Perſons, Bony.

PROCESSUS *Zygomaticus* or *Jugalis*, is an External Proceſs of the *Oſſa Temporum*, which runs forward, and is joined with the Bone of the upper Maxilla, from which juncture is formed that Bridge called the *Zygoma*, reaching from the Eye to the Ear, under which lie the Tendons of the Crotaphite Muſcle.

PROCHEIN *amy*, in Common Law, ſignifies him that is next of Kin to a Child in his Nonage, and is in that reſpect allowed by Law to deal for him, in the managing his Affairs, as to be his Guardian, if he hold any Land in *Socage*, and in Redreſs of any Wrong done to him, and is in the Proſecution of any Action at Law *per Guardianum*, where the Plaintiff is an Infant, *&* *per proximum amicum*, where the Infant is Defendant.

PROCIDENTIA *Ani*, is a falling out of the Lower end of the *Rectum inteſtinum*, and is very uſual in Children.

PROCIDENTIA *uteri*, is a relaxing of the inner Tunick of the *Vagina* of the Womb, and was cut off by Phyſicians formerly, and even ſtill, ſome think the Womb it ſelf may fall down; but the Ligaments are ſo ſtrong as to hinder any ſuch Fall. *Blanchard.*

PROCLAMATION, is a Notice publickly given of any thing, whereof the King thinks fit to advertiſe his Subject.

PROCLAMATION *of a Fine*, is a notice openly and ſolemnly given at all the Aſſizes held in the County, within one Year after the engroſſing it. And theſe Proclamations are made upon Tranſcripts of the Fine, ſent by the Juſtices of the Common-Pleas, to the Juſtices of Aſſize, and the Juſtices of Peace.

PROCLAMATION *of Rebellion*, is a Publick Notice given by the Officer, That a Man not appearing upon a *Subpœna*, nor an Attachment in the Chancery

Chancery, ſhall be reputed a Rebel, unleſs he render himſelf by a Day aſſigned in this Writ.

PROCONDYLI are the Bones of the Fingers next the back of the Hand.

PRO *confeſſo*, in Law, is when upon a Bill exhibited in Chancery, the Defendant appears, upon a *Habeas Corpus* (which is granted by order) to bring him to the Bar, the Court Aſſigns him a Day to Anſwer; which being expired, and no Anſwer put in, a ſecond *Habeas Corpus* is granted, and a further Day aſſign'd; by which Day, if he anſwer not, the Bill upon the Plaintiff's Motion, ſhall be taken *pro confeſſo*, unleſs cauſe be ſhewed by a Day, which the Court uſually gives, and for want of ſuch cauſe ſhew'd upon Motion, the Subſtance of the Plaintiff's Bill ſhall be decreed, as if it had been confeſſed by the Defendant's Anſwer.

PROCTOR, is he who undertakes to manage another Man's Cauſe in any Court of the Civil or Eccleſiaſtical Law, for his Fee.

PROCTORS *of the Clergy*, are thoſe who are choſen and appointed to appear for the Cathedral and other Collegiate Churches; as alſo for the Common Clergy of every Dioceſs at the Parliament, to ſit in the Lower-houſe of Convocation.

PROCURATORY, is the Inſtrument by which any Perſon or Community did conſtitute or delegate their Proctor or Proctors to repreſent them in any Judicial Court or Cauſe.

PRODROMUS *Morbus*, is a Diſeaſe that comes before a greater, as the ſtraitneſs of the Breaſt predicts a Conſumption, or the Rickets. *Blanchard.*

PRODUCE, a Term in Geometry, ſignifying to continue a Right Line, or draw it out farther, till it have any aſſigned Length.

PRODUCT, is the Quantity Ariſing from, or *Produced* by the Multiplication of two or more Numbers, Lines, *&c.* into one another, thus, If 6 be multiplied by 8, the Product in 48. In Lines, 'tis always, (and ſometimes in Numbers) called the Rectangle between the two Lines that are multiplyed one by another. See *Rectangle.*

PROEGUMENA, is an Antecedent Internal Cauſe of a Diſeaſe in the Body, occaſioned by another, and ſo cauſing the Diſeaſe, that if it be taken away, the Diſeaſe may ſtill continue; as a *Plethora*, or ill Juice in the Blood, produced by an ill way of Diet, whence proceeds an Obſtruction of the Entrails. *Blanchard.*

PROFIL (*French*) a Term in Painting, ſignifying properly a Face or Head ſet ſideways, as uſually on Medals, and ſuch a Face is ſaid to be in *Profil*, or in a Side View. 'Tis alſo ſpoken of the View of a Building, or City, *&c.* in Oppoſition to the Plan or Ground-plot of it; and ſo appears to have much the ſame ſenſe as a Proſpect of any Place, City, or Piece of Architecture, viewed ſideways, and expreſſed according to the Rules of *Perſpective.* This is called the *Profil* of ſuch a Place, City, *&c.* Some call the Out-lines of any Figure its *Profil*, but that way of ſpeaking is improper.

PROFUNDUS, a Muſcle, which bends the Fingers.

PROGNOSIS *&* *Signa Prognoſtica*, are Signs whereby we know what will become of the Patient, as to Recovery or Death.

PROGRESSION *Arithmetical*, or Continual *Proportion Arithmetical*, is when Numbers (or other Quantities) or proceed by equal differences (either increaſing or decreaſing.) As,

2, 4, 6, 8, 10, 12, 14, *&c.*
3, 5, 7, 9, 11, 13, 15, *&c.*
16, 14, 12, 10, 8, 6, 4, *&c.*

In the two former, is a continual Increaſe, in the latter a continual Decreaſe, by two in all of them; which is called the *Common Difference*, or *Common Exceſs.*

1. If three Quantities are in *Arithmetical Proportion Continued*, the Sum of the *Extreams* is equal to the Double of the *Mean.*

Let a be the firſt Term, and x the Common Difference; then will the three Quantities be $a, a+x, a+2x$; or $a, a-x, a-2x$, if the Progreſſion deſcend.

Now $a+x$, doubled, is $= a+a+2x = 2a+2x$. *Q. E. D.*

2. If four Quantities are ſo, the Sum of the *Extreams* is equal to the Sum of the *Means.*

Let the four Terms be $a, a+x, a+2x, a+3x$.

'Tis plain, that the Sum of the *Means*, and of the *Extreams*, is $2a+3x$.

3. If never ſo many Quantities are ſo proportional, the Sum of the *Extreams* is always equal to the Double of the *Mean*, if the Number of the Terms be odd, or to the Sum of any two Terms equally diſtant from the Extreams.

Thus, in the following Series,

2	4	6	8	10	12	14
$a.$	$a+x.$	$a+2x.$	$a+3x.$	$a+4x.$	$a+5x.$	$a+6x.$

16	18	20	22
$a+7x.$	$a+8x.$	$a+9x.$	$a+10x.$

The Sum of the Extremes $2a+10x$ is equal to $a+5x$ multiplied by 2; that is, the Double of the middle Term: As it is alſo to the Sum of any Two of them equally diſtant from both Extremes.

And this muſt ever be, becauſe the laſt Term contains in it the firſt, and alſo the common Difference ſuper-added as often as the Number of its Place is diſtant from the firſt Term: But the firſt Term hath no Addition of the Difference at all; and as the ſecond Term hath one Difference or Ratio more than the firſt, the third one more than the ſecond, *&c.* ſo the laſt ſave one, hath one leſs than the laſt of all; the laſt ſave two, one leſs than the laſt ſave one, *&c.* So that the Sum of any two of theſe equally diſtant from the *Extremes*, muſt be equal to the Sum of the *Extremes*; becauſe one encreaſes as much as the other decreaſes.

Hence 'tis plain,

COROLLARIES.

1. That the Sum of any Number of Terms in ſuch a Progreſſion may be had, *if the Sum of the Extremes be multiplied by half the Number of the Terms*, or half that Sum by the whole Number of the Terms.

2. To

2. To gain the Sum of never ſo many Quantities in this *Progreſſion*, there is nothing neceſſary to be given but the Extremes and the Number of Terms: So that if by having the *Firſt Term* and *Common Exceſs*, one could get the *Laſt*, 'twould ſtrangely diſpatch Queſtions in *Progreſſion*.

3. Which laſt Term in ſuch a *Progreſſion* may be had eaſily, by multiplying the Number of the Terms, leſſened by one, into the Common Exceſs, and then to that Product adding the firſt Term.

Thus, if the laſt Term, in a *Progreſſion* of 52 Places were deſired, where the Common Difference is 3, and the firſt Term 5:

Multiply 51 by 3, it produces 153; to which adding 5 the firſt Term, you have 158 equal to the laſt Term in ſuch a *Progreſſion*.

4. Wherefore if the *Progreſſion* begin with a Cypher, (which is the moſt Natural and Simple *Progreſſion*; for when it begins with any other Term, 'tis in reality a Compound of two *Progreſſions*; one of Equals, as of *a*, *a*, *a*, *a*, &c. and the other of Arithmetical Proportionals, as *o. x. 2 x. 3 x. 4 x.* &c.) then I ſay, *the Sum of all the Terms* will be equal to half the Product of the laſt Term multiplied by the whole Number of the Terms: For by the Firſt Corollary, the Sum of all the Terms will be equal to the Sum of the Extremes multiplied by half the Number of Terms.

Thus, ſuppoſe

o. 2. 4. 6. 8. 10. 12. 14. 16. 18. 20.

Or,

o. x. 2 x. 3 x. 4 x. 5 x. 6 x. 7 x. 8 x. 9 x. 10 x.

20 the laſt Term, multiplied by 11 the Number of the Terms, gives 220; the half of which, 110, is the Sum of all the Terms.

For, by *Corollary* the Firſt, 20, the Sum of the Extremes, multiplied by 5. 5 half the Number of Terms, produces 110, the Sum of all the Terms.

5. Hence this very uſeful Theorem may be deduced, that the Sum of all the Terms in any ſuch *Progreſſion*, beginning from o, is *Subduple* of the Sum of ſo many Terms, all equal to the greateſt. For let the firſt Term be o, and the laſt *x*, and the given Number of the Terms *n*; then (by N° 1.) will the Sum of all the Terms of the *Progreſſion* be $\frac{1}{2}$ *n x*, which is half or *ſubduple* of *n x* equal to the Number of ſo many Terms equal to the greateſt. *Q. E. D.*

6. The Sum of a Simple Arithmetical Progreſſion, (*i. e.* aſcending by the Cardinal Numbers) continued from Unity *ad Infinitum*, is ſubduple the Sum of the ſame Number of Terms, each of which is equal to the greateſt; or, on the contrary, this latter Sum is double of the former. By prefixing a Cypher before unity, this would be but a Caſe of the laſt Corollary, the Sum of the *Progreſſion* remaining ſtill the ſame.

But that this is true in an infinite Series beginning from Unity, (for in a Finite or Determinate one, the Proportion of the Sum is always leſs than double; tho' it always approaches to it, and comes ſo much the nearer by how much greater the Series is) we ſhall now thus demonſtrate:

To the Sum of Three Terms, 1, 2, 3, *i. e.* 6, the Sum of as many equal in Number to the greateſt, *i. e.* 9, has the ſame Proportion as 3 to 2; but to the Sum of Six Terms, 1, 2, 3, 4, 5, 6, *i. e.* 21, the Sum of as many equal to the greateſt, *i. e.* 36, has the ſame Proportion as 3 to $1 + \frac{3}{4}$ that is 3 to $2 - \frac{1}{4}$, the Decreaſe being $\frac{1}{4}$; but to the Sum of Twelve Terms, which may be found by *Coroll.* 1. equal 78, the Sum of ſo many equal to the greateſt, *viz* 144, has the ſame Proportion, (dividing both ſides by 48) as 3 to $1\frac{30}{48}$ *i. e.* 3 to $1 + \frac{1}{2} + \frac{1}{8}$, (for 24 make $\frac{1}{2}$, and the Remainder $\frac{6}{48}$ is the ſame as $\frac{1}{8}$) that is, as 3 to $2 - \frac{1}{4} - \frac{1}{8}$, the Decrement being now $\frac{1}{8}$. Since therefore, by doubling the Number of Terms onwards, you'll find the Decrement to be $\frac{1}{16}$, and ſo onwards in double Proportion; the Sum of an Infinite Number of ſuch Terms, in Arithmetical Progreſſion, equal to the greateſt, will be to the Sum of the *Progreſſion*, from 1 *ad infinitum*; as 3 to $2 - \frac{1}{4} - \frac{1}{8} - \frac{4}{16}$, &c. that is, by *Coroll.* 1 and 2, as 3 to $2 - \frac{1}{2}$, that is, as 3 to $1\frac{1}{2}$, or as 2 to 1. *Q. E. D.*

7. The Sum of any Duplicate Arithmetical Progreſſion, continued from Unity *ad infinitum*, is ſubtriple of the Sum of as many Terms equal to the greateſt, as is the Number of Terms: For any ſuch Finite Progreſſion is greater than the Subtriple Proportion, but approaches nearer and nearer to it continually, but how much the farther the Series of the Progreſſion is carried on. Thus the Sum of Three Terms, 1, 4, 9, = 14, is to thrice 9 = 27, as $1\frac{5}{9}$ or $1\frac{10}{18}$, or $1 + \frac{1}{2} + \frac{1}{18}$ to 3, (dividing both ſides by 9) the Sum of Six Terms, 1, 4, 9, 16, 25, 36, &c. *viz.* 91 to Six times 36, *i. e.* to 216, (dividing both ſides by 72) is as $1 + \frac{1}{4} + \frac{1}{72}$ to 3, and the Sum of Twelve Terms 650, to 12 times 144, *i. e.* 1728, (dividing both ſides by 576) is as $1 + \frac{1}{8} + \frac{1}{288}$ to 3, &c. the Fraction adhering to them thus conſtantly decreaſing, ſome by their Half parts, others by Three quarters: (for $\frac{1}{8}$ is $\frac{1}{72}$; therefore the firſt Decrement is $\frac{3}{72}$, and $\frac{1}{72}$ is $\frac{4}{288}$; therefore the ſecond Decrement is $\frac{3}{288}$, &c.) Wherefore the Sum of the Infinite Progreſſion will be to the Sum of the like Number of Terms equal to the greateſt; as,

$$\begin{array}{l} 1 + \frac{1}{2} + \frac{1}{8} \\ - \frac{1}{4} - \frac{5}{72} \\ - \frac{1}{8} - \frac{3}{288} \\ - \frac{1}{16}, \&c. - \frac{2}{1152}, \&c. \end{array}$$

to 3, by *Coroll.* 2d and 4th, in *Progreſſion Geometrical.*

But the Sum of a Triplicate Arithmetical Progreſſion, (*i. e* aſcending by the Cubes of the Cardinal Numbers) proceeding from 1 thro' 27, 64, &c. *ad infinitum*, is ſubquadruple of the like Number of Terms equal to the greateſt: For the Sum of Four Terms, 1, 8, 27, 64, *i. e.* 100, to 4 times 64, *i. e.* 256, (dividing both ſides by 64) will be found to be as $1 + \frac{1}{2} + \frac{1}{16}$ to 4; but the Sum of 8 Terms, 1, 8, 27, 64, 125, 216, 343, 512, *i. e.* 1296 to 8 times 512, *i. e.* 4096, (dividing both ſides by 1024) will be found to be as $1 + \frac{1}{4} + \frac{1}{64}$ to 4, &c. The adhering Fractions thus conſtantly decreaſing, the one by their Half part, the others by Three quarters, (for $\frac{1}{64}$ is $\frac{4}{256}$ and $\frac{1}{256}$ is $\frac{4}{1024}$, &c. Wherefore the Sum of the

Infi-

Infinite Progreſſion will be to the Sum of a like (Infinite) Number of Terms, equal to the greateſt; as,

$1 + \frac{1}{2}$ $+ \frac{1}{4}$
$--- \frac{1}{2}$ $--- \frac{1}{4}$
$--- \frac{1}{1}$, &c. $--- \frac{1}{2}$, &c. to 4, by *Coroll.* 2d and 4th, as 1 to 4. *Q. E. D.*

PROGRESSION *Geometrical*, or *Geometrical Proportion Continued*, is when Numbers, or other Quantities, proceed by equal Proportion or *Ratio's*, (properly ſo called) that is according to one Common Multiplier, or *Exponent* of the Common *Ratio*, whether Increaſing or Decreaſing. As,

2. 4. 8. 16. 32. 64. &c. : :

Or in Species, ſuppoſing *a* the Firſt Term, and *r* the *Ratio*, here equal to 2.

a. ra. rra. rrra. rrrra. rrrrra, &c. : :

For, every Term (but the firſt) ariſes from the multiplication of the *Ratio*, or ſome Power of it, into it.

The following Numbers are Continual Proportionals decreaſing, according to the Common *Ratio*, 2 or *r*.

128. 64. 32. 16. 8. 4. 2. &c. : :

ar^6. ar^5. ar^4 $ar.^3$ ar^2. ar. a. &c.

And as in the former Rank of Numbers 2 was the Common Multiplier, in this 2 is the Common Diviſor; or, which is in effect the ſame, the Common Multiplier is $\frac{1}{2}$.

The moſt Natural and Simple Geometrical Progreſſion, is when it begins with Unity; as,

2	4	8	16	32	
1.	*r.*	*rr.*	*rrr.*	*rrrr.*	*rrrrr.* &c.

When it begins with any other Term, as *a* in the former Progreſſion, it is in effect but ſuch a Progreſſion as this latter, multiplied into that firſt Term all along.

PROPOSITION I.

If there are Three Quantities continually Proportional, the Rectangle of the Extremes is equal to the Square of the Mean Term.

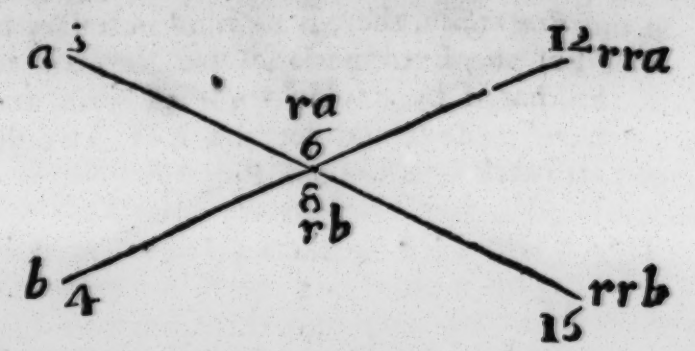
As, Suppoſe

a, ra, rra, : : Or, 3. 6. 12. : :

Its plain that the Extremes *a, rra*, multiplied into one another, are equal to the Mean *ra* multiplied into it ſelf, or in Numbers, that 3 times 12 is equal to 6 times 6.

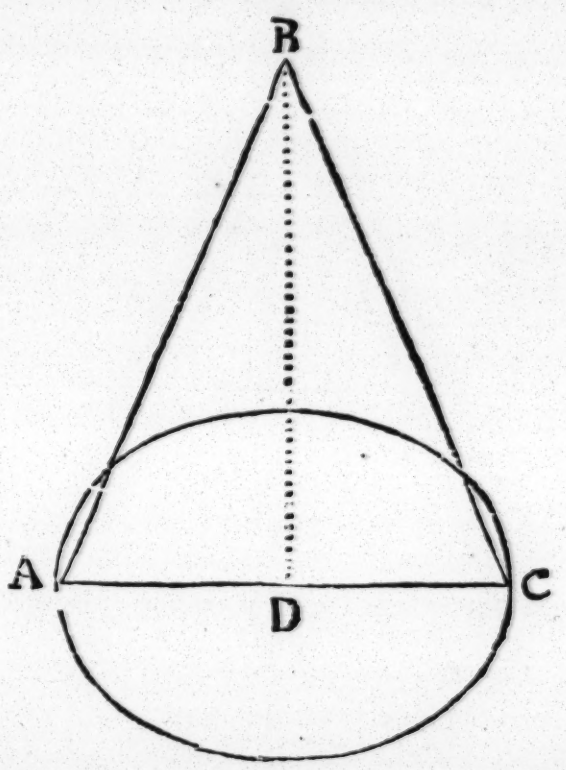
SCHOLIUM.

Alſo, If Three Quantities on each ſide are in the ſame Continual Proportion as.

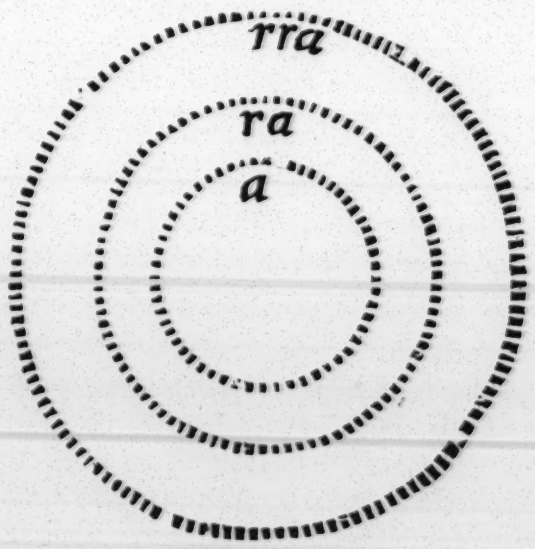


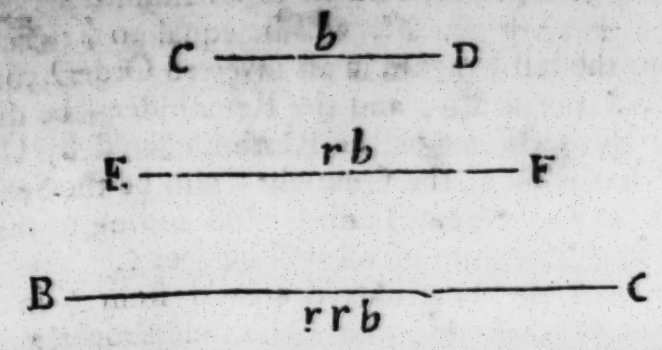
the Rectangles of the Extremes made croſs-ways are equal to the Rectangle of the Mean Term, being every way *r r a b*, or 48.

And from hence, *Sturmius*, in his *Matheſis Enucleata*, Prop. 17. of Book 1. *Schol.* very briefly demonſtrates that Propoſition of *Archimedes*, *that the Surface of a Right Cone is equal to a Circle whoſe Radius is a Mean Proportion between the Side of that Cone and the Semi-diameter of its Baſe.*



Let E F (or *r b*) be a Mean Proportional between the Side of the Cone B C, (or *r r b*;) and the Radius of the Baſe C D, (or *b*;) and let there be an equal Number of Peripheries, *r r a*, *r a*, and *a*, anſwering to an equal Number of *Radii* in the ſame proportion; then will half the firſt Radius, B C, (or *r r b*) multiplied into the Periphery *a*, (that is $\frac{1}{2}$ *r r a b*) be equal to half the Product of the middle Line into the middle Periphery,





phery, that is (as before) half *r r a b*: The former of which is equal to the Surface of the Given Cone, by the 4th *Conf.* of his *Def.* 18.) and the latter to the Area of the Circle, whoſe Radius is the Mean Proportion E F, (by the 2d *Conf.* of his *Def.* 15.) Q. *E. D.*

And from hence alſo flows naturally this other Propoſition, *That the Surface of the Cone, half* r r a b, *is to its Baſe half* a b; *as the Side of the Cone* r r b, *is to the Radius of the Baſe* b. For

$$\tfrac{1}{2} r r a b : \tfrac{1}{2} a b :: r r b : b.$$

PROPOSITION II.

If four Quantities are proportional, either continually or diſcreetly, the Product of the Extremes is equal to the Product of the Means.

For if *a*, *ra*, *rra*, *rrra*, ≒, or 2. 4. 8. 16. ≒ 'tis plain the Product of the *Extremes* and of the *Means*, is the ſame Quantity *r r r a a* or 32.

In diſcreet Proportionals, let $a : ra :: b : rb$; that is, 2 : 4 :: 15 : 30. The Product of the *Extremes* and of the *Means* can here be no other than $rab = 60$.

On which Proportion is grounded the *Golden Rule*, or *Rule of Three* in Arithmetick; ſo called, becauſe having Three Numbers, (as 2. 4. 15.) it teaches how to find an unknown Fourth Proportional: For altho' this Fourth be unknown, yet its Product by 2 the Firſt Term is known, becauſe 'tis the ſame with the Product of the Means 4 and 15. Wherefore the Rule directs us to multiply the Third by the Second, that you may thereby obtain the Product of the *Extremes*; which divided by one of the *Extremes*, *viz.* the Firſt, muſt needs give the other, that is, the Fourth ſought.

COROLLARY.

Hence 'tis plain, That if two Products ariſing from the Multiplication of any two Pairs of Quantities, are equal; thoſe four Quantities will be at leaſt diſcreetly proportional.

PROPOSITION III.

If there are never ſo many continual Proportionals, the Product of the *Extremes* is equal to the Product of any two of the Means that are equally diſtant from the *Extremes*, as alſo to the Square of the Mean or Middle Term, if the Number of the Terms be odd.

Thus in this Progreſſion,

2 4 8 16 32 64 128.
a. ra. rra. rrra. rrrra. rrrrra. rrrrrra. &c.

It's plain the Product of the Extremes, and of any two Terms equally diſtant from them, and the Square of the middle Term, muſt always be r^6aa.

At the laſt Term but one, is multiplied into a Degree or Power of the Ratio leſs by one than the laſt; ſo the ſecond Term is multiplied into one more than the firſt: And therefore the Rectangle of the Extremes muſt ſtill be the ſame Quantity with that of the Product of any two Terms equally diſtant from that; and this alſo equal to the Square of the Middle Term, if the Number of them be odd.

PROPOSITION IV.

Having the firſt and laſt Terms, and the Ratio. *To find the Sum of all the Terms in any Geometrical Progreſſion*, Mr. *Oughtred* gives this Method.

Let *a* be the firſt Term, and *y* the laſt; then let $z - y =$ all the *Antecedents*, and $z - a =$ all the *Conſequents*. Therefore, by Compoſition of Proportion, it plainly follows, That $a. ra :: z - y. z - a$. That is, the firſt Term is to the ſecond :: as the Sum of all the Antecedents is to the Sum of all the Conſequents: Wherefore by Multiplication of the Extreams and Means, $za - aa = raz - ray$. Wherefore transfer za, and it will be $-aa = raz - ray - za$. Tranſpoſe ray, then will $ray - aa = raz - za$. Divide each Part by $ra - a$, and z will be equal to $\frac{ray - aa}{ra - a}$. That is, *Multiply the ſecond and laſt Terms together, and from the Product ſubſtract the Square of the firſt Term; and then divide the Remainder by the Difference between the firſt and ſecond Term, and the Quotient will be the Sum of all the Terms.*

Example, in this Series 2. 4. 8. 16. 32. 64. 128.

	2
	4
128	8
4	16
	32
512	64
4	128
2) 504 (254 = 254	

The z of all the Terms but the laſt, may be found very eaſily thus: From the laſt take the firſt, and divide the Remainder by the *Ratio* leſſened by Unity; the Quotient is the Sum of all the Terms but the laſt, as will very eaſily appear if you multiply and divide Algebraically: Which Rule is in ſome Caſes more ready than the former, and therefore 'tis ſometimes referred to in the following *Conſectaries*, under the Name of *Rule* 2.

PROPOSITION V.

Having the Ratio of the Terms in any Geometrical Progreſſion, *To find any of the other Terms, or to find any Term ſought.*

As for Inſtance: In Progreſſion, whoſe Ratio is 2, to find the 24th Term; or to anſwer expeditiouſly the common Queſtion of the Price of an

Horſe ſold at a Farthing a Nail (of his Shooe) and doubled every time.

Begin and double, as 'tis eaſie to do, for 6 or 8 times, thus,

0	1	2	3	4	5	6	7	8
1.	2.	4.	8.	16.	32.	64.	128.	256.

And then over the Geometrical Numbers place a Series of Arithmetical ones, beginning with 0, as you ſee: Theſe are Indexes or Exponents of the other, and ſhew every where how often the Ratio is multiplied into its ſelf, to produce any particular Term. Thus over 64, the 7th Term, there ſtands the Index or Exponent 6; which ſhews that 64 is the 6th Power of the Ratio 2, (ſince the Series begins with Unity.) Now the Addition and Subſtraction of the Indexes anſwers to the Multiplication and Diviſion of the Numbers they ſtand over: For $3 + 5 = 8$, which is the Index of 256, the Product of 8 into 32; and $7 - 4 = 3$, which is the Index of 8, the Quotient of 128 divided by 16. This being the admirable Property and vaſt Uſe of theſe Indices, (which is the Reaſon and Foundation of the whole Buſineſs of the *Logarithms*, as you may ſee under that Word) 'tis very eaſie by their help to come at any Term, tho' never ſo remote either way. For ſuppoſing I would have the 16th Place in this Progreſſion, ſince $8 + 8 = 16$, I find, that if I multiply 256 by it ſelf, or ſquare it, it will give me 65536, which is the 16th place; and ſince $16 + 7 = 23$, if I multiply that Number by 128, it will produce 8388608, which is the 24th Place or Nail; (for the Indices begin with 0) and therefore that doubled, according to the Condition of the Queſtion, will give 16777216 Farthings, which reduced, is 17476 *l.* 5 *s.* 4 *d.*

From which *Propoſitions* about *Geometrical Proportionals*, theſe wonderful *Corollaries* may be deduced.

1. That 'tis poſſible by theſe Rules to collect an *Infinite Series* of Proportional Terms into one Sum, altho' it is impoſſible to run over all the Terms ſeparately, becauſe Infinite. Thus, in a continu'd Series of Fractions decreaſing in a double Proportion, $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{32}$, &c. *ad infinitum*, if you take them backwards, you may juſtly reckon a Cypher, or 0, for the firſt Term; (for between $\frac{1}{2}$ and 0, there may be an Infinite Number of ſuch Terms) and the Infinite Sum of theſe Terms will be preciſely equal to Unity: For ſubſtracting the firſt 0 from the laſt $\frac{1}{2}$, and the Remainder $\frac{1}{2}$ being divided by the Name of the Reaſon leſſen'd by 1, that is by 1, which divides nothing; the Quotient $\frac{1}{2}$ is the Sum of all the Terms, excepting the laſt, (by *Rule* 2.) and ſo the laſt $\frac{1}{2}$ being added, the Sum of all in that Series will be 1. Now if the laſt is not $\frac{1}{2}$, but 1, the Sum of all will neceſſarily be 2; and if 2 be the laſt, the Sum of all will be 4: In a Word, it will be always double the laſt Term.

2. And ſince in this Caſe the Sum of all the precedent Terms is equal to the laſt Term, the one being ſubſtracted from the other, there will remain nothing, *i. e.* $\frac{1}{2} - \frac{1}{4} - \frac{1}{8} - \frac{1}{16} - \frac{1}{32}$, &c. *in Infinitum*, is $= 0$; and alſo, $1 - \frac{1}{2} - \frac{1}{4}$, &c. or $2 - 1 - \frac{1}{2} - \frac{1}{4} - \frac{1}{8}$, &c. $= 0$.

3. In like manner the Sum of Infinite Fractions decreaſing in tripple Reaſon in an Infinite Series, ($\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \frac{1}{81}$, &c. will be equal to $\frac{1}{2}$: For if from the laſt $\frac{1}{3}$ (again in an inverted Order) you ſubſtract the firſt 0, and the Remainder $\frac{1}{3}$ be divided by the Name of the Reaſon leſſen'd by Unity, that is by 2, the Quotient $\frac{1}{6}$ will be the Sum of all the Antecedent Terms; and adding to this laſt $\frac{1}{3}$ or $\frac{2}{6}$, the Sum of all will be $\frac{3}{6}$ or $\frac{1}{2}$.

But had the Fractions decreas'd from $\frac{1}{4}$ in a Quadruple, or from $\frac{1}{5}$ in a Quintuple Proportion, &c. the Sum of the whole Series would have been accordingly $\frac{1}{3}$ or $\frac{1}{4}$, and ſo any Series of this kind is equal to a Fraction, whoſe Denominator is leſs by an Unite than the Denominator of the laſt Fraction in that Series, (ſuppoſing the Series to be numbred backward, as before.)

4. Generally alſo, any Infinite Series of Fractions decreaſing according to the Proportion of the Denominator of the laſt Term, and having a common Numerator leſs by an Unite than the Denominator of the laſt Term, (as $\frac{2}{3} + \frac{2}{9} + \frac{2}{27}$, &c. or $\frac{3}{4} + \frac{3}{16} + \frac{3}{64}$, &c. or $\frac{4}{5} + \frac{4}{25} + \frac{4}{125}$, + &c. is equal to Unity, after the ſame way as the Series, *Coroll.* 1. which may be comprehended under this kind, and which may be demonſtrated in all its particular Caſes by the ſame Method we have hitherto made uſe of, or alſo barely ſubſumed from *Coroll.* 3. For ſince $\frac{1}{3} + \frac{1}{9} + \frac{1}{27}$, &c. is equal to $\frac{1}{2}$; $\frac{2}{3} + \frac{2}{9} + \frac{2}{27}$, &c. will be equal to $\frac{2}{2}$ or 1; and ſo in the reſt.

And particularly the Sum $\frac{7}{27} + \frac{7}{288} + \frac{7}{1152}$, &c. decreaſing in a Quadruple Proportion, is equal to $\frac{1}{18}$; and the Sum of $\frac{3}{64} + \frac{3}{256} + \frac{3}{1024}$, &c. is equal to $\frac{1}{16}$; and the Sum of $\frac{7}{64} + \frac{7}{512} + \frac{7}{4096}$, &c. decreaſing in an Octuple Proportion, is equal to $\frac{1}{8}$: For ſubſtracting the firſt Term 0, and dividing the Remainder by the Name of the Ratio leſſen'd by Unity, that is by 3, the Quotient $\frac{1}{72}$, gives the Sum of all, except the laſt.

This therefore (*viz.* $\frac{7}{72}$) being added, the Sum of all will be $\frac{4}{72}$ or $\frac{1}{18}$: In like manner $\frac{7}{64}$ being divided by the Name of the Reaſon leſſen'd by Unity, the Quotient will give $\frac{1}{64}$; and adding the laſt, the Sum of all will be $\frac{8}{64}$, *i. e.* $\frac{1}{8}$: So that hence 'tis evident, that $\frac{1}{18} - \frac{3}{72} - \frac{3}{288} - \frac{3}{1152}$, &c. or $-\frac{1}{18} + \frac{3}{72} + \frac{3}{288} + \frac{3}{1152}$, &c. *in infinitum*, will be equal to nothing; and $\frac{1}{8} - \frac{7}{64} - \frac{7}{512} - \frac{7}{4096}$, &c. $= 0$.

5. The Sum of an Infinite *Progreſſion*, whoſe greateſt Term is a Square Number, the others decreaſing according to the odd Numbers 1, 3, 5, 7, &c. is in *Subſequialteran* Proportion of the Sum of the like Number of equal Terms, *i. e.* as 2 to 3. For the Sum of three ſuch Terms, as 9, 8, 5. *i. e.* 22 to thrice 9, *i. e.* 27, is (dividing both ſides by 9) as $2\frac{4}{9}$, *viz.* $\frac{8}{18}$ to 3, or $2 + \frac{1}{2} - \frac{1}{18}$ to 3. But the Sum of Six ſuch Terms, 36, 35, 32, 27, 20, 11, *i. e.* 161, to ſix times 36, *i. e.* 216 (dividing both ſides by 72) is as $2 + \frac{1}{4} - \frac{1}{72}$, &c. the adhering Fractions thus always decreaſing, ſome by half, others by three Quarters, as in *Coroll.* 7. *Progreſſion Arithmetical*: Wherefore the Sum of the Infinite *Progreſſion* will be to the Sum of the like Number of Terms equal to the greateſt, as,

$$\begin{array}{l} 2 + \frac{1}{2} - \frac{1}{18} \\ -\frac{1}{4} + \frac{3}{72} \\ -\frac{1}{8} + \frac{3}{288}, \text{ &c. to } 3; \end{array}$$

that is, by *Coroll.* 2d and 4th, as 2 to 3. *Q. E. D.*

PROHI-

PROHIBITIO *de vaſto directa parti*, is a Writ Judicial directed to the Tenant, prohibiting from making Waſt upon the Land in Controverſie, during the Suit. It is ſometimes made to the Sheriff.

PROHIBITION, is a Writ to forbid any Court, either Spiritual or Secular, to proceed in any Cauſe there depending, upon Suggeſtion that the Cogniſance thereof belongeth not to the ſame Court: But is now moſt uſually taken for that Writ which lieth for one that is impleaded in the *Court Chriſtian*, for a Cauſe belonging to the Temporal Juriſdiction, or the Conuſance of the King's Court; whereby as well the Party and his Council, as the Judge himſelf, and the Regiſter, are forbidden to proceed any further in that Cauſe.

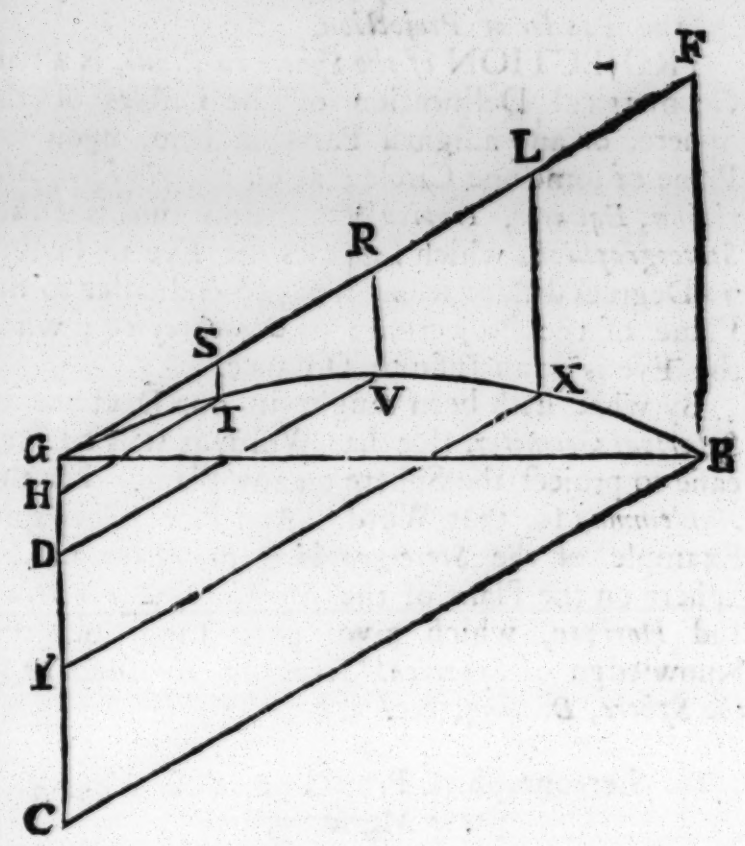
PROJECTILES, are ſuch Bodies, as being put into a violent Motion by any great Force, are then caſt off or let go from the Place where they received their Quantity of Motion, and do afterwards move at a Diſtance from it; as a Stone thrown out of ones Hand, or by a Sling, an Arrow from a Bow, a Bullet from a Gun, *&c.*

There hath been a great Diſpute about the Cauſe of the Continuation of the Motion of *Projectiles*, or what it is that makes them move after they part from the Force that began the Motion. The *Peripateticks* will needs have it, That the Air being by the Motion of the Hand of the Slinger, *&c.* put into a moſt violent Agitation, and forced rapidly to follow the Motion of the Stone, while 'tis accelerated in the Hand of the Slinger, doth to prevent a *Vacuum*, preſs with all due Velocity after the Stone when it parts from the Hand, and thruſts it forwards as long as it can. But this Account ſeems very unconceivable; and there needs nothing more to ſolve the Motion of *Projected Bodies*, but only to conſider, That all Bodies being indifferent to Motion or Reſt, will neceſſarily continue the State which they are put into, unleſs they are forced to change if by ſome other Force impreſſed upon them. Thus if a Body be at reſt, ſo it will eternally abide, if nothing move it; or if it be in Motion, ſo it will eternally move uniformly on in the ſame right Line, if nothing ſtop it. Wherefore, when a Stone is put into any Degree of Motion, by the Rotation of the Arm of the Man that ſlings it, whatever Degree of Velocity it had acquired when it parted from the Hand, the ſame would it ever after keep if it moved in *Vacuo*, and had no Gravity: But becauſe it hath a Tendency, as all Bodies (by the Law of Nature) have, towards the Centre of the Earth, and is alſo reſiſted by the Air all along as it goes, in proportion to its Velocity; it plainly follows, that it muſt needs be both continually drawn downwards, and alſo continually retarded in its Progreſſive Motion forwards, and conſequently at laſt fall down to the Earth, and ſtop.

The Line of Motion which a Body *projected* deſcribes in the Air, (abſtracting from the Reſiſtance of the Medium) is, as hath been proved by *Galilæus*, and many Others, and particularly by our Sir *Iſaac Newton*, *Prop.* 4. *Cor.* 1. of his Second Book, the Curve of a Parabola: Which Line is alſo deſcribed by every Deſcending Body.

He ſhews alſo, That if the Line of Direction of the Projectile Motion of any Body, the Degree of its Velocity, and at the Beginning, the Reſiſtance of the Medium being given, the Curve which it will deſcribe may be diſcovered, and *vice verſa*; he ſaith alſo in *Schol. Prop.* X. *Lib.* 2. That the Line which a *Projectile* deſcribes in a Medium uniformly reſiſting the Motion, rather approaches to an *Hyperbola* than a *Parabola*.

The Learned Capt. *Halley* proves all *Projectiles* to deſcribe a *Parabola* thus:



Let the Line G R F be the Line in which the *Project* is directed, and in which, by the firſt *Axiom*, under the Word *Deſcent*, it would move equal Spaces in equal Times, were it not deflected downwards by the Force of *Gravity*. Let G B be the *Horizontal Line*, and G C a Perpendicular thereto. Then the Line G R F being divided into equal Parts, anſwering to equal Spaces of Time, let the *Deſcents* of the *Project* be laid down in *Lines parallel* to G C, proportioned as the Squares of the Lines, G S, G R, G L, G F, or as the Squares of the Times; (*i. e.*) let them be drawn from S to T, from R to U, from L to X, and from F to B, and draw the Lines T H, V D, X Y, B C, parallel to G F; I ſay, the Points T, V, X, B, are Points in the *Curve* deſcribed by the *Project*, and that That *Curve* is a *Parabola*.

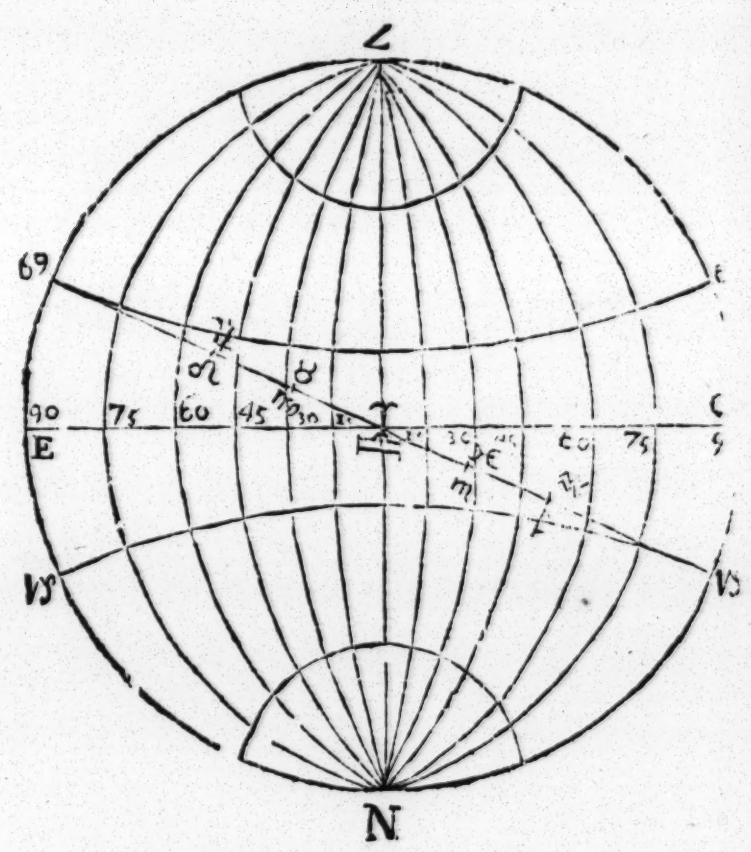
That the Points are in the *Curve*, is evident by *Axiom* 2. under the Word *Deſcent of Heavy Bodies*: and the Parts of the *Deſcent* G H, G D, G Y, G C = S T, R V, L X, F B, being as the Squares of the Times, (by *Prop.* 2. under the Word *Deſcent*) that is as the Square of the *Ordinates* H T, D V, Y X, B C = G S, G R, G L, G F, the *Spaces* meaſured in thoſe *Times*; and there being no other *Curve* but the *Parabola*, whoſe Parts of the *Diameter* are as the Squares of the *Ordinates*, it follows that the *Curve* deſcribed by a *Project* can be no other than a *Parabola*: And ſaying, as R V the *Deſcent* in any *Time*, as R G or V D the *direct Motion* in the ſame *Time*; ſo is V D to a *Third* Proportional, or the *Parameter* of the *Parabola* to the *Diameter* G C, which is always the ſame in *Projects* caſt with the ſame *Velocity*: And the *Velocity* being defined by the Number of *Feet* moved in a *Second* of *Time*, the *Parameter* will be found by dividing the *Square* of the *Velocity* by 16 *Foot* 1 *Inch*, the *Fall* of a *Body* in the *ſame Time*.

PROJECTION, in Chymiſtry, is putting any Matter to be *calcined* or *fulminated* into the Crucible Spoonful by Spoonful. The pretended Caſting of the Powder of the Philoſopher's Stone into a Crucible of melted Metal, in order (as they boaſt they can do) to tranſmute it into Gold or Silver, is called alſo *Projection*; and the Matter they caſt in, the *Powder of Projection*.

PROJECTION *of the Sphere in Plano*, is a true Geometrical Delineation of the Circles of the Sphere, or any aſſigned Parts of them, upon the Plane of ſome one Circle; as on the *Horizon*, *Meridian*, *Equator*, *Tropick*, &c. And this is either *Stereographick*, which ſuppoſes the Eye to be but 90 Degrees diſtant from, and perpendicular to the Plane of the Projection; or *Orthograpick*; when the Eye is at an Infinite Diſtance.

By what hath been taught in our Doctrine of *Spherical Geometry*, (ſee that Word) it will be very eaſie to project the Sphere on any Plane. For the *Analemma*, ſee that Word. And here follows an Example of the *Stereographick Projection* of the Sphere on the Plane of the *Meridian*, *Equinoctial*, and *Horizon*, which gives good Light into the Knowledge of *Spherical Triangles*, *the Doctrine of the Sphere*, *Dialing*, &c.

The Stereographick Projection *on the Plane of the* Meridian.



Let Z Q N E be the *Meridian*.
- Z and N the *Poles*, as alſo the *Zenith* and *Nadir*.
- E Q the *Equinoctial* and *Horizon*.
- Z N the *Equinoctial Colure*, and *Prime Vertical Circle*.
- Z 15 N, Z 30 N, Z 45 N, &c. are *Hour-Circles* or *Meridians*, and alſo *Azimuths*, becauſe the *Pole* is in the *Zenith*.

And to deſcribe theſe Circles, find the Points 15, 30, 45, 60, &c. in the *Equinoctial*, by ſetting the Half Tangent of their Diſtance from ♈; and then their Centres are found by ſetting their Coſecants both ways from their Points of Interſection with the *Equator*.

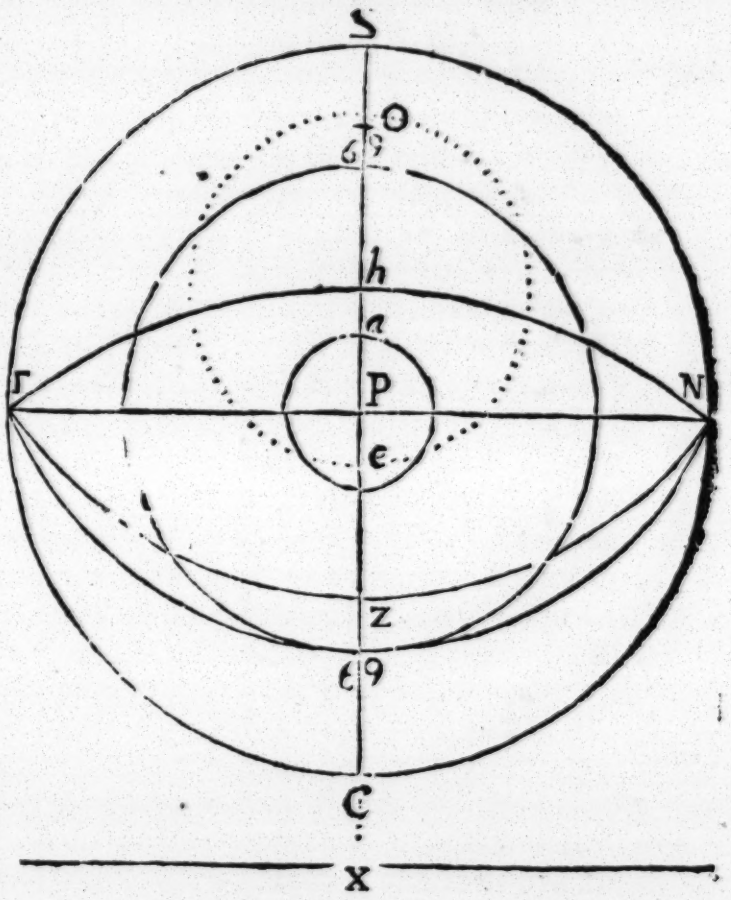
♋, ♋, and ♑, ♑, are the Northern and Southern *Tropicks*, which are deſcribed by ſetting the Half Tangent of 23 Deg. 30 Min. from ♈ each way: Then the Tangent of its Complement, *viz.* 66 Deg. 30 Min. each way from thence on the *Colure* produced, gives their Centres. By this Method all Parallels, of Declinations may be drawn.

Or you might have ſet the *Co-ſecant* of the *Parallel* from the Centre of the *Primitive*, which would have alſo found the ſame Point for the Centre of the Parallel, whoſe *Radius* is equal to the *Tangent* of its Diſtance from its *Pole*, by *Cor.* 1. and 2. of *Probl.* 2. of *Spherick Geometry*.

Theſe *Parallels* in this *Projection*, are alſo *Almicanters*, or *Parallels of Altitude*.

♋, ♑, is the *Ecliptick*, which muſt be divided from the Diviſion on the Scale of *Half Tangents*, but denominated according to the *Signs* of the *Zodiack*, reckoning 30 Degrees to each Sign.

The Stereographick Projection *on the Plane of the* Equinoctial.



Let S C be the *Meridian* and *Solſticial Colure*,
- E N the *Equinoctial Colure* and *Hour-Circle* of 6.
- P the *North Pole*.
- ♋ ♋ the *Northern Tropick*.
- E ♋ N the *Northern Half of the Ecliptick*, (whoſe Centre is found by ſetting off the *Secant* of 23 Deg. 30 Min. from ♋) And its *Pole* is at *a* the Interſection of the *Polar Circle* and *Meridian*; and is the Place through which all Circles of Longitude muſt paſs.
- E Z N the *Horizon* of *London*, which is deſcribed thus: Set the *Half Tangent* of the *Co-latitude* from P to Z; then the *Tangent* of the ſame, ſet from P to O, or its *Secant* from Z to O, gives its Centre; and its *Pole* will be at *h*, 38 Deg. 30 Min. (in the *Half Tangents*) diſtant from F, where *h* is at the *Zenith*.

To draw any other Circles in this Projection.

1. For *Circles of Longitude*, which muſt all paſs thro' *a*, and the ſeveral *Degrees* of the *Ecliptick*; ſet therefore the *Tangent* of 66 Deg. 30 Min. from *a*, downwards, on the *Meridian*, produced; which will find a Point, through which a Perpendicular drawn to the *Meridian*, ſhall contain in it the Centres of all the Circles of Longitude, whoſe Diſtances ſet off to the *Radius P x*, ſhall be the *Tangents* of the Degrees of their Diſtances from the *Meridian*, S P C, (which is that belonging to 180. Deg.)

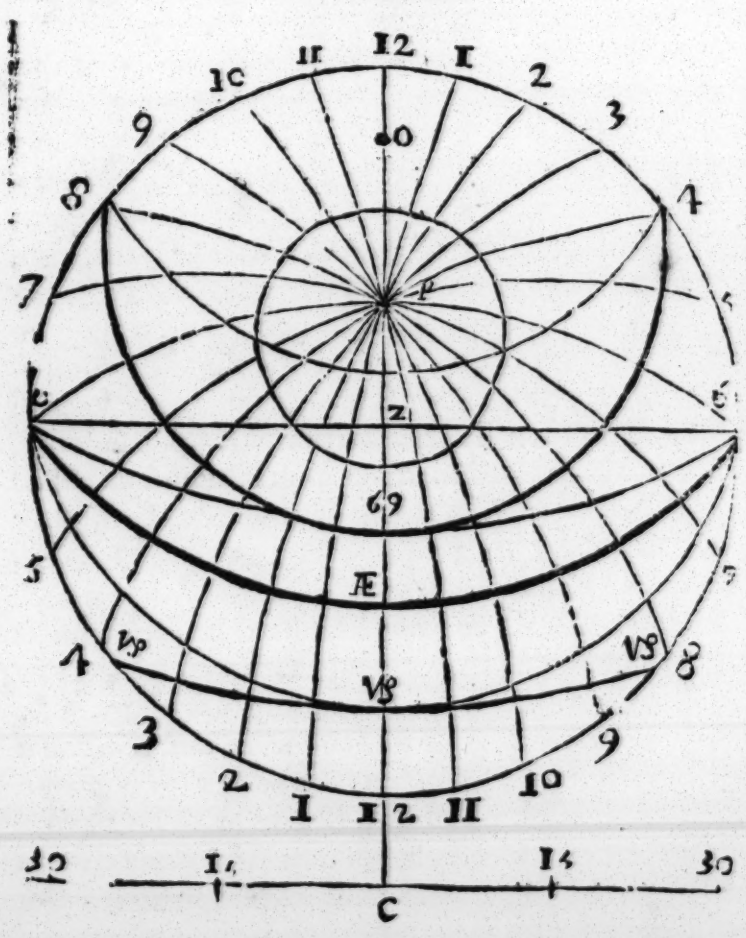
2. All *Parallels of Declination* are drawn by ſetting the *Half-Tangents* of their Diſtances from P.

3. All *Azimuths*, or *Vertical Circles*, muſt paſs thro' *h* at the *Zenith*; Since therefore the *Zenith* is 38 Deg. 30 Min. diſtant from P, ſet the *Co-ſecant* of that (or the Secant of 51 Deg. 30 Min.) from *h* on the *Meridian* extended below, and that ſhall find the Point *x*, the Centre of the *Azimuth* of Eaſt and Weſt, *viz*, E *h* N; and the Centres of all the reſt are in a Line that's perpendicular to the *Meridian*, and drawn through *x*.

4. *Circles of Altitude*, or *Almicanters* are leſſer Circles, whoſe *Poles* are not in the Plane of the *Projection*, and may be deſcribed by our Third Caſe of *Probl.* 9. of *Spherick Geometry*. Thus the Circle O *e* is a *Parallel of Altitude* 50 Degrees above the *Horizon*.

5. All *Hour-Circles* are ſtrait Lines from the Centre to the Limb.

The Stereographick Projection *on the Plane of* the *Horizon*.



First, Draw a Circle repreſenting the *Horizon*, and quarter it with two Diameters.

Then will

ζ be the *Zenith* of the Place.
12 ζ 12 the *Meridian*.
6 ζ 6 the *Prime Vertical*, or *Azimuth* of E, & W.

Make

ζ P = ½ Tangent of 38° 30′ (or Tangent of 19° 15′)
P ſhall be the *Pole of the World*.

Make

ζ Æ = 1 Tangent of 51° 30′ (or Tangent of 25° 45′)

And

Æ *o* = Secant } of 38 Deg. 30 Min.
ζ *o* = Tang. }

Then ſhall

o be the *Centre of the Equinoctial*, 6 Æ 6.

In this *Projection*, *Almicanters* are all parallel to the Primitive Circle.

And *Azimuths* are all Right Lines, paſſing thro' (ζ) the Centre of the Primitive, to the equal Diviſions in the Limb.

Parallels of Declination, are all Leſſer Circles, and parallel to the *Equinoctial*; and their Interſection with the meridian are found by ſetting the Half Tangent of their Diſtance from the *Zenith* Southward and Northward, or both ways from ζ.

Their Centres are found by biſecting the Diſtance between thoſe two Points; for the Middle ſhall be the Centre of the Parallel.

Thus,

ζ ♋ = ½ Tangt. of 28° 00′ = Diſtance of the Tropick of ♋ from the *Zenith*, } to the Southw. or downward from ζ.
And
ζ ♑ = ½ Tangt. of 75° 00′ = Diſtance of the Tropick of ♑ from the *Zenith* } to the Southw. or downward from ζ.

And the Interſection again with the North of the *Meridian*, is at

105° 30′ } for { ♑ } to the Northwards, or upwards from ζ.
152° 0′ } for { ♋ } to the Northwards, or upwards from ζ.

For the *Hour-Circles*,

Make ζ *c* = Tangent of 51° 30′, or P *c* = Secant of 51° 30′. Draw G C T perpendicular to the produced *Meridian*. Wherefore, if from *c*, with the Radius ζ *c*, you ſet off the Tangents of 15°, 30°, 45°, &c. both ways, you'll have the Centres of the ſeveral *Hour Circles*, 7 and 5, 8 and 4, &c.

Note, *In all* Stereographick Projections, *all Diameters are meaſured on the Scale of* Half Tangents: *The Reaſon of which you have in* Prop. 2. *of our* Spherick Projection. *And this is the* Ground of all Dyalling, *or the True Projection of the Hour-Circles of the Sphere on any Given Plane.*

PROJECTURE, a Term in Architecture ſignifying the Jutting or Leaning-out of any Part of a Building, the Coping of a Wall, &c. Theſe the *Italians* call *Sporti*, and the *Greeks*, *Echphoras*; and in the General, all *Margents* which hang over beyond

yond the *Scapus* of a Column, are called *Projectures.*

PRO *in Diviſo*, is a Poſſeſſion or Occupation of Lands or Tenements, belonging to two or more Perſons, whereof none knows his ſeveral Portion, as *Co-parceners* before Partition.

PROLABIA, the utmoſt prominent Parts of the Lips.

PROLEPSIS, is a Figure in Rhetorick, by which we prevent what might be objected by the Adverſary.

PROLAPSUS *Uteri*. See *Uteri Prolapſus.*

PROLEPTICUS, is a Diſeaſe always anticipating; ſo as if the Ague came to day at Four of the Clock, then to Morrow one Hour ſooner, and ſo on. *Blanchard.*

PROLOCUTOR *of the Convocation Houſe*, is an Officer choſen by Perſons Eccleſiaſtical, publickly aſſembled by Virtue of the King's Writ, for every Parliament: And as there be two Houſes of *Convocation*, ſo there are two *Prolocutors*, one of the Lower, and one of the Higher Houſe. He of the Lower Houſe, preſently upon the firſt Aſſembly, by the Motion of the Biſhops, being choſen by the Members of the ſaid Lower Houſe, is preſented to the Biſhops for *Prolocutor*, that is, the Perſon by whom they intend to deliver their Reſolutions to the Higher Houſe, and to have their own Houſe eſpecially ordered and governed. His Office is to cauſe the Clerk to call the Names of ſuch as are of that Houſe, when he ſees Cauſe to read all things propounded, gather Suffrages, and the like.

PROMOTERS, or *Promooters*, are thoſe who in Popular and Penal Actions do proſecute Offenders in their own Name and the King's; having Part of the Fines or Penalties for their Reward. They do belong eſpecially to the *Exchequer* and *King's Bench.*

PROMULGE *a Law*, is firſt to make a Law, and then to declare, publiſh, and proclaim the ſame to Publick View; and ſo *Promulgated.*

PRONOS, or *Pronaus*, a Term uſed by Architects for a Church-Porch, or a *Portico* to a Palace, great Hall, or ſpacious Building.

PRONATOR *Radii Quadratus*, is a Muſcle of the *Radius*, which ariſeth broad and fleſhy from the Lower and Inner part of the *Ulna*; and paſſing tranſverſly over the Ligament that joins the *Radius* to the *Ulna*, and is ſo inſerted to the Superior and External part of the *Radius*: It helps with the *Pronator Teres* to move the *Radius* inwardly.

PRONATOR *Radii Teres* is a Muſcle of the *Radius*, by ſome called *Pronator Superior Rotundus*: It ariſeth fleſhy from the Internal Extuberance of the *Os Humeri*, where thoſe bending the *Carpus* and Fingers do ariſe; and firmly adhering to the *Flexor Carpi Radialis*, it deſcends obliquely downwards to its fleſhy Inſertion, a little above the middle of the *Radius* Externally: Its Uſe is to move the *Radius* inwards.

PRONOTARY, or *Protonotary*, is a Chief Officer of the *Common Pleas* and *King's Bench.* He of the *King's Bench* records all Actions Civil ſued in that Court, as the *Clerk* of the *Crown-Office* doth all Criminal Cauſes. Thoſe of the *Common-Pleas* do enter and enrol all manner of Declarations, Pleadings, Aſſiſes, Judgments and Actions: Alſo they make out all Judicial Writs, as the *Venire facias*, after Iſſue joined; and *Habeas Corpus*, for bringing in of the Jury; and *Diſtringas Jurator.* They alſo make out Writs of Execution and Seiſin; Writs of *Superſedeas*, for Appearance to *Exigents*: as well as the *Exigents* and *Writ of Priviledge*, for removing Cauſes from other Inferior Courts of Record, where the Party hath Cauſe of Priviledge; Alſo Writs of *Procedendo* and *Scire facias* in all Caſes, and Writs to *enquire of Damages*, and all Proceſs upon *Prohibitions*, and upon Writs of *Audita Querela*, and *Falſe Judgment*; with many other. Laſtly, They enrol all Recogniſances acknowledged in that Court, and all Common Recoveries; and they make Exemplifications of any Record in the ſame Term, before their Rolls are made up and delivered into the Treaſury of the Records of that Court.

PRONOUN, in Grammar, is a Variable Word, often uſed as a Noun, and nearly of a like Signification with it: And theſe *Pronouns* they divide into ſuch as are,

1. *Finite*; as, *I, Thou, He,* &c.
2. *Infinite*; as *Quis, Cujus,* &c.
3. *Demonſtrative*, which ſhew a preſent Perſon or Thing; as, *I, You, He.* &c.
4. *Relative*, which refer to ſome Antecedent Word; as, *who, which, &c.*
5. *Interrogative*; as when *who* and *which*, &c. are uſed in asking Queſtions.
6. *Poſſeſſives*; as, *Mine, Thine,* &c.
7. *Gentiles*, which expreſs a Nation or Country; as, *Noſtras, Veſtras, Cujas* in the Latin Tongue.

PRO *Partibus Liberandis*, is a Writ for the Partition of Lands between Co-heirs.

PROPER *Fraction*, is ſuch an one as hath its Numerator leſs than the Denominator; as $\frac{3}{4}$, $\frac{5}{7}$, which is really leſs than Unity, and therefore properly ſpeaking, a Fraction.

PROPER *Navigation*, is the guiding of a Ship to any Port deſired, where the Voyage is to be perform'd in the vaſt Ocean; and requires not only the Lead-Line, and Ordinary compaſs, but *Azimuth Compaſs, Charts, Log-board*, and *Half Minute-Glaſs*; with Inſtruments for Celeſtial Obſervation, as the *Quadrant, Fore-ſtaff*, &c. And the Navigator muſt be able by theſe to find at any time in what Place the Ship is; which is done by comparing it with any known Place; that is, how much the ſame known Place is ſituate from the Ship, either towards the North or South, which is called the *Difference of Latitude*; or towards the Eaſt or Weſt, which if in proper Degrees, is called the *Difference of Longitude.*

PROPERTY, or *Propriety*, ſtrictly ſpeaking, is the higheſt Right that a Man hath or can have to any thing, and no ways depending upon any other Man's Courteſie: And this, none in our Kingdom can be ſaid to have in any Lands or Tenements, but only the King in the Right of his Crown; becauſe all the Land throughout the Realm is in the Nature of Fee, and held either mediately or immediately of the Crown.

This Word nevertheleſs, is uſed for that Right in Lands and Tenements that Common Perſons have, becauſe it importeth as much as *utile Dominium*, tho' not *Directum.* And there are Three manners of Rights of *Property*, that is, Property *Abſolute*, Property *Qualified*, and Property *Poſſeſſory.*

PROPHASIS, is a Fore knowledge in Diſeaſes, alſo an Occaſion or Antecedent Cauſe. *Blanchard.*

PRO-

PROPHYLATICA, is a Part of that Part of Phyſick called *Hygicina*, (or what reſpects the Preſervation of Health) which gives notice of future but imminent Diſeaſes. *Blanchard.*

PROPLASM, the ſame with a *Mould* in which any Metal or ſoft Matter, which afterwards will harden, is caſt.

PROPORCITAS, in Law, ſignifies the Declaration or Deliverance of an Aſſiſe; otherwiſe called *Veredictum Aſſiſæ*, the Verdict of an Aſſiſe; becauſe the Aſſiſors are ſworn to declare the Truth, and therefore are called *Juratores* or *Juorors.*

PROPORTION, 1. When two Quantities are compar'd one with another, in reſpect of their Greatneſs or Smallneſs, that *Compariſon* is called *Ratio*, *Reaſon*, *Rate*, or *Proportion*: But when more than two Quantities are compared, then the Compariſon is more uſually called the *Proportion* that they have to one another. The Words *Ratio* and *Proportion* are frequently uſed promiſcuouſly.

2. When two Quantities only are compared, the former Term is called the *Antecedent*, and the latter the *Conſequent.*

3. And the *Proportion* or Relation of two Numbers one to another, is found by dividing the *Antecedent* by the *Conſequent*; and the Quotient is the Exponent or Denominator of the Proportion.

As, if the Quotient be 2, the Proportion is Double; if 3, Treble; if 4, Quadruple; if $\frac{1}{2}$, Subduple, or one Half; if $\frac{1}{3}$, Subtriple, or one Third part; if $\frac{3}{2}$, or $1\frac{1}{2}$, Seſquilateral, or the Proportion denominated by one and an Half; if $\frac{4}{3}$, or $1\frac{1}{3}$, Seſquitertian, or once with a Third part; and univerſally, the Proportion of A to B, is that denominated by $\frac{A}{B}$, that is by the Quotient of A divided by B.

4. Theſe *Proportions*, ſo many of them as are Rational, or between Number and Number, have particular Names given them by *Greek* and *Latin* Writers.

If after the Antecedent be divided by the Conſequent, the Quotient be 1, it is called *Proportion of Equality*, or *Simple Proportion.*

If the Quotient be 2, 3, 4, (or ſuch other Integer Number) it is called *Multiple Proportion*, (viz. *Double*, *Treble*, *Quadruple*, &c.) And the Contrary to thoſe are called *Submultiple*, (viz. *Subduple*, *Subtriple*, *Subquadruple*, &c.) or *One half*, a *Third part*, *Fourth part*, or ſuch other *Aliquot* Part.

If the Quotient be 1, with one ſuch Part, as $1\frac{1}{2}$, $1\frac{1}{3}$, $1\frac{1}{4}$, &c. it is called *Superparticular*, (viz. *Seſquialteral*, *Seſquitertian*, *Seſquiquartan*, &c.) And the Contraries hereunto are called *Subſuperparticular*, (viz. *Subſequialteral*, *Subſequitertian*, &c.

If ſuch Quotient be 2, 3, 4, (or ſuch other Integer greater than Unity) with ſuch an *Aliquot* Part, it is called *Multiple-ſuperparticular*, (as $2\frac{1}{2}$, *Duple-ſeſquialteral*; $3\frac{1}{3}$, *Triple-ſeſquitertian*; $3\frac{1}{4}$, *Triple-ſeſquiquartan*, &c.) And the Contraries thereunto are *Submultiple-ſuperparticular*, as *Subduple-ſeſquialteral*, *Subtriple-ſeſquitertian*, &c.

If the Quotient be 1, with ſome Number of *Aliquot* Parts, as $1\frac{2}{3}$, $1\frac{3}{4}$, $1\frac{2}{5}$, &c. it is called *Superpartient*, (as *Superbipartiens tertias*, *Supertripartiens quartas*, *Superbipartiens quintas*, &c.) And the Contraries hereunto are *Subſuperpartient*, as *Subſuperbipartiens tertias*, &c.

If ſuch Quotient be ſome greater Integer Number, (as 2, 3, &c.) with ſuch Number of *Aliquot* Parts, as $2\frac{2}{3}$, $3\frac{3}{4}$, $3\frac{2}{5}$, &c. it is called *Multiple-ſuperpartiens*, (as *Dupla ſuperbipartiens tertiens*, *Tripla ſupertripartiens quartas*, *Tripla-ſuperbipartiens quintas*, &c.) And the Contraries thereunto, *Submultiple-ſuperpartient*, (as *Subdupla-ſuperbipartiens tertias*, *Subtriple-ſupertripartiens quartas*, &c.) As that of 31 to 7, (becauſe $\frac{31}{7} = 4\frac{3}{7}$) is *Quadruple ſupertripartiens ſeptimas*; and its Contrary, 7 to 31, is *Subquadruple-ſupertripartiens ſeptimas.*

And under ſome of theſe Compellations all Proportions will fall, which are as one Integer Number to another.

But notwithſtanding all this ado, (tho' that the Ancient Geometers may be underſtood, I thought fit to explain theſe long, barbarous, and hard Words here) tis much better, and more Intelligible, to expreſs theſe Proportions, as the uſual manner now is, by the Numbers themſelves, than by theſe Names; and briefly and clearly to ſay, as 31 is to 7, or as 7 is to 31, rather than to ſay *Quadrupla-ſupertripartiens ſeptimas*, or *Subquadrupla-ſupertripartiens ſeptimas.*

5. If when Four Quantities are conſidered, you find that the *Firſt* hath as much Greatneſs or Smallneſs, in reſpect of the *Second*, as the *Third* hath in reſpect of the *Fourth*: Thoſe Four Quantities are called *Proportionals*, and are thus expreſſed,

$$8 . 2 :: 16 . 4.$$
$$a . b :: c . d.$$

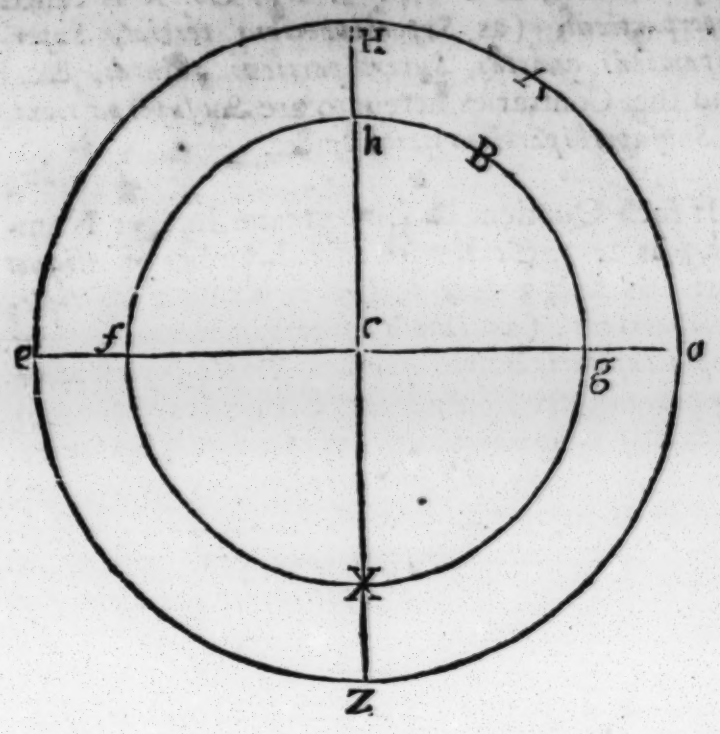
That is, As 8 contains 2 four times, ſo 16 contains 4 four times; and therefore 8 is juſt as big in reſpect of 2, as 16 is in reſpect of 4.

Here therefore, the *Ratio* between the Firſt Pair, is equal to the *Ratio* between the other Pair of Numbers; and conſequently, theſe Four having equal *Ratio's*, are *Proportionals.*

But if you encreaſe or diminiſh any one of theſe Four Numbers, the *Ratio* will grow unequal, and then they will not be *Proportionals*: As if inſtead of 8 you ſhould put 9 or 7, letting all the reſt remain as they were; 'twill then be plain, that 9 hath more Magnitude, and 7 hath leſs in reſpect of 2, than 16 hath in reſpect of 4; for 9 contains 2 above four times, and 7 doth not contain it ſo often as four times; whereas 16 contains 4 exactly four times: Wherefore theſe latter Numbers, 9, 2, 16, 4, or 7, 2, 16, 4, are not *Proportionals.* And 'twould be the ſame, if any other Member of the firſt Four Numbers had been altered; for the *Proportion* would neceſſarily be deſtroyed.

6. The annexed Figure will ſerve very well to explain *Proportion.*

Let



Let the *Radius e* C be ſuppos'd to move quite round on its Centre C, 'till the Point *e* come to the ſame Place it was at before it began to move; then will that Point *e* have deſcribed the Circumference of a Circle, which let be H *d* Z *e*. Then at the ſame time, any other Point of the *Radius*, as ſuppoſe *f*, will alſo have deſcribed the Inner Circle *f h g* X. Draw the two Diameters H Z, and *e d*, cutting each other at Right Angles in C, which will divide both Circles into four Quadrants. 'Tis plain from hence, that the ſame Proportion which the outer Circle (Z) bears to its fourth (or any other) part A; the ſame muſt the inner Circle (X) bear to B, alike Part of its Circumference. For when the longer *Radius e* C hath moved over the fourth part of the Circle Z, and the Point *e* is come to H; then will the Point *f* alſo be come to *h*, and will have gone over a Quadrant of its Circle X; and when *e* is come to *d*, *f* alſo will be come to *g*, and will as well as the other have deſcribed a Semi-circle: So that as the Circle Z is to any Part of its Periphery, or as it is to the Ark A; ſo will the Circle X be to a like Part of its Periphery, or to the Ark B. That is,

12 3 8 2
Z : A :: X : B.

7. And from theſe Conſiderations may all the ſeveral Species of Proportion be demonſtrated from the Nature of the Thing. For if

12 : 3 :: 8 : 2.
Z : A :: X : B.

It will certainly follow by *Inverſion*, that

A : Z :: B : X.

That is, If Z be as big in reſpect of A, as X is in reſpect of B; then muſt A be as little in reſpect of Z, as B is in reſpect of X.

Or if 12 contain 3 as often as 8 contains 2, then will 3 be contained in 12 as oft as 2 is contained in 8.

8. Since Z : A :: X : B, it will follow, by *Alternate* Proportion, that Z : X :: A : B; that is, Antecedent is to Antecedent, as Conſequent is to Conſequent: Which is plain, if the former Figure be well conſidered.

For ſuppoſe the outer Circle Z to be Double, Triple, Quadruple, &c. of the inner Circle X; then muſt the Ark A (or any other Part of it) be Double, Triple, &c. of the Ark B, a like Part of the Circle X. Therefore, as the Whole is to the Whole, ſo the Parts muſt be to the Parts; that is, Z : X :: A : B. *Q. E. D.*

9. If you compare the *Differences* (which is what remains when one is ſubtracted from the other) between the Antecedents and their Conſequents, with thoſe Conſequents; another Species of *Proportion* will be found, which is called *Proportion by Diviſion*, and ought to be thus expreſt,

$\overline{Z - A} : A :: \overline{X - B} : B.$

Now undoubtedly, if from the whole Circle Z you take a Quarter, (or any other Part) as A; and alſo from the whole Circle X you take a Quarter, or any like Part, as B; the remaining three Quarters of the outer Circle, muſt be to its other Quarter A, as the remaining three Quarters in the inner Circle are to its Quarter B. That is,

$\overline{Z - A} : A :: \overline{X - B} : B.$ *Q. E. D.*
9 . 3 :: 6 . 2

10. Or if you add the Antecedents and Conſequents together, and then compare the Sums with the former Conſequents; another Species ariſes, called *Proportion by Compoſition*; and 'tis thus expreſt,

$\overline{Z + A} : A :: \overline{X + B} : B.$

And 'tis certain, ſince Z : A :: X : B, by the Suppoſition, and alſo Z : X :: A : B. by *Alternate Proportion*: Z and A together will be to A, as X and B together are to B. That is,

$\overline{Z + A} : A :: \overline{X + B} : B.$ *Q. E. D.*
15 . 3 :: 10 . 2

11. If you compare the Antecedents with the Differences between them and their Conſequents, another Species of Proportion ariſes, which is called *Converſion of Proportion*: And is thus expreſt,

$\overline{12 \quad .9} :: 8. \overline{\quad 6}$
$\overline{Z. Z - A} :: X. \overline{X - B}$

Which is very plain from the Conſideration of the Figure; for no doubt the whole Circle Z is to its $\frac{3}{4}$ (*viz.* Z − A) as the whole leſſer Circle X is to $\frac{3}{4}$ (which is X − B.)

12 3 8 2
12. If when Z. A :: X. B, you compare the Conſequents A and B with two other Quantities, ſo as to make two Rows of Proportionals, ſtanding thus, Z . A :: X . B
A . *d* :: B . I.

12 9 :: 8 : 6
Then will Z be to *d* :: as X : I, which is another Species of Proportion by *Equality*, or *ex æquo ordinata*: And follows from this Figure very plainly,

plainly; for no doubt the whole Circle Z is to its $\frac{1}{4}$; which is 9 or 4 :: as the whole Circle X is to its $\frac{1}{4}$, which is 1. or 6.

13. If Z be taken as often as X, *ex. gr.* 3 Z and 3 X, you may conclude, That Z : X :: 3 Z : 3 X, or as 10 Z to 10 X; or alſo as 12 $\frac{1}{2}$ Z, to 12 $\frac{1}{2}$ X. And ſo on, in whatſoever Proportion the two Magnitudes Z and X are multiplied, ſo they are multiplied equally, or that you take one as often as you take the other. For then there will be the ſame Proportion between the Magnitudes thus equally multiplied, as there was between the Simple Magnitudes, before ſuch Multiplications.

And theſe Magnitudes thus equally multiplied, are called *Æqui-multiples* of the ſimple Magnitudes Z and X: Hence we ſay, that *Æqui-multiples* are in the ſame Proportion as ſuch ſimple Magnitudes, out of which they are compounded.

14. If Z be divided in the ſame manner as X is; and *ex. gr.* you take a fourth Part of Z, and the like of X; or the tenth, or any other Part of Z, and the ſame of X: Then will theſe Parts be proportional to their Wholes, Z : X :: $\frac{1}{4}$ Z (or $\frac{1}{10}$ Z) : $\frac{1}{4}$ or $\frac{1}{10}$ X. All which is ſelf-evident.

15. A *Proportion* is ſaid to be *Compounded* of other Proportions, when the Exponent of That is made by the Multiplication of the Exponents of Theſe, one into another. Thus, the *Compound of the Treble and Double*, (whoſe Exponents are 3 and 2) is the *Treble of the Double*, (whoſe Exponent is 3 × 2) that is, the *Sextuple* (becauſe 3 × 2 = 6) which is manifeſtly a Work of Multiplication.

16. The *Products*, or the *Quotients* of any Two Quantities or Numbers *Multiplied* or *Divided* by the ſame Third Numbers, are in the ſame Proportion as the Numbers were before they were *Multiplied* or *Divided*.

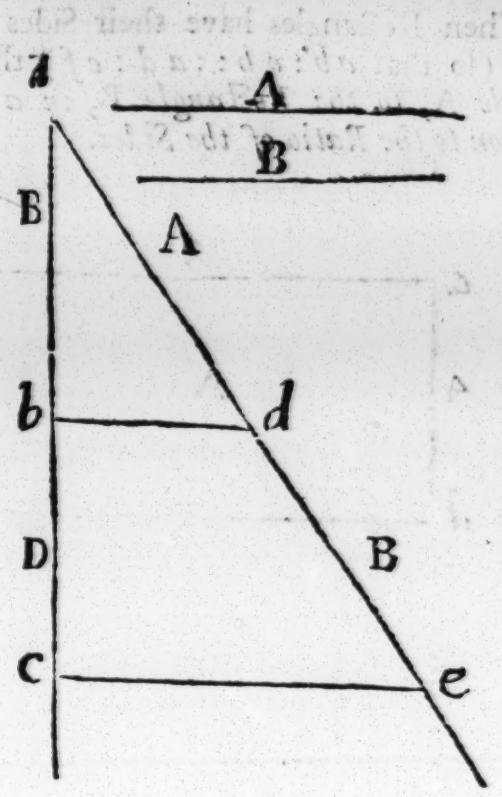
E. gr. 1. Let 8 and 12 be multiplied by 4; then will 8 : 12 :: 32 : 48.

2. Let 8 and 12 be divided by 4; then will 8 : 12 :: 2 : 3.

The Reaſon of which is very plain; becauſe one Number is juſt as much increaſed by Multiplication, or diminiſhed by Diviſion, as the other is.

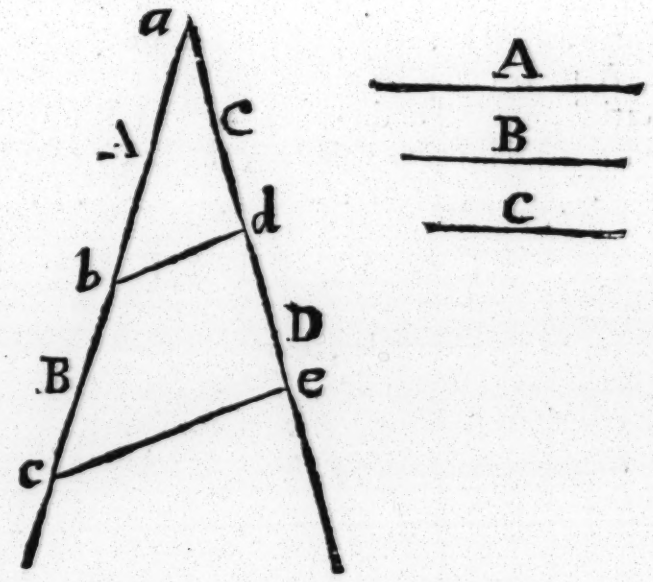
PROBLEMS.

To Two Lines A *and* B, *to find* D *a Third Proportional.*



Make any Right-lined Angle, as *c a e*. Then ſet off in it *a d* = A, and *a b* = B. Set off alſo B again from *d* to *e*; then join *b* and *d*, and to *b d*, draw a Parallel thro' the Point *e*, ſo ſhall *b c* be the Line ſought for, A. B :: B. D, by 2 *e* 6 *Euclid.*

To Three given Lines, A B *and* C, *to find a Fourth Proportional* D.



Make any Angle, as *a c e*; then from *a*, take *a b* = A, and *b c* = B, and *a d* = C, join *b d*, and thro' *c* draw a Parallel to *b d*; ſo ſhall *d e* be the Line ſought: For A. B :: C. D. 2 *è* 6 *Euclid.*

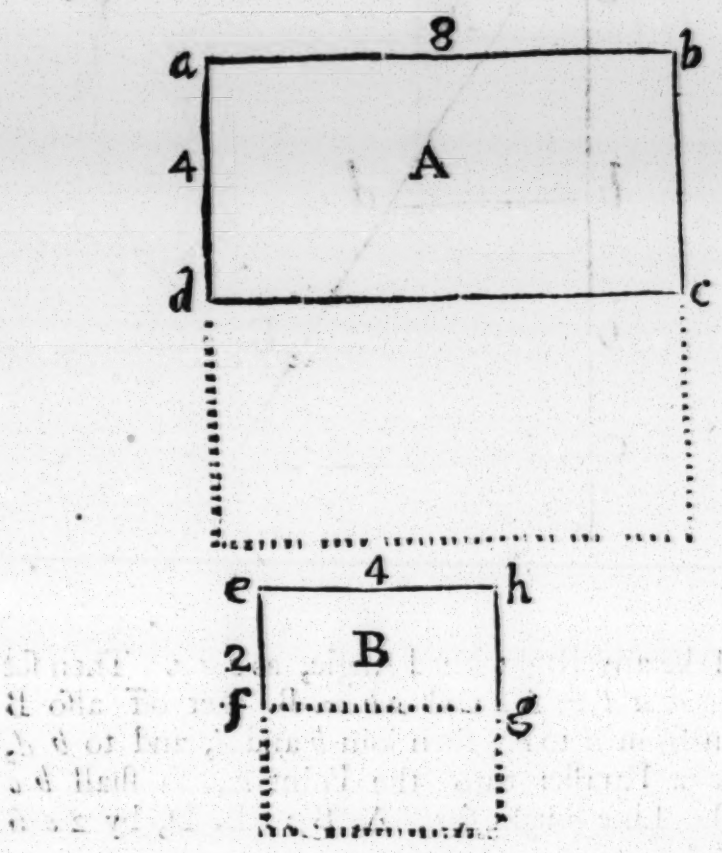
Of the Proportion of Figures.

1. To find the Proportion that one Rectangle hath to another, both Length and Breadth muſt be conſidered.

For Rectangles are to each other as the Products of their reſpective Lengths multiplied by their Breadths.

Thus, if there be two Rectangles, the former of which hath its Length 5 Inches, Yards, &c. and its Breadth 3 Inches, Yards, &c. and the latter had its Length 8 Inches, Yards, &c. and its Breadth 4 Inches, Yards, &c. Then the Rectangles will be to each other, as 3 x 5 (= 15) is to 4 x 8 (= 32) *i. e.* as 15 is to 32. So that all Rectangles are to one another in a Ratio compounded of that of their Sides.

2. When Rectangles have their Sides proportionable, (ſo that $a b : e h :: a d : e f$) then is the *Rectangle* A, *to the Rectangle* B, *in a duplicate Proportion to the Ratio of the Sides.*



For the Ratio of A to B, is compounded of the Ratio of $a b$ to $e h$, and of the Ratio of $a d$ to $e f$.

But in this Caſe $a b$ is to $e h$, in the very ſame Ratio as $a d$ is to $e f$; and therefore the Proportion of A to B being compounded of thoſe two equal Ratio's, muſt be duplicate of the Ratio of their Sides to each other; that is, duplicate of the Ratio of $a b$ to $e h$, or of $a d$ to $e f$. *Q. E. D.*

COROLLARY.

Hence all Triangles, Parallelograms, Priſms, Parallelopipeds, Pyramids, Cones and Cylinders are to one another reſpectively compared, *in a Proportion compounded of that of their Heights and Baſes.*

3. All Triangles, and Parallelograms, Pyramids, Priſms, and Parallelopipeds; alſo all Cones and Cylinders, each Kind compared among themſelves: If they have equal Altitudes, are in the ſame Proportion as their Baſes: If they have equal Baſes, are as their Heights.

For the Baſes, or Heights, will ſeverally be common Efficients or Multipliers; and therefore muſt make the Products be in the ſame Proportion as the Multiplicand was before.

Thus, if the equal Altitude of any two Triangles, Parallelopipeds, Cones, *&c.* be called a, and their unequal Baſes b and d: Then by the 13th of Proportion (above) $b. d :: a b. a d$.

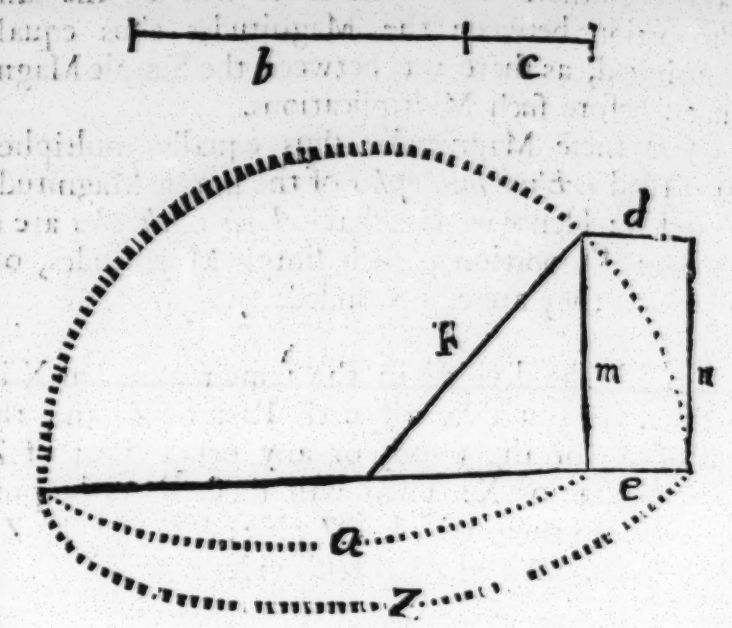
This *Problem* being of conſtant Uſe, ought to be placed among the Elements of *Geometry*.

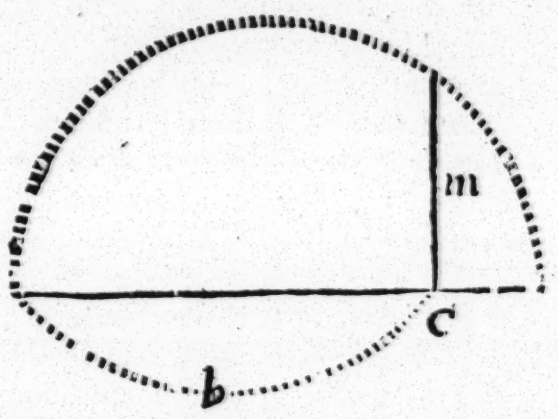
CASE I.

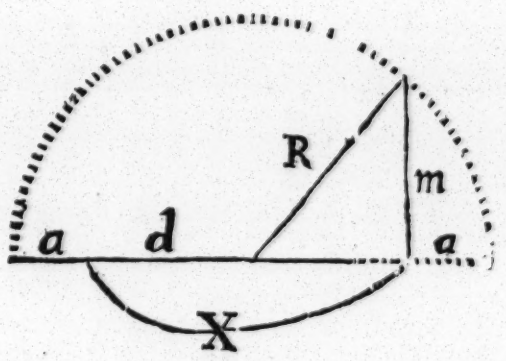
To find Two Right Lines, whoſe Sum and Difference is given, reciprocally proportional to Two given Lines.

Let the two given Lines be b and c, and let the Sum of the two Lines ſought, be Z: 'Tis required to find a Point where Z may be ſo divided, as that $b. a :: e. c$.

Firſt find m a mean proportional between b and c, which erect perpendicularly at either End of Z: Draw d parallel to Z, and where it cuts the Circle let fall m, and draw R: Then, I ſay, a and e are the Segments required: For $a e = m m = b c$. *Q. E. D.*







CASE II.

Where the Difference = X is given, find m as before, which erect perpendicularly at either End of X: Then draw R from the middle Point of X, and with it, as a Radius, deſcribe a Semi-circle on the Center d: So ſhall $a + X$ be the greater Line, and a the leſſer ſought: For $a + X$, multiplied by $a = m m = b c$, *Q. E. D.*

That is, in other Words, if you have the Extreams, and the Sum and Difference of 4 Proportionals, you may find the Terms ſeverally.

PROBLEM II.

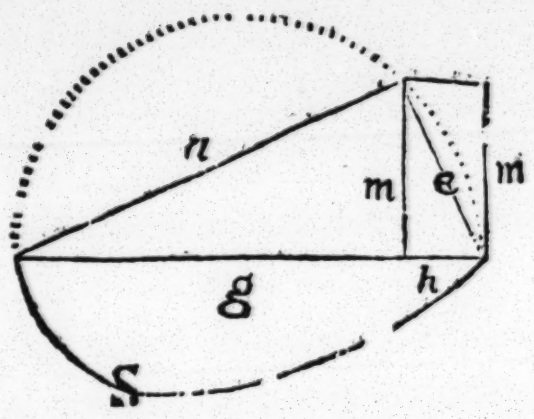
To find Two Squares, whoſe Sum or Difference is given reciprocally proportional to Two given Squares.

CASE

CASE I.

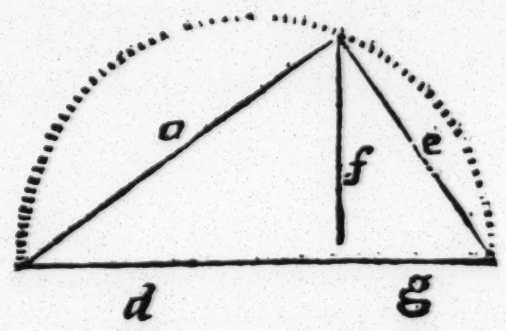
Let *b* and *c* be the Sides of the Squares given, and let S be equal to the Sum of the Squares required.

Find a fourth proportional to S *b* and *c*; which ſuppoſe to be *d*: Then, by the former Problem find 2 Lines reciprocally proportionable to *b* and *c*, whoſe Sum is S: As ſuppoſe the Segments *g* and *b*, and draw the Lines *a* and *e*, which ſhall be the Sides of the Squares ſought. For ſince S *b*:: *c d*. (or *m*): Therefore by Similar Triangles, S *a*:: *e*. *m*. Wherefore *ex æquo* reciprocally *b* . *a*:: *e*. *c*. Wherefore their Squares will be alſo in the ſame Ratio. *Q. E. F.*



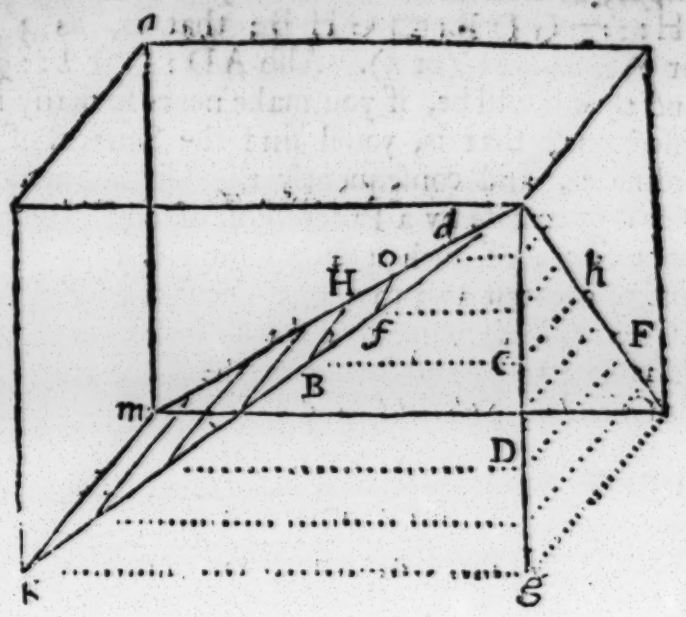
CASE II.

If *d*, the Side of a Square, which is the Difference of the Squares required, were given; make as *d*. *b*:: *c*. *f*. a fourth Proportional; and, by the former Problem, find 2 Lines reciprocally proportional to *b* and *c*; which ſuppoſe to be *g* and *d* + *g*, whoſe Difference is *d*: Then erect *f* at Right Angles, and on *d* + *g*, deſcribe a Semi-circle: After which drawing *a* and *e*, they ſhall be the Sides of the Squares required.



Of the Proportion of Solids.

Every Parallelopiped, as *a g*, is to a Pyramid, *g k m n b* of the ſame Baſe and Height, as 3 to 1.



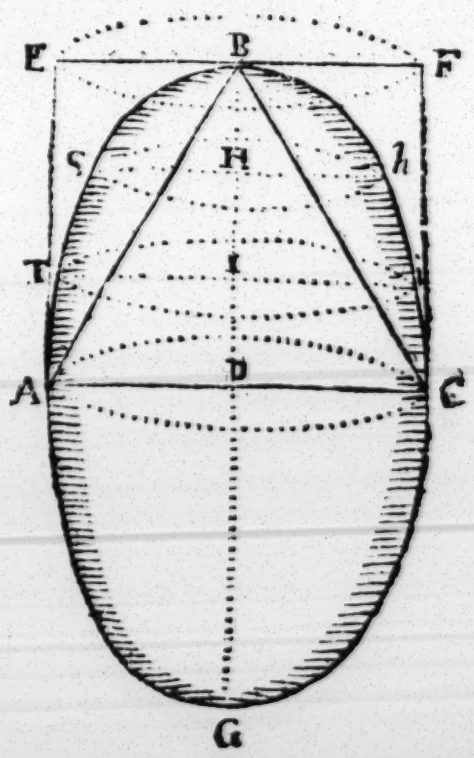
For if you ſuppoſe the Altitude *b g*, to be divided into any Number of equal Parts, by Plains parallel to the Baſe; then becauſe of the Pyramids *b n g k m b*, *b* F D B H *b*, &c. being ſimilar, the Baſes *m n g k* and H B D F, will be in a Duplicate Ratio of their Altitudes *b g*, D *b*. That is, Theſe Baſes diminiſh towards the Vertex in the Propoſition of the Squares of Numbers in Arithmetical Progreſſion.

But it was proved above in *Numb.* 7. of *Arithmetical Progreſſion*, That a Rank of ſuch Quantities are Subtriple to as many, equal to the greateſt; *i. e.* to ſuch as compoſe, or are the Elements of the Parallelopiped: Wherefore the Parallelopiped to the Pyramid, is as 3 to 1, or the former is triple of the latter.

And this muſt hold in all Priſms of what Figure ſoever, in reference to a Pyramid of the ſame Baſe with them.

And ſo alſo in the Proportion of Cones to Cylinders; for a Cone being compoſed of Circles whoſe Peripheries decreaſe Arithmetically, the Planes of thoſe Circles muſt be a Rank of *Secundans*, (for they are as the Squares of their Radius) and conſequently the whole Rank, or the Cone, will be Subtriple of the Cylinder, which is a Rank of as many Terms equal to the greateſt.

A *Cylinder*, *Spheroid*, and *Cone*, of the ſame Baſe and Height, are as 3, 2, and 1.



Let the Semiſpheroid A T S B h i c be divided into 3 equal Parts, as in the Figure. Then the

Ellipſis, as well as in the Circle) the □ AD : □ SH :: □ GDB : □ GHB; that is, as 3 × 3 (or 9) is to 5 × 1 (or 5). Alſo AD : □ TI :: 9 : 8. And thus it will be, if you make never ſo many new Biſſections; that is, you'll find the Squares of the Ordinates, and conſequently the Circles made on them do decreaſe by a Progreſſion of odd Numbers. But a Series of ſuch a Progreſſion is to as many equal to greateſt as 3 to 2 (by Corol 5. of *Progreſſion Geometrical*) wherefore the *Cylinder* to the *Spheroid* is as 3 to 2, and being to the Cone as 3 to 1. The *Cylinder*, *Spheroid*, and *Cone*, are as 3, 2, and 1. *Q. E. D.*

PROPORTIONAL *Spiral Lines*. See *Spiral Lines*.

PROPOSITION, (in General) is a Thing propoſed to be proved, made out, or demonſtrated: And in Mathematicks, is either a *Theorem*, or a *Problem*; which ſee.

PROPRIETATE *Probanda*, is a Writ that lies for him that would prove a *Property* before the Sheriff: For where a *Property* is alledged, a *Replegiare* lieth not.

PROPTOSIS, is the Falling-down of ſome Part; as of the Eye, the Cawle, &c.

PRO *Rata*. See *Oneranda pro rata portionis*.

PROROGUE, ſignifies to prolong, or put off to another Day. The Difference between a *Prorogation* and an *Adjournment*, or Continuance of the Parliament, is, That by the *Prorogation* in open Court, there is a Seſſion; and then ſuch Bills as paſſed in either Houſe, or both Houſes, and had not the Aſſent to them, muſt at the next Aſſembly begin again: For every Seſſion of Parliament is in Law a ſeveral Parliament; but if it be but Adjourned or Continued, then there is no Seſſion, and conſequently all Things continued in the ſame State they were in before the *Adjournment*.

PROSECUTOR, in Law, is he that follows a Cauſe in another's Name. See *Promoters*.

PROSODIA, is that Part of Grammar which teaches the Quantity of Syllables, diſtinguiſhing into Long and Short, &c.

PROSOPOPOEIA, is a violent Rhetorical Figure, wherein the Speaker addreſſes himſelf to inanimate Things as if they were living, and makes them ſpeak as if they had Souls.

PROSPHYSIS, is a Coalition, or growing together, as when two Fingers are connected to each other.

PROSTAPHERESIS, in Aſtronomy, is the ſame with the Equation of the Orbit, or ſimply the *Equation*; and is the Difference between the *True* and *Mean Motion* of a *Planet*. The Angle alſo made by the Lines of the Planets *Mean* and *True Motion*, is called the *Proſtapheresis*.

PROSTATÆ, *Adſtantes*, or *Corpora Glanduloſa*, are two Glandules placed near the Paſſage of the Seed; which (as may be gueſs'd) lubricate the common Paſſage of the Seed and Urine, and afford a kind of a Vehicle to the Seminal Matter, and are ſaid to provoke the Titillation in Coition: Their Moiſture being conveyed by certain little Tubes, which terminate in the Paſſage near where the Seed is ejected, and is emitted at the ſame time with it. The Learned *Bartholine* has obſerved ſome ſuch thing in Women.

PROSTASIS, a Part of Surgery, which fills up what is wanting; as we ſee in hollow and fiſtulous Ulcers filled up with Fleſh by Surgery. *Blanchard*.

PROSTHESIS, in Grammar, is in the General a Metaplaſm, and in particular an Addition of ſome Letter or Letters to the Beginning of a Word, as *Gnavus pro navus*. This is alſo called *Appoſition*.

PROSTOMIA, the Red-tinctured Part of the Lips. *Blanchard*.

PROTECTION, in Law, hath a general and a ſpecial Signification: In the general, it is uſed for that Benefit and Safety which every Subject, Deniſon or Alien, eſpecially ſecured, hath by the King's Laws. *Protection*, in the Special Signification, is uſed for an Exemption or Immunity given by the King to a Perſon againſt Suits in Law, or other Vexations, upon Reaſonable Cauſes moving him thereto. Of this *Fitz-Herbert* maketh two Kinds; the Firſt he calls a *Protection*, *cum clauſula volumus*, whereof he mentions Four Particulars: 1. A *Protection quia profecturus*, for him that is to paſs over Sea in the King's Service. 2. A *Protection quia moraturus*, for him that is Abroad in the King's Service upon the Sea, or in the Marches. 3. A *Protection* for the King's Debtor · that he be not ſued or attached till the King be paid his Debt: This the *Civilians* call *Moratoriam*. 4. A *Protection* in the King's Service beyond Sea, or in the Marches of *Scotland*.

The Second Form of *Protection* is *cum clauſula nolumus*, which is granted moſt commonly to a Spiritual Company for their Immunity, from taking their Cattle by the King's Miniſters: But it may be granted alſo to one Man Spiritual or Temporal.

PROTEST, in Law, hath two divers Applications; One is by way of Caution, to call witneſs, (as it were) or openly to affirm, That he doth either not at all, or but conditionally yield his Conſent to any Act, or unto the Proceeding of any Judge in a Court wherein his Juriſdiction is doubtful, or to anſwer upon his Oath further than by Law he is bound. The other is by way of Complaint, to *Proteſt* a Man's Bill. For Example: If I give Money to a Merchant in *France*, taking his Bill of Exchange to be repaid in *England* by one whom he aſſigneth; If at my coming, I find not my ſelf ſatisfied, but either delay'd or deny'd, then I go the *Exchange*, or other open Concourſe of *Merchants*, and *Proteſt*, That I am not paid: And thereupon, if he hath any Goods remaining in any Man's Hands within the Realm, the *Law of Merchants* is, That I be paid out of them to my full Satisfaction.

PROTESTATION, in Law, is a Defence of Safeguard to the Party which maketh it, from being concluded by the Act he is about to do, that Iſſue cannot be joined by it.

PROTOPATHIA, is a Primary Diſeaſe, not cauſed by another.

PROTRACTING-*Pin*, is a fine Needle faſtned in a Piece of Wood, Ivory, &c. uſed to prick off any Degrees and Minutes from the *Protractor*.

PROTRACTOR, is an Inſtrument uſed in *Surveying*: It is commonly made of a well poliſh'd thin Piece of Braſs, and conſiſteth of a *Semi circle* divided into Degrees, and a *Parallelogram* with Scales upon it, and may be of any Bigneſs deſir'd. But this Inſtrument is ſo well known, that there needs no further Deſcription.

Its Uſe is chiefly, To lay down an Angle of any aſſigned Quantity of Degrees: Or, an Angle being *Protracted*, to find the Quantity of Degrees it contains

contains readily, which is of great Use in Plotting, and making of Draughts, *&c.*

PROVISO, is a Condition inserted into any Deed, upon the Observance whereof the Validity of the Deed depends; but sometimes it is only a Covenant. It hath also another Signification in Matters Judicial, as if the Plaintiff or Demandant desist in prosecuting an Action, by bringing it to a Trial; the Defendant or Tenant may take out a *Venire facias* to the Sheriff, which hath in it these Words, *Proviso quod*, &c. to this End, That if the Plaintiff take out any Writ to that Purpose, the Sheriff shall summon but one Jury upon them both: In which Case, we call it going to Trial by *Proviso*.

PROW of a Ship, is that Part of her *Fore-castle* which is *Aloft*, and not in the *Hold*; and is properly that which is between the *Chase* and the *Loof*.

PRUNELLÆ *Sal.* See *Sal Prunellæ*.

PRUNIFEROUS-*Trees* or *Shrubs*, are such whose Fruit is pretty large and soft, with a Stone in the middle; in this kind the Flower adheres to the Bottom of the Base of the Fruit.

PSAMMISMUS, a Bath of dry and warm Sand, wherewith the Feet of Men in the Dropsy are dried. *Blanchard.*

PSEUDODIPTERON, is an Ancient Form of a Temple, compassed about with but one Row of Pillars, and which Row from the Wall, is at the Distance usually of two Rows of Pillars.

PSEUDOSTELLA, in Astronomy, signifies any kind of Comet or Phænomenon newly appearing in the Heavens like a Star.

PSOAS *Magnus*, or *Lumbalis*, is a Muscle of the Loins, which proceeds from all the Vertebres of the Loins and their transverse Processes internally and laterally, within the Cavity of the *Abdomen*; from thence descending over the superior Part of the *Os Sacrum* and Spine of the *Ilium*, where it's joined with the fleshy Fibres of the *Iliacus Internus*, with which it's inseparably united to their partly Fleshy and partly Tendinous Insertions in the inferior Part of the lesser *Trochanter* of the Thigh-Bone: It's Use is, together with the *Iliacus Internus*, to move the Thigh forwards.

PSOAS *Parvus*, is a Muscle of the Thigh, which arises fleshy from the superior Part of the first *Vertebra* of the Loins, internally and laterally within the *Abdomen*, immediately below the Cavity of the *Diaphragm*, whence descending obliquely inwards towards the *Pelvis Abdominis* (where it ceases to be Fleshy) in a manner embracing the *Psoas Magnus*, and is inserted with a thin, broad, strong Tendon, to that Part of the *Os Pubis*, where it is join'd to the *Os Ilium*: This Muscle, with its Partner Acting, assists the *Recti Abdominis* in drawing the *Ossa Pubis* upwards, as in raising our selves from a decumbent Posture. Thus Rope-Dancers hang by their Hands, and raise the inferior Parts of their Bodies, to take hold of a Rope with their Feet. Tho' their proper Action is to bend the Loins, yet their Tendons embracing the *Psoas Magnus* and *Iliacus Internus*, (which we have frequently observed to extend over the inferior Parts) not unlike the *Fascia Tendinosa Cubiti* and *Lata* of the Thigh, do also Corroborate them in their Action. *Cowper.*

PSOROPHTHALMY, an *Ophthalmy*, or Inflammation of the Eyes with itching. *Blanchard.*

PSYCTICA, are cooling Medicines against the Scab. *Blanchard.*

PTARMICA, or *Sternutatoria*, are those things which being endowed with a more piercing Acrimony than the Errhinaceous Medicines, do so extremely irritate and shrivel up the Membranes of the Brain, that it sends forth the pituitous Humour at the Nostrils, in an extraordinary Measure, and so cause Sneezing. *Blanchard.*

PTERIGOPALATINUS, or *Sphænopterigopalatinus*, is a Muscle of the *Gargareon*, whose former Appellation intimates its Progress and Insertion; the latter its Origin also. This arises from the Process of the *Os Spænoides*, and descends according to the Length of the Interstice made by the internal *Ala* of the *Os Sphænoides* and *Musculus Pterigoidæus Internus* of the lower Jaw; and becoming Tendinous, marches over the *Processus Pterigoides*, and is inserted to the Fore-part of the *Gargareon*. The Tendon of this passes over the Pterigoidal Process, which, like a Pulley, gives it a different Power from that of the *Sphænopalatinus*, tho' they have both their Origin from the same Place. Wherefore contrary to that, This draws the *Gargareon* downwards; which Contrivance in Nature is no less remarkable, than any of those where the like Artifice of a *Trochlea* is made use of.

PTERIGOPHARYNGÆUS, is a Muscle which arises thin and fleshy from both the Pterigoidal Processes of the *Os Cuneiforme*; also from the Root of the Tongue, and Extremities of the *Os Hyoides*; from these Places its fleshy Fibres run in a Semi-circular manner, embracing the superior and back Part of the glandulous Membrane of the *Fauces*, where they meet in a middle Line. When this Muscle acts, it brings the middle or back Part of the *Fauces* towards a Plain, by which means the *Tonsillæ*, together with the rest of the Glandules, are compress'd in the Evacuation of their *Mucus*, to join with the Aliment in its Descent into the *Stomach* in *Deglutition*; and at other times to promote *Screation*, in which this Muscle is the chief Instrument: That the *Tonsillæ* approach towards each other, is observable, when we inspect these Parts in living Persons.

PTERIGOSTAPHYLINUS *Externus*, is a Muscle which moves the *Uvula*, arising from a small Protuberance upon the under Side of the Body of the *Os Sphænoides*, and goes directly to be inserted into the hinder Part of the *Uvula*.

PTERIGOSTAPHYLINUS *Internus*, is a Muscle which moves the *Uvula*, arising from a small Protuberance of the *Os Sphænoides*, and growing into a small round Tendon, which passes over a small Process like a Hook, of the *Processus Pterigoidæus*; from thence reverting, it's inserted into the Fore-part of the *Uvula*.

PTERYGIUM, is the Wing or round rising of the Nose or Eye, or the Process of the Bone *Sphænoides*. which is like a Wing. Also a membranous Excrescence above the horney Tunic of the Eye, call'd *Unguis* and *Ungula*, growing for the most part from the inner Corner, towards the Apple of the Eye, and often obscuring it. *Blanchard.*

PTERYGOIDÆUS *Internus* and *Externus*, are two Muscles arising from the *Processus Pterygoides*, or *Aliformis* of the *Os Sphænoides*. Their Use is to move the Jaw from Side to Side.

PTERYSTAPHYLINI, are Muscles of the *Uvula* or *Gargareon*, and were so named by *Riolanus*; but the Accurate Dr. *Croon* changed their Names into *Sphænopalatinus* and *Pterigopalatinus*, or *Sphænopterigopalatinus*. (See those Words.) Their Use is to give various Motions to the *Uvula*.

PTISANA, *Ptisan*, is a Decoction of Pearl-Barley, Liquorish, Raisins, &c. being a cooling pleasant Drink for one in a Fever, and much used by the *French*.

PTYLOSIS, is a Disease when the Brims of the Eye-lids being grown thick, the Hairs of the Eye-brows fall off. *Blanchard*.

PUBIS OS. See *Pectinis Os*.

PUDDINGS, in a Ship, are Ropes nailed to the Arms of the Main and Fore-Yards, near the Ends, and then at 3 or 4 due distances inwards one from another, in order to keep the Robbins from galling or wearing asunder upon the Yards, when the Top-sail-Sheets are haled home.

They call also those Ropes which are wound about the Rings of Anchors to save the Clinch of the Cable from being galled with the Iron, by this Name. So that when the Ring is so served, 'tis called the Pudding of the Anchor.

PUDICÆ *Plantæ*, the same with sensitive Plants; which see.

PUGILLUS, is an handful of any Herbs. Others interpret it, as much as may be taken up with the Thumb and two Fingers.

PUISNE, or *Puny*; the Lawyers term for Younger.

PULMONARIA *Arteria*, or *Vena Arteriosa*, is a Vessel in the Breast, arising immediately out of the Right Ventricle of the Heart; its Mouth is not so large as that of the *Cava*: It has three Valves, called *Segmoidales* or *Semilunares*. Its Use is to carry the Blood from the right Ventricle of the Heart to the Lungs, and its Coat is double, like that of the Arteries.

PULMONARIA *Vena*, or *Arteria Venosa*, is a Vessel of the Heart, which discharges it self thro' the left Auricle into the Ventricle of the same side; for after it has accompanied the Wind-pipe and *Arteria Pulmonaris* in all their Branchings in the Lungs; and by its small Twigs has received the Blood out of the Artery, all these Twigs are united first into two Trunks (*viz.* the Right and Left) afterwards into one, which opens into the Left Ventricle of the Heart. This *Vein* hath no Valve in it, except that at its opening into the Left Ventricle, where at its Orifice are placed two Membranous Valves, called *Mitrales* from their Form resembling; when joined, something of a Mitre. These are very strong and firm, to sustain the violent Motion of the Blood, and to hinder it from returning back again into this Vein, and to direct its Course to the *Aorta*, whose Orifice opens in the *Systole* of the Ventricle.

PULMONARY *Vessels*, are those which carry the Blood from the Heart to the Lungs, and back again, being two in Number, *viz.* the *Pulmonary Vein*, and the *Pulmonary Artery*; which see.

PULPA, is the fleshy Part of Fruits, Roots, or other Bodies, which is extracted by Infusion or Boiling, and passing through a Sieve; as the Pulp of *Tamarinds*, *Althea*, *Dates*, &c.

PULSE, by the Mathematical Naturalists, is the Term used for that Stroak with which any Medium is affected by the Motion of *Light*, *Sound*, &c. through it.

And the Admirable Sir *Isaac Newton* demonstrates, *lib.* 2. *prop.* 48. *Princip.* That the Velocities of the Pulses, in an Elastick Fluid Medium (whose Elasticity is proportionable to its Density) are in a Ratio, compounded of half the Ratio of the Elastick Force directly, and half the Ratio of the Density inversly. So that in a Medium, whose Elasticity is equal to its Density, all Pulses will be equally swift.

PULSUS, the Pulse, is the immediate Index of the Heart, by the Mediation whereof the Blood is diffused through the whole Body, and is differently affected thereby, according to the different Influx of the Animal Spirits; the Motion whereof is chiefly to be attributed to the circular and direct Fibres. Others affirm it to be the Dilatation and Contraction of the Heart and Blood. A Pulse is either natural or preternatural: of the former we have spoken already; the latter is such as is different, according to the different Circumstances of the Fibres and Animal Spirits; to wit, *strong*, *weak*, *swift*, *slow*, *equal*, *unequal*, *intermittent*, &c.

PULSES, according to Dr. *Abercromby*, are either,

Pulse Unequal, is either in respect of Time or Strength; that is, either it strikes quicker and slower, or else stronger and weaker.

Pulse Interrupted, is when the Strokes are much smaller than usual, or their Intervals much greater.

Pulse Intense, is that whose Stroke is very hard, (the Parts as it were upon a bent) or else this Strength is made up with the Multiplicity and Frequency of less Mications, as in the Heights of Fevers.

Pulse Remiss, is that whose Strokes are less quick, or less strong, and in Sickness shews more Danger than the other.

Pulse Superficial, is that which shews an exact Temperament of Body, as also a free and merry Temper of Mind.

Pulse Deep, shews a Disposition to Melancholy, Asthma's, Lethargy, &c. and is more frequent in the Aged than the Young.

Pulse Leaping, is said to portend no great Danger.

Pulse Trembling, shews great Extremity.

Pulse Wandring, is that which is sometimes felt in one place, and sometimes in another, and sometimes no where, and is never but a few Minutes before Death.

PULSION, is the driving or impelling of any thing forward. See *Attraction*.

PULVERIZATION, is reducing any Body into a fine Powder, which is done by beating *Friable* Bodies in a Mortar; but to Pulverize *Malleable* ones, or such as will spread under the Hammer, some other Helps and Artifices must be made use of. To *Pulverize* Tin and Lead, proceed thus: Get a round wooden Box, which rub well with Chalk all over on the Inside; then melt the Metal, and pouring a little of it nimbly into the Box, shut the Lid, and shake the Box strongly and quick, and the Metal will be reduced by it into a Powder. And this is a very useful thing to know, tho' it be plain and easy; because by this means, these Metals are rendred fit for several Operations, and will easily be mixed with Salts or other Things.

PULVIS *Fulminans*. Mix well together three Parts of common Salt-petre, two Parts of Salt of Tartar, and one of common Brimstone, all finely powdered. Take half a Dram or a Dram of this Mixture, put it upon a Fire-shovel over a gentle Fire, so that it may heat, and appear to melt and change Colour gently, and in about half a quarter of an Hour it will go off with a terrible Noise, as great

great as that of a Musket, and yet without danger to any Perſon in the Room; for its Force is chiefly downwards. The Reaſon of this Effect appears to be, that the fix'd Salt of Tartar doth ſo lock up the Spirits of the Nitre and Sulphur, that they cannot get looſe without breaking their Priſons, which when the Fire hath aſſiſted and enabled them to do, they do it with very great Violence and Noiſe.

PUMP *Brake*, at Sea, is the Handle of the Pump, as,

PUMP *Can*, is the Bucket whereby they pour Water into the Pump to fetch it, and make it work when they intend to uſe it. And

PUMP *Vale*, is the Trough by which the Water runs from the Pump along the Ship-ſides, that it may go out at the *Scoper-holes*.

PUNCTUM *Lachrymale*. See *Lachrymale Punctum*.

PUNCTUM *Saliens*: In the Growth of an Egg, you ſee a little Speck or Cloud, as it were, in the innermoſt Tunic of it, called *Amnios*, which growing gradually thicker, acquires a kind of ſlimy Matter, in the middle whereof you ſee firſt this *Punctum Saliens*, (a little Speck that ſeems to leap) afterward the rude Body of an *Embryo*, which tends every day more and more to Perfection. *Blanchard.*

PUNY. See *Puiſne*.

PUPILLA, or *Pupula*, is the opening of the Tunic of the Eye, called *Uvea*, or *Choroides*; it is round in a Man, and is capable of being contracted or dilated like a Muſcle, according to the different Degree of Light the eye is Expoſed to.

PUPPIS *Vena*, is that Vein which ſpreads it ſelf about the hinder Part of the Head.

PURCHASE: This Word hath the ſame Senſe at Sea, as *Draw* has a-Shore; thus they ſay, *The Capſtan Purchaſes apace*; that is, draws in the Cable apace. And when they cannot draw or hale in any thing with the Tackle, they ſay, *The Tackle will not Purchaſe.*

PURFLEW; the Term in Heraldry to expreſs *Ermines*, *Pean*, or any of the Furrs when they compoſe a *Bordure* round a Coat of Arms. Thus they ſay, he Beareth *Gules*, a *Bordure Purflew*, *Verry*; meaning that the Bordure is Verry.

PURGATION, *Purging*, is an Excretory Motion quick and frequent, proceeding from a quick and orderly Contraction of the Carneous Fibres of the Stomach and Inteſtines, whereby the Chyle and Excrements, and corrupted Humours, either bred or ſent there from other Parts, are protruded from Part to Part, till they be quite excluded the Body. *Blanchard.*

PURGATION, in Law, is the clearing of a Man's ſelf of a Crime whereof he is generally ſuſpected, and of the ſame accuſed before the Judge; and is either *Canonical* or *Vulgar*. The *Canonical*, is that which is preſcribed by *Canon-Law*, the Form thereof is uſually thus in the Spiritual Court: The Man ſuſpected takes his Oath, that he is clear of the Fault objected, and brings ſo many of his Honeſt Neighbours, being not above Twelve, as the Court ſhall aſſign him, to Swear upon their Conſcience and Credulity, that he Sweareth truly. *Vulgar Purgation* was by *Fire* or *Water*, or by *Combat*, uſed both by Infidels and Chriſtians, till by the *Canon Law* aboliſhed: But *Combat* may be ſtill practiſed by the Laws of the Realm in Cauſes doubtful, and where there is want of Evidence and other Proof, if the Defendant chuſe rather the Combat than other Tryal.

PURIFICATION *of a Metal*, in Chymiſtry, ſignifies its being purged or cleanſed from the Mixture of all other Metals.

'Tis chiefly uſed about Gold and Silver. The beſt

Purification of Gold, is by Antimony, in this manner: Put the Gold in a Crucible, make it red hot, and when it begins to melt, pour upon it by degrees four times its Weight of Antimony in Powder; the Gold will preſently melt; continue a very ſtrong Fire, till you perceive the Metal to ſparkle; then take the Crucible out of the Fire, and knock it, that the Gold may ſink to the Bottom; break it when 'tis cold, and ſeparate the fine Gold, which is called the *Regule*, from the droſſy Part.

After this, melt the *Regule* again over a ſtrong Fire in a Crucible; and when it begins to melt, throw into it, by little and little, three times its Weight of *Salt-Petre*; continue a very ſtrong Fire to keep the Matter in conſtant Fuſion; and when the Fumes are all gone, and the Metal appears bright and clear, caſt it into an Iron Mortar greaſed and warmed; or elſe if you don't value the Crucible, leave it in that to cool, and break the Crucible before 'tis quite cold, and then ſeparate the *Regule* from its Droſs remaining at the Top, the Gold will be very pure.

There are ſeveral other ways of Purifying Gold, as the *Depart* and *Cementation*, which ſee under thoſe Words: But this is the beſt of all.

Red Gold is leſs valuable, as containing moſt Copper; the Yellow is better, and it ſhould remain Yellow while 'tis in the Fire.

Purification of Silver, is made in the Coppel thus:

Heat the Coppel gently and by degrees, till it grow red hot; then caſt into it four or five times as much Lead as you deſign to purify Silver: The Lead will ſoon melt, and fill the Sides of the Coppel; then put the Silver into the midſt of the melting Lead, and it alſo will preſently melt; then lay Wood all about and over the Coppel, and blow the Flame ſo that it may reverberate on the Matter, the Impurities of which will by this means mix with the Lead, and the Silver will remain pure and unmixed in the middle of the Coppel; and the Lead, mixed with the droſſy Parts of the Silver, will lie on the Sides like a Scum: This Scum is to be taken off with a Spoon, or other Inſtrument, and is what is called *Litharge*; which, according to the degree of the Calcination it hath endured, is of divers Colours, and ſometimes is called Litharge of Gold, and ſometimes Litharge of Silver.

PURLUE, or *Purlieu*, from the *French* Pur, *i.e. Purus*, and *Lieu*, i. e. *Locus*, is all that Ground near any Foreſt, which being anciently made Foreſt, is afterwards, by Perambulations, ſevered again from the ſame, and exempted from that Servitude that was formerly laid upon it: And he that Walketh or Courſeth within that Circuit, is not liable to the Laws and Penalties incurred by them which hunt within the Precincts of the Foreſt.

PURPURE, the Heralds Term for a Colour conſiſting of much Red and a little Black: And this Term is uſed in the Coats of all Perſons below the degree of Noble; but in the Coats of Noblemen, 'tis called *Amethiſt*; and in thoſe of Sovereign Princes, 'tis called *Mercury*. 'Tis expreſſed in Engraving by Lines

Lines drawn athwart the Escutcheon, beginning at the *Dexter Point*.

PURSER, an Officer in the King's Ship, who receives her Victuals from the Victualler, and is to take care that it be in good Condition, and well laid up and stowed: His Office is also to keep a List of the Men and Boys belonging to the Ship, and to set down exactly the Days of each Man's Admittance into Pay, that so the Pay-Master, or Treasurer of the Navy, may issue out his Disbursements, and Pay Men off according to the *Purser*'s Books.

PURSUIVANT. See *Poursuivant*.

PURVEYANCE. See *Pourveyance*.

PURVEYOR. See *Pourveyor*.

PUTREFACTION, is a slow kind of Corruption in Bodies, wrought generally by the Moisture of the Air, or some other ambient Fluid, which penetrating unto the Pores of Bodies, and being agitated in them, doth fetch or force out some of the more subtil and agile Parts of Bodies, loosen and dislocate the Parts in general one from another, and thereby quite change the Texture, and sometimes the Figure of the *Mixt*, from what it was before.

PUTTOCKS, or *Puttock Shrowds*, are small Shrowds which go from the Shrowds of the Main-Mast, Fore-mast, and Missen-Mast, to the Top-Mast Shrowds. And if there be any Top Gallant-Masts on the Top-masts, there are *Puttocks* to go from the Top-Mast Shrowds into those. These *Puttocks* are at the Bottom seized to a Staff, or to some Rope which is seized to a Plate of Iron, or to a Dead-man's Eye, to which the Laniards of the Fore-Mast Shrowds do come.

PYCNOSTYLE, in Architecture, is a Building where the Pillars stand very close one to another, one Diameter and a half of the Column being only allowed for the *Intercolumniation*.

PYLORUS, or *Janitor*, is the lower Orifice of the Ventricle, which lets the Meat out of the Stomach into the Intestines; Dr. *Willis* calls the Beginning of the Pylorus, where its Coats are thickest, the *Antrum*.

PYRAMID, in Geometry, is a Solid Figure whose Base is a Polygon, and whose Sides are plain Triangles, their several Tops meeting together in one Point.

The Solid Content of

A *Pyramid*, is = to $\frac{1}{3}$ of the Perpendicular Altitude multiplied by the Base; because a Pyramid is $\frac{1}{3}$ of a Prism of the same Height and Base. 7 *è.* 12. *Eucl.* which see also proved under the Word *Parallelopiped* (the same with Prism.)

The superficial Area of a *Pyramid*, is found by adding the Area of all the Triangles, whereof the Sides of the *Pyramid* consist, into one Sum: For the whole external Surface (except the Base) of any *Pyramid*, is nothing but a System of as many Triangles as the *Pyramid* has Sides.

If a *Pyramid* be cut with a Plane Parallel to the Base, the Surface of that Truncated *Pyramid* comprehended between the Parallel Lines, is found by Substracting the Surface of the *Pyramid* cut off from the Surface of the whole *Pyramid*.

Also the external Surface of a right *Pyramid*, that stands on a regular Polygon Base, is equal to a Triangle, whose Altitude is equal to the Altitude of one of the Triangles which compose it, and its Base to the whole Circumference of the Base of the *Pyramid*.

Whence therefore the Surface of a right *Cone*, (for a Cone is but a *Pyramid* of infinite Sides) is equal to a Triangle, whose Height is the Side of the *Cone*, and the Base equal to the Circumference of the Base of the *Cone*.

PYRAMIDALIA, are Vessels which prepare the Seed; of which in their proper place. Also Muscles of the Nostrils, and of the *Abdomen*, called *Pyramidales*, or of a Pyramidical Figure. Also two Strings of Marrow about the Basis of the oblongated Marrow.

PYRAMIDALIA *Corpora*. See *Corpora Pyramidalia*.

PYRAMIDALIS, *sive Succenturiatus Musculus*, one of the Muscles of the Abdomen, lying on the Rectus, helping in Conjunction with the rest, to compress the Abdomen, and to exclude its Contents: Mr. *Cowper* thinks it to have also a peculiar Use in compressing the Bladder.

PYRAMIDOID. See *Parabolick Pyramidoid*.

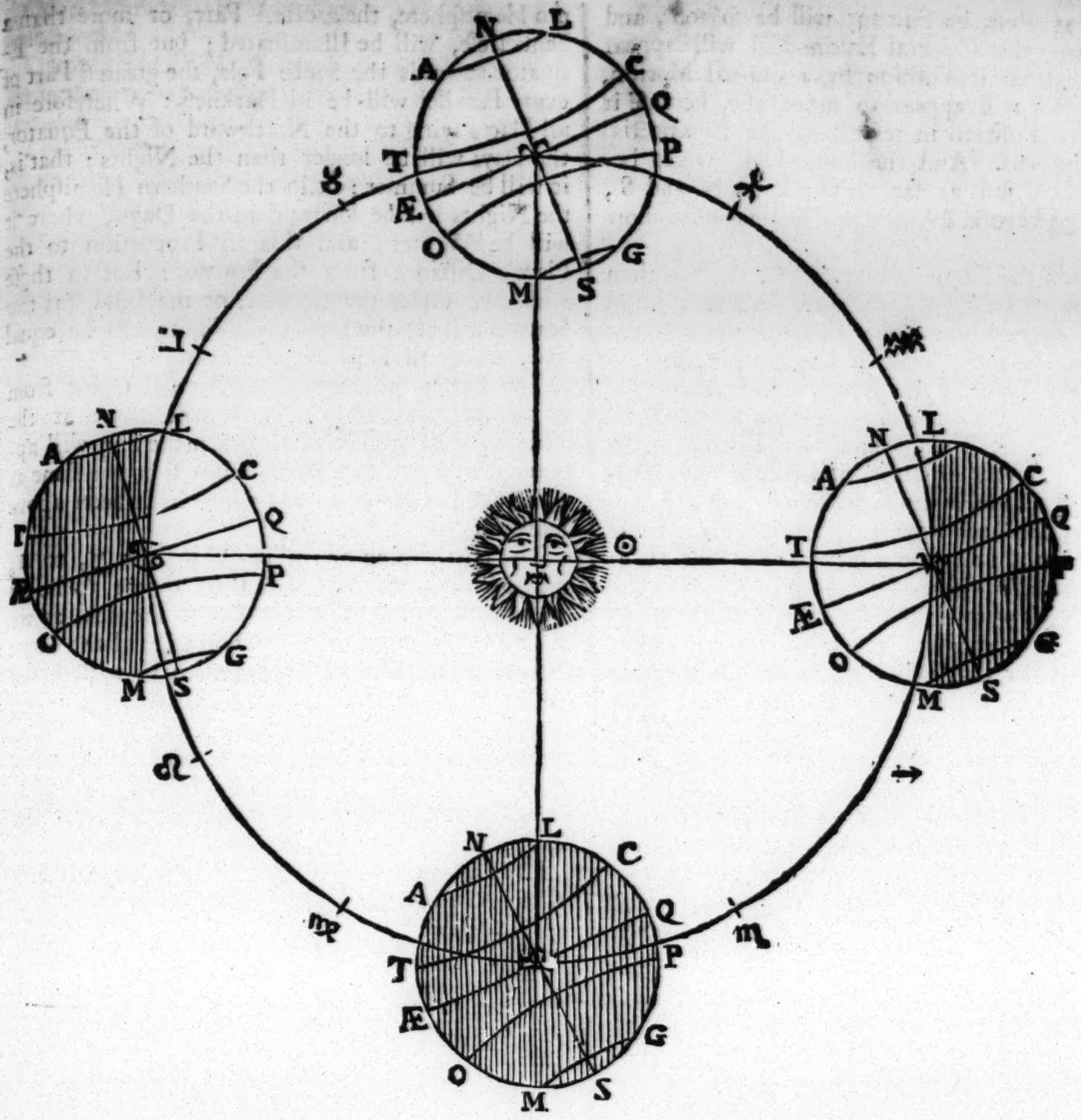
PYRIFOMIS, *seu Iliacus externus*, is a Muscle of the Thigh, which receives its first Name from its Figure, the second from its Situation; Its Beginning is round and fleshy from the inferior and internal Part of the *Os Sacrum*, where it respects the *Pelvis* of the *Abdomen*, and descending obliquely in the great *Sinus* of the *Os Ilium*, above the acute Process of the *Ischium*, and joining with the *Gluteus Medius*, it's inserted by a round Tendon to the superiot Part of the Root of the *Great Trochanter*. This moves the *Os Femoris* somewhat upwards, and turns it outwards.

PYROTECHNICK-ART, is the Art of Chymistry, so called from the *Greek* πῦρ *Fire*, and τέχνη *Art*; because Fire is the chief Instrument the Chymist makes use of in the separating and collecting the purer Substances of mixt Bodies.

PYROTECHNIA, the same with *Chymia*.

PYROTICA, or *Urentia*, are Medicines virtually Hot, which being applied to Human Bodies, grow extremely hot; because that having Particles and Pores so ordered, that Vapours and Humours insinuate into them, the subtil Matter finds such Passages, that it being moved extreme violently, forces certain earthy, hard, and acute Particles, which float in the Passages upon the Neighbouring Parts with great Impetuosity, and so excites an Heat which corrupts or changes differently, according to the Diversity of its Motion and the Particles that are moved. Such are things that cause Redness, that Blister, that Ripen or Rot, that close up, and bring Wounds to a Crust, and that pull Hairs out of the Body. *Blanchard*.

PYRRICHIUS, is the Foot of a *Latin* Verse consisting of two Syllables, and both short.



PYTHAGOREAN *Syſtem*, is the ſame with the *Copernican*, but is ſo called, as being maintained by *Pythagoras* and his Followers, and therefore is the moſt ancient of any. In this the Sun is ſuppoſed at Reſt in the Centre of our Syſtem of Planets, and the Earth to be carried round him annually in a Track or Path between *Venus* and *Mars*. I ſhall only add here an account how

The *Phænomena* of Day and Night, and the *viciſſitudes* of Seaſons are accounted for, according to the *Pythagorean* Syſtem, where the Earth moves round the Sun.

Let ♈ ♋ ♎ ♑ repreſent the Earth's Annual Orbit round the Sun at ☉. The Plane of which Orbit if infinitely produced among the Fix'd Stars, will deſcribe that Circle which we call the Ecliptick. In this Orbit, let the Earth be ſuppoſed to move from ♈ to ♉, next to ♊, &c. and let the Earth be repreſented by the Epicicles N A Æ S Q N, in which N and S are the North and South Poles, and the Line N S the Earth's Axis always keeping Parallel to it ſelf; and Æ Q, the Equator, whoſe Plane is inclined to the Ecliptick with an Angle of 23° 30′, which is the Complement of 66° 30′, the Angle that the Earth's Axis (perpendicular to the Plane of the Equator) makes with the Ecliptick.

Suppoſe then the Earth in ♎ (then will the Sun appear to be in ♈, the firſt Point of its Annual Orbit) and the Earth ſo turning it ſelf to the Sun, that the Axis of its Motion may be Perpendicular to a Line drawn from the Center of the Sun to that of the Earth, then will the Earth's Equator appear Coincident with the Celeſtial Equinoctial; and the Sun will appear to be juſt in the middle between the two Poles, and to ſend his Light equally towards both of them, and as far as both of them (for the Sun always illuminates one half of the Globe.) Wherefore as that Hemiſphere of it (*viz.* T N L C P) which is now turned towards him, is *Enlightned*, ſo the other (behind) is now ſuppoſed to be in Darkneſs. And becauſe the Earth revolves round its Axis N S in 24 Hours, which Axis is now at Right-Angles with the Line ♈ ☉ ♎ connecting the Centres of the Earth and Sun, every Point of the Equator Æ Q, and of the Tropicks T C and O P, and of all other Parallels to the Equator, will be as much in the Light as in the Dark, in every Diurnal Revolution; and conſequently the Days and Nights will be Equal, at that Time, all over the Earth.

But as the Earth moves further on in the Annual Orbit towards ♏ and ♐, the Plane of the Terreſtrial Equator will be then no more direct to the Sun, but will ſubſide towards the South, and therefore the Sun will appear to go as much toward the North Pole, and as it were from the Equator in the Heavens; for the Earth being ap-

parently at Reſt, its Equator will be ſo too, and conſequently the Celeſtial Equinoctial will appear to change from its Poſition by a diurnal Motion, and the Sun will appear to move alſo, becauſe it changes its Poſition in reſpect to the Equinoctial in the Heavens. And the Sun's Light which before reached juſt as far as the Poles N and S, will now go beyond N, and will fall as much ſhort of S.

But when the Earth is come to ♈, the Sun then will appear to be in ♋, where he will ſeem moſt of all to decline from the Equator towards the North, *viz.* as much as is the Angle of Inclination between the Plane of the Equator and that of the Ecliptick; and the Sun will then ſeem to move all Day in the Circle T C, which is a Parallel to the Equator at 23° 30′ diſtance, and is called the Tropick of ♋. The Earth being thus poſited, 'tis apparent that the Sun's Rays enlightening always one half of it, will now reach beyond the Pole N, as far as L, and fall ſhort of the Southern Pole S, by the Ark S M = to L N = to 23° 30′ the Inclination of the Ecliptick to the Equator; and therefore if 2 leſſer Circles are imagined to be there drawn on the Earth, they will be the Polar Circles as A L and M G: And 'tis plain that that Part of the Earth which lies between the Polar Circle A L and the Pole, will enjoy perpetual Day, notwithſtanding the Earth's diurnal Motion, as the oppoſite Part within the Antarctick Circle M G will be in continual Darkneſs. The Earth being thus in ♈, and the ☉ appearing in ♋, 'tis plain alſo that of every Circle parallel to the Equator in the Northern Hemiſphere, the greateſt Part, or more than a Semicircle, will be Illuminated; but from the Equator towards the South Pole, the greateſt Part of every Parallel will be in Darkneſs: Wherefore in all Places lying to the Northward of the Equator, the Days will be longer than the Nights; that is, it will be Summer; as in the Southern Hemiſphere the Nights will be longer than the Days, where it will be Winter; and this in Proportion to the Place's Diſtance from the Equator: But to thoſe who live under the Equator, or the Line, (as the Seamen call it) the Days and Nights will be equal now, and at all Times of the Year.

The Earth moving on its Annual Orbit from ♈ into ♒, ♓, and ſo to ♉ it will arrive at the other Equinoctial Point, and then the Sun will appear to be in ♎, and all Things will be the ſame as when the Earth was in ♎, which hath been above deliver'd.

The Earth going on in its Orbit from ♉, to ♊, and ſo to ♋, the Sun will then appear to be in ♈, and conſequently in the Winter Tropick, as we call it in reference to our Poſition toward the Sun: And now the State of Things with us will be the Reverſe of what it was when the Earth was in ♈, our Nights will be longer than our Days, *&c.* as appears from the Figure; and it will fare with us Inhabitants of the Northern Hemiſphere, in all reſpects, as it did then with the Inhabitants of the Southern.

PYXIS, is the Cavity of the Hip-Bone, which is called *Acetabulum*.

QUADRANGLE, or *Quadrangular Figure*, in Geometry, is that which hath no more than four *Angles*.

QUADRANT, is an Arch which is the fourth Part of a Circle, containing 90 degr. And oftentimes the ſpace contained between a Quadrantal Ark, and two Radius perpendicular one to another in the Centre of the Circle, is called a *Quadrant*; from the Figure of which the following Inſtrument takes it Name, which is called a

Quadrant, and is a very uſeful and ready Inſtrument, when well made, for many Operations. The Limb of it is divided into 60 Degrees, and as many Parts of a Degree as the Bigneſs of the Inſtrument will bear, and this by means of a String and Plummet, (or Label, if it be a ſcrewed Limb) gives you the Sun's Altitude, or that of any Star or other Object above the Horizon, reckoned from that Edge of the Quadrant where the Sights are not placed. In *Collin*'s Quadrant, this Limb is alſo divided into Time, and numbred accordingly, and then it ſerves very readily to find the Sun's right Aſcenſion either in Degrees or Time, and to ſhew the Hour of the Day there to a Minute, by his Altitude. Next to the Limb, in *Gunter*'s Quadrant, is the Calendar of the Months placed; but in *Collin*'s 'tis put in four little Quadrantal Arks next the Center of the Inſtrument, having an Ark alſo of the Sun's Declination fitted thereunto; ſo that the String laid to the Day of the Month, will ſhew the Declination; or laid to the Declination, will give the Day of the Month, in the Quadrantal Ark proper for that Seaſon of the Year. Next below this, in Mr. *Collin*'s Quadrant (which I judge to be the beſt) is the Projection, which is a 4th Part of *Stoffler's Aſtrolabe*, inverted and fitted to the Latitude of *London*; of which thoſe Lines which run from the Right Hand towards the Left are Parallels of Altitude, and thoſe which croſs them are Azimuths. In the Projection are drawn the two Eclipticks, with the Characters of the Signs upon them, and the two Horizons, all iſſuing from the ſame Point; and up and down in the Projection are placed ſuch eminent fixed Stars, as are between the Tropicks. Next below the Projection is the *Quadrat* and Line of Shadows, being only a Line of Natural Tangents to the Arks of the Limb; and by its help, the Heights of Towers, Steeples, *&c.* may be pretty exactly taken.

QUADRANT *of Altitude*, is part of the Furniture of an artificial Globe, being a thin Braſs Plate divided into 90 Degrees, and marked upwards with 10, 20, 30, *&c.* being rivetted to a Braſs Nut which is fitted to the Meridian, and hath a Screw in it, to ſcrew upon any Degree of the Meridian: when it is uſed, 'tis moſt commonly ſcrew'd to the Zenith. Its Uſe is for meaſuring *Altitudes*, to find *Amplitudes* and *Azimuths*, and deſcribing *Almicantars*.

QUADRANT *Aſtronomical*; ſee *Aſtronomical Quadrant*.

QUA-

QUADRANT *Triangular.* See *Triangular Quadrant.*

QUADRANTAL *Triangle*, is a Spherick Triangle, one of whoſe Sides (at leaſt) is a Quadrant, and one Angle Right.

QUADRAT, and Line of Shadows on a Quadrant, are only a Line of natural Tangents to the Arks of the Limb, and are placed there in order to meaſure Altitudes readily, for it will always be; as the Radius to the Tangent of the Angle of Altitude at the Place of Obſervation; (that is, to the Parts of the Quadrat or Shadows cut by the String) :: ſo is the Diſtance between the Station and Foot of the Object to its Height above the Eye.

Quadratick Equations.

QUADRATICK Equations, are ſuch as retain on the unknown Side, the Square of the Root or Number ſought; and are of two ſorts.

I. *Simple Quadraticks*, where the Square of the unknown Root is equal to the abſolute Number given, as $aa = 36$, $ee = 146$, $yy = 133225$. And for the Solution of thoſe, there needs only to Extract the Square Root out of the known Number, and that is the Value of the Root or Quantity ſought: Thus the Value of a in the Firſt Equation is equal to 6, in the Second $e = 12$ and a little more, it being a Surd Root. And in the Third Example $y = 365$.

II. *Adfected Quadraticks*, are ſuch as have between the higheſt Power of the unknown Number and the abſolute Number given, ſome intermediate Power of the unknown Number, as $aa + 2ba = 100$.

And this Equation is properly called *Adfected*; becauſe the unknown Root a is Multiplied into the Coefficient $2b$.

The Original of *Adfected Equations*, the Ingenious Mr. *Harriot* thus derives: Let a be $= +b$, or $a = -c$, then by Tranſpoſition will $a - b = 0$, and $a + c = 0$. And then multiplying one by another, the Product is $aa - ab + ca - bc = 0$.

And this he properly calls an *Original Equation.* From which, or others of the ſame Kind, Tranſpoſing bc over to the other Side with a contrary Sign, he gains ſuch an Equation as this, $aa - ab + ca = bc$, which he calls a Canonical Equation.

And from hence, by putting Examples in all Caſes, he ſhews, that every poſſible Quadratick Equation hath two real Roots, according to the Dimenſions of the higheſt Power; as being made up by the Multiplication of two ſimple Equations. And that theſe two Roots may be either both Affirmative, or both Negative; and that ſometimes they are equal to each other, and ſometimes not. And from hence he finds, that the abſolute Number bc is always the Rectangle of the two Roots b and c, (or of the two Values of a): And that if it have a poſitive Sign, the two Roots have like Signs, but if a Negative one, unlike.

And, That the Coefficient of the middle Term is always the *Aggregate of both the Roots with contrary Signs*; and conſequently their *Difference*, when without its Sign. See more in his *Second Section*, and in *Wallis's Algebra*, p. 132, &c.

And when in ſuch Kind of Quadraticks as theſe, the Index or Exponents of the Dimenſions of the unknown Root are in Arithmetical Proportion, that is, as in this Equation, $aa + 2ba = 100$, the Index of aa is 2, the Index of $2ba$ is 1, and the Index of 100 is 0; then may the Root be eaſily found out by the following Method.

All Equations of this Rank will be in one of theſe three Forms:

$aa + a = dR$
$aa - ad = R.$
$as - aa = R$

* *Some make four Forms, but at long run it comes to the ſame Thing.*

In all which Forms, R, the abſolute Number given, is a Rectangle or Product made out of the two Quantities or Roots ſought, a Greater and a Leſſer.

Of which in the *Firſt Form*, where all is Affirmative, the Coefficient d is the Difference between thoſe two Quantities or Roots; and a is the Leſſer of them, as is plain if you ſuppoſe the two Roots (as *Oughtred* doth) to be a the greater, and e the Leſſer. For then let $d = x$ be the Difference between them: So that $e + x = a$. If then you multiply each Part by e, it will be $ee + ex = ae$; from whence it appears alſo plainly, that ae is equal to R, the abſolute Number given, or equal to the Rectangle of the two unknown Roots a and e, of which in this Form, the Coefficient x or d is equal to the Difference between them, and e is the Leſſer of them.

In the *Second Form*, The Coefficient d is the Difference of the two Roots as before, but a *there* repreſents the Greater of them, as is plain by putting (becauſe the Sign is Negative) $a - x = e$, and multiplying each Part by a, it produces $aa - ax = ae$, the ſecond Form, where x or d the Coefficient is the Difference of the two unknown Roots; and a repreſents the greater of them.

In the *Third Form*, where the higheſt Power is Negative, the Coefficient s is the Sum of the two Quantities or Roots ſought; and a the Affirmative Root ſought, may be either the Bigger or the Leſſer of them. For let (becauſe the higheſt Power is Negative) $z - a = e$; then multiplying both by a it will $za - aa = ae = R.$ or if $z - e$ had been put equal to a, then it would have been $ze - ee = ae$, by multiplying all by e.

So that this Method ſhews you the Original Conſtitution of theſe Forms, and the Nature and Office of each Member of them.

From all which may be found this general Canon for the Solution of Quadratick Equations, according to this Method.

Multiply the abſolute Number by 4, and to the Product add the Square of the Coefficient, then Extract the Square Root of that Sum: Which Root ſhall be the Sum of the two Numbers ſought. Then to or from the half of that Root, add and ſubſtract half the Coefficient, and the Sum and Remainder are the two Roots required.

For the particular Solution of adfected Quadraticks there are three Ways.

1. *That of* Oughtred, *who proceeds in this Method.*

In all the three Forms, there is given either the Rectangle and Sum, or the Rectangle and Difference of the two unknown Quantities; whence 'tis very easy to find either the Difference in the former, or the Sum in the latter Case: And then having the Sum and Difference of any two unknown Quantities, the Quantities themselves will soon be known.

Thus in the first Form, let $a\,a + d\,a = \mathrm{R}$.

Here is given R the Rectangle of the Roots, d their Difference; and 'tis known that a represents the lesser of them. Let S stand for the Sum to be sought.

Let $a + e = \mathrm{S}$ and $a - e = d$, Then $aa + 2\,ae + ee = \mathrm{SS}$, and $aa - 2\,ae + ee = dd$, Substract the latter from the former, and there remains only $4\,ae = 4\,\mathrm{R}$. Wherefore $\mathrm{SS} - dd = 4\,\mathrm{R}$.

You may therefore by simple Algebra find that $4\,\mathrm{R} = \mathrm{SS} - d\,d$, and consequently that $4\,\mathrm{R} + d\,d = \mathrm{SS}$, and therefore S is known; and then having S and d, a the lesser Root will be known too, for $\frac{1}{2}\,\mathrm{S} - \frac{1}{2}\,d = a$.

Again, in the second Form. Let $a\,a - a\,d = \mathrm{R}$.

Here d and R (as before) the Difference and Rectangle of the two Roots are given; and a the greater of them; wherefore 'tis easy to find S the Sum, and then $\frac{1}{2}\,\mathrm{S} + \frac{1}{2}\,d = a$.

In the third Form, where $\mathrm{S}\,a - a\,a = \mathrm{R}$.

There is given the Coefficient S = Sum of the unknown Roots, A the Rectangle between them; and a may be either the bigger or lesser of them;

Here therefore to find d the Difference.

Because $\mathrm{SS} - dd = 4\,\mathrm{R}$, therefore $\mathrm{SS} + 4\,\mathrm{A} = d\,d$, and consequently d is known; and then $\frac{1}{2}\,\mathrm{S} + \frac{1}{2}\,d =$ greater, and $\frac{1}{2}\,\mathrm{S} - \frac{1}{2}\,d =$ lesser.

II. *The Solution of Adfected Quadratick Equations, by the Method of Compleating the Square.*

Which is by Mr. *Harriot*, thus: Since in every one of the three Forms of Quadraticks, one quarter of the Square of the Coefficient will make the unknown Side of the Equation a Compleat Square, whose true Root will be $a + \frac{1}{2}\,d$ (or whatever Letter else be the Coefficient.) 'Tis plain by this means, an Adfected Quadratick Equation, may be reduced to a *Simple* one.

Wherefore,

In the first Form, where all the Species are Affirmative.

Let $a\,a + d\,a = \mathrm{R}$

If $\frac{1}{4}\,d\,d$ be added to the unknown Side, it will be a perfect Square $aa + d\,a + \frac{1}{4}\,dd$, whose true Root is $a + \frac{1}{2}\,d$.

Add then, $\frac{1}{4}\,dd$ to R, and $\mathrm{R} + \frac{1}{4}\,d\,d$ will be a perfect Square Number and known: Whose Square Root extracted in Numbers, will be equal to $a + \frac{1}{2}\,d$; and consequently, a will be equal to that Root, when $\frac{1}{2}\,d$ is taken from it, and so a will be known.

The Practical Rule is this,

To the absolute Number, add $\frac{1}{4}$ of the Square of the Coefficient, (or the Square of half the Coefficient) and extract the Root of the Sum; then from that Root found in Numbers, subtract $\frac{1}{2}$ the Coefficient, and the Remainder is a, the lesser of the two Roots, or Values of a.

Example.

$$a\,a + d\,a = \mathrm{R}$$
$$\text{or } aa + 16\,a = 36$$
$$\text{to } 36 = \mathrm{R}$$
$$\text{add } 64 = \tfrac{1}{4}\,d\,d$$
$$\sqrt[2]{:100} = 10 = a - \tfrac{1}{2}\,d.$$
$$\text{but } \tfrac{1}{2}\,d = 8$$

therefore $2 = a$.

In the Second Form.

Let $a\,a - d\,a = \mathrm{R}$.

Proceed in all respects as in the first Form, only you must at last add $\frac{1}{2}$ the Coefficient to the Root Extracted out of the absolute Number instead of taking it from it, as before: because here a represents the greater Root; and thus, if $aa - 16\,a = 36$. a will be found = to 18.

In the Third Form.

Let $\mathrm{S}\,a - a\,a = \mathrm{R}$.

Here because the highest Power is Negative, 'tis impossible any such Root can be found that will produce $-aa$; wherefore you must imagine all the Signs changed, and then it will stand thus; $-\mathrm{S}\,a + a\,a = -\mathrm{R}$, or putting the highest Power first, $a\,a - \mathrm{S}\,a = -\mathrm{R}$.

In this Form, the Coefficient is the Sum of the two Roots, and a may be either of them.

And here the absolute Number is so determined as that it cannot be greater than the Square of half the Coefficient: For,

If the absolute Number be = to the Square of half the Coefficient, the Roots are equal.

The Practical Rule then is this:

From the Square of half the Coefficient, take the absolute Number given; and extract the Square Root of the Remainder; which Root either added to, or subtracted from half the Coefficient, will give accordingly the greater or lesser Value of a.

Thus: If $20\,a - aa = -36$
or $\mathrm{S}\,a - aa = -\mathrm{R}$
From $100 = \frac{1}{4}\,\mathrm{SS}$
take $36 = \mathrm{R}$
$\sqrt[2]{:64} = 8$
now $10 + 8 = 18$ the greater Root,
and $10 - 8 = 2$ the lesser Root.

III. *To*

III. *To Solve* Quadratick Adfected Equations, *by taking away the* Second Term.

In any of the Three Forms, if the Coefficient have a Negative Sign, put $e + \frac{1}{2}d$; but if it have an Affirmative Sign, put $e - \frac{1}{2}d$; inſtead of a, the Root of the higheſt unknown Power.

Then will $ee + ed + \frac{1}{4}dd = aa$
alſo $+ed + \frac{1}{4}dd = +da$.

And theſe two Quantities added together, muſt be equal to the Abſolute Number given, and the Equation will become a Simple one.

In the Firſt Form,

$aa + da = R$, or $aa + 16a = 36$.
Let $e - \frac{1}{2}d = a$,

Then will $ee - ed + \frac{1}{4}dd = aa$
and $ed - \frac{1}{2}dd = ad$
which added together make $ee - \frac{1}{4}dd = R$
Therefore $ee = R + \frac{1}{4}dd$
And conſequently $e = \sqrt{R + \frac{1}{4}dd}$

But $e - \frac{1}{2}d = a$,
Therefore $e = a + \frac{1}{2}d$
Conſequently $a + \frac{1}{2}d = \sqrt{R + \frac{1}{4}dd}$
Wherefore $a = \sqrt{R + \frac{1}{4}dd} - \frac{1}{2}d$. Q.E.D.

And ſince $a + \frac{1}{2}d = \sqrt{R + \frac{1}{4}dd}$: If each part of the Equation be Squared, there will ariſe,

$$aa + ad + \tfrac{1}{4}dd = R + \tfrac{1}{4}dd.$$

Which is the other common Canon for Solving Quadraticks, by adding to each Part the Square of half the Coefficient, in order to compleat the Square.

In the Second Form,

$$aa - ad - R.$$
Let $e + \frac{1}{2}d = a$.

Then is $ee + ed + \frac{1}{4}dd = aa$
and $-ed - \frac{1}{2}dd = ad$

Theſe added make $ee - \frac{1}{4}dd = R$
Therefore $ee = R + \frac{1}{4}dd$.

and $e = \sqrt{R + \frac{1}{4}dd}$.
but $e + \frac{1}{2}d = a$
Therefore $e = a - \frac{1}{2}d$.

And conſequently $a - \frac{1}{2}d = \sqrt{R + \frac{1}{4}dd}$.

Wherefore $a = \sqrt{R + \frac{1}{4}dd} + \frac{1}{2}d$.
Q. E. D.

And ſince $a - \frac{1}{2}d = \sqrt{R + \frac{1}{4}dd}$; if each Side of the Equation be Squared, you will have,

$$aa - ad + \tfrac{1}{4}dd = R + \tfrac{1}{4}dd.$$

Which is the common Canon for Solving Equations by compleating the Square.

In the Third Form,

$$da - aa = R.$$

Which Form muſt be thus changed,

$$aa - da = -R.$$

Then make as before, $e + \frac{1}{2}d = a$
and then $ee + ed + \frac{1}{4}dd = aa$
and $-ed - \frac{1}{2}dd = -ad$.

Whoſe Sum is $ee - \frac{1}{4}dd = -R$
Then is $ee = \frac{1}{4}dd - R$.

And $e = \sqrt{\frac{1}{4}dd - R}$.

And ſince, $e + \frac{1}{2}d = a$
$e = a - \frac{1}{2}d - (\sqrt{\frac{1}{4}dd - R})$

Wherefore (becauſe there are two Poſitive Roots in this Form)

$$a = \sqrt{\tfrac{1}{4}dd - R} + \tfrac{1}{2}d.$$

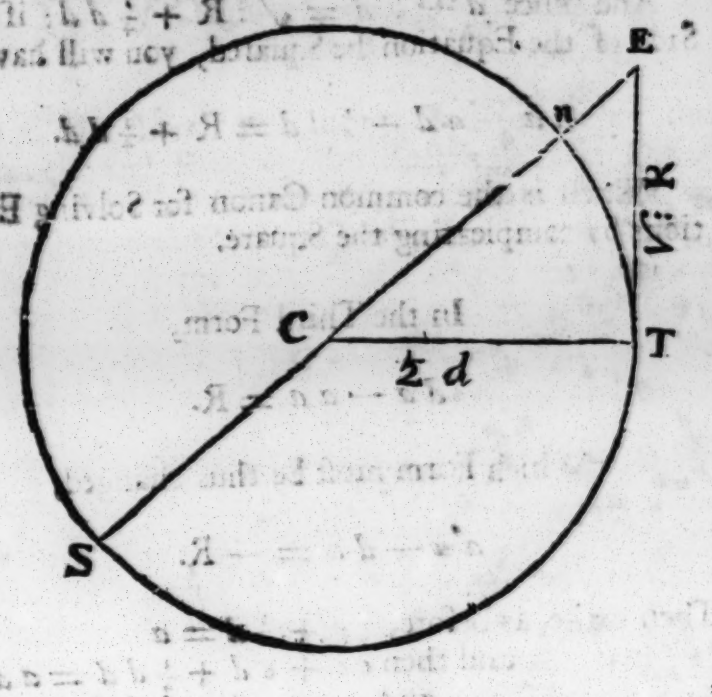
But the Value of a is Ambiguous, and you muſt generally try both Roots before you can find which will Solve the Queſtion: Whereas in the other two Forms, the firſt a found, will be that required.

N. B. In this way of Solving *Quadraticks*, the known Quantity added to, or Subſtracted from e, muſt be always half the Coefficient.

Conſtruction of Adfected Quadraticks.

The Conſtruction of *Simple Quadraticks*, you have before under *Simple Equations*: That of *Adfected* ones, is eaſily done many ways.

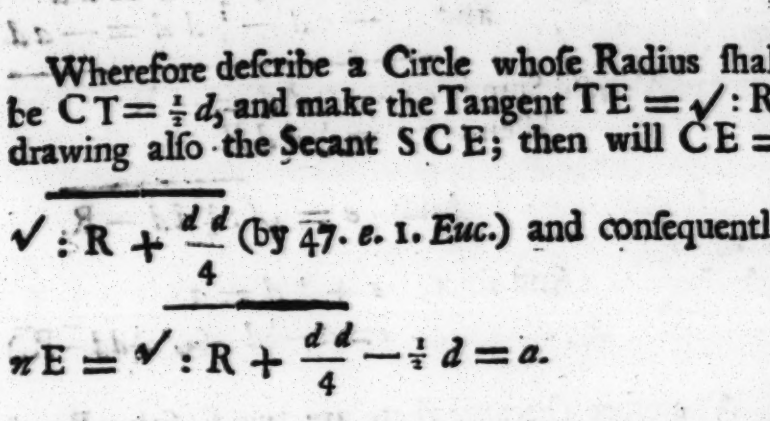
I. In the Firſt Form of Quadraticks, let $aa + da = R$. Then by the common Method of Solution, $a = \sqrt{R + \frac{dd}{4}} - \frac{d}{2}$.



Wherefore describe a Circle whose Radius shall be $CT = \frac{1}{2}d$, and make the Tangent $TE = \sqrt{:R}$, drawing also the Secant SCE; then will $CE = \sqrt{:R + \frac{dd}{4}}$ (by 47. *e.* 1. *Euc.*) and consequently $nE = \sqrt{:R + \frac{dd}{4}} - \frac{1}{2}d = a$.

II. In the Second Form, where $aa - dd = R$, a will be equal to $\sqrt{:R + \frac{dd}{4}} + \frac{d}{2}$. And consequently, The same Construction and Diagram will serve here, which was used in the first Form: And the Root will be represented by $SE = \sqrt{:\frac{1}{2}dd + R} \frac{1}{2}d$.

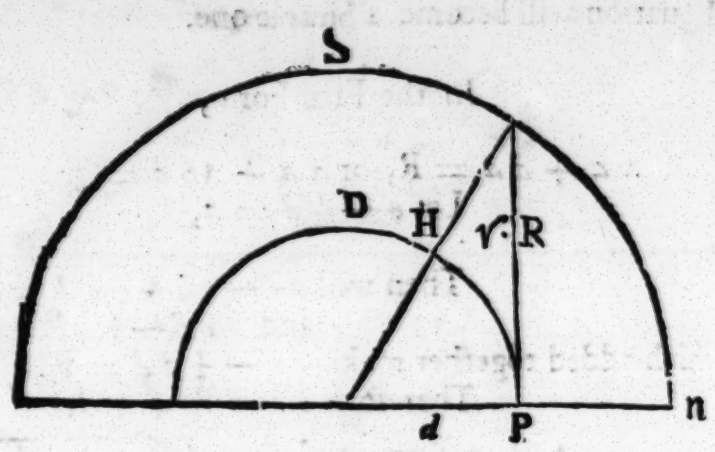
III. In the Third Form, where $Sa - aa = R$, a will be equal to $\frac{S}{2} + \sqrt{:\frac{SS}{4} - R}$, and here the Root a hath two real Values; make CT $(= \frac{1}{2}S)$ the Radius of a Circle, and erect the



Perpendicular $ET = \sqrt{:R}$; then draw EQ Parallel to CT, and NO Parallel to ET, draw also the Radius CN. Then will (by 47. *e.* 1 *Euclid.*) $CO = \sqrt{:\frac{SS}{4} - R}$, and consequently, $BO = \frac{S}{2} + \sqrt{:\frac{SS}{4} - R} =$ the greater Root a. Or the two Roots will be QN, and NE; equal to the two former.

Dr. *Wallis*'s way of Constructing the Three Forms of all Quadratick Equations, according to Mr. *Oughtred*'s Method of Solution.

Draw two Concentrick Circles, and let the Diameter of the greater be called S, and the Diameter of the lesser D, the Sum and Difference of the Roots found. Wherefore H and d will represent the half Sum and half Difference of the Roots.



Since therefore *Oughtred*'s Theorem, as is shewed above, is, That $SS - DD = 4R$. Wherefore, : divide all by 4 : $\frac{SS - DD}{4} = R$; Let $\sqrt{:R}$ be made a Tangent to the lesser, or a Right-Sine to the greater Circle, as you see in the Figure according as D, or S, is given: And draw also the Hypothenuse H. Then will the Base of the Triangle be d. And $HH - dd = R$ (by 47. *e.* 1.) That is, $\frac{SS}{4} - \frac{DD}{4} = R$. Wherefore by Transposition, $HH = R + dd$, and therefore $H = \sqrt{:R + dd}$. And consequently, if it had been in the first or second Forms, where d and R were given, H will also be found. Or if H had been given, and d required as in the third Form, since, $HH = R + dd$: Therefore, $HH - R = dd$; And $\sqrt{:HH - R} = d$: And having thus found A and d, the $\frac{1}{2}$ Sum and $\frac{1}{2}$ Difference of the two Roots: Then $H + d$ $(= op)$ will be the greater Root a. and $H - d$ $(= pn)$ will be the lesser, which will be Affirmative or Negative, according to the Form and Circumstances of the Equation.

A Question and Problems in Adfected Quadratick Equations.

QUESTION.

Two Men have each a certain number of Crowns, whose Sum Substracted from the Sum of their Squares, leaves $R = 78$: *But their Sum added to the Product of the two Numbers, makes* $39 = S$. How many Crowns had each?

For the unknown Sum of the Numbers put $2a$. And for their Difference $2e$.

For then the Numbers may be thus Noted, $a + e$ = the greater, and $a - e$ = the lesser.

Then

Then,

$1 - \overline{2a}$	1	$2aa + 2ee =$ Sum of their Sq.
	2	$2aa + 2ee - 2a =$ R. by the State of the Queſtion.
$2 \div \overline{2}$	3	$aa + ee - a = \frac{R}{2}$. $39. = S.$
by Tranſp.	4	$39 - aa + a = ee$ which Step will at laſt help to find e.
$\square + 2a$	5	$aa - ee + 2a = S.$ Their Product added to their Sum.
by Tranſp.	6	$aa + 2a - S = ee.$
4, 6,	7	$39 - aa + aa = aa + 2a - 39\ (S) = ee.$
by Tranſp.	8	$78 = 2aa + a.$
	9	$aa + \frac{1}{2}a = 39 = S$, which is a Quadratick of the firſt Form.
Comp. $\square$ ww	10	$aa + \frac{1}{2}a + \frac{1}{16} = 39 + \frac{1}{16}$
	11	$a + \frac{1}{4} = \sqrt{:}\ 39 + \frac{1}{16}$
	12	$a = \sqrt{:}\ 39 + \frac{1}{16} - \frac{1}{4} = 6.$
	13	Therefore $2a = 12.$

And (a) being known, the value of (e) will be found from the fourth Step. Where $e = 3$.

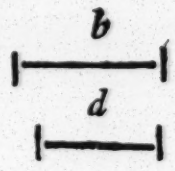
Now by our Suppoſition at firſt, the greater Number was $a + e$, that is 9; and the leſſer was $a - e$; that is 3: Which numbers 3 and 9, will Anſwer the Queſtion.

For 12, their Sum, taken from 90, the Sum of their Squares, leaves 78; and added to 27, their Rectangle, makes 39.

N. B. By this Method of putting $a + e$ and $a - e$ for the two Numbers ſought, inſtead of a and e as in the Common way; many Queſtions producing Adfected Quadratick Equations, when that way manag'd, may be ſolved as eaſily, and in the manner of Simple Equations. Eſpecially when the Sum and Difference, or Sum or Difference of the Squares of the Quantities ſought, are among the *Data*.

PROBLEM I.

The Difference of both the Legs of a Right angled Triangle being given from the Hypothenuſe; to find the Sides ſeverally, and to Form the Triangle.



Let the Difference of the leſſer Side from the Hypothenuſe be (b) and that of the greater (d.)

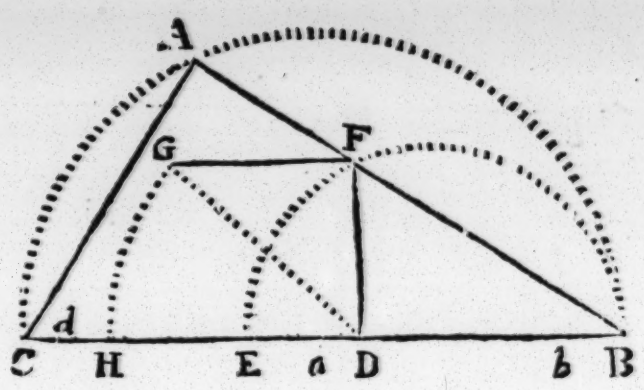
For the greater Side ſought put (a)

Then will,

$1 - \overline{b}$	1	$a + d =$ Hypothenuſe, and
	2	$a + d - b =$ to the leſſer Side.
47. *e.* 1.	3	$aa + 2ad + dd. = 2aa + 2ad - 2ab - 2bd + dd + bb.$
	4	$aa - 2ab - 2bd + bb = 0.$ by Compariſon and Tranſpoſition of the laſt Step.
Tranſp.	5	$aa - 2ab = 2bd - bb.$ which is a Quadratick Equation of the Second Form.
Compl. $\square$ ww	6	$aa - 2ab + bb = 2bd.$
	7	$a - b + \sqrt{:}\ 2bd$
		$a = \sqrt{:}\ 2bd + b.$

Geometrical Conſtruction.

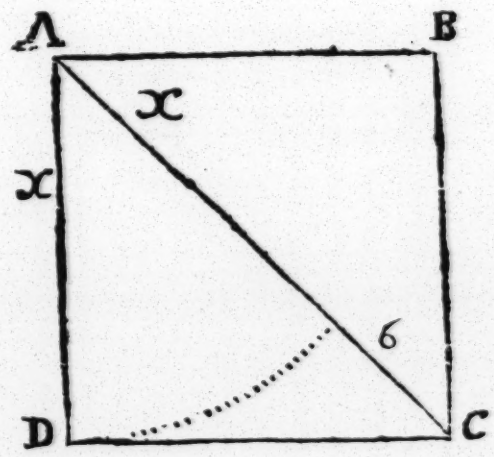
Find a mean Proportional between d and b, which let be D F: to which, place at Right-angles F G = to D F, Draw G D, and cut off H D = G D. Then will B H, be the greater Side ſought. And this being



produced to C (ſo that C H = E D) will give C D (= A C) the leſſer Side of the Triangle required, for $a + d - b =$ leſſer Side; Draw a Semi-circle on C B and apply A B = H B. Then draw A C, and the Triangle is found, which is A C B.

PROBLEM II.

Having in the Square A B C D, *the Difference between the Sides and Diagonal* = 6, *or* a, *to find the Side of the Square.*



Let the Side ſought be called x, and $6 = a$.

Then $x + a =$ A C the Diagonal.

But (by 47. *e.* 1 *Eucl.*) A C q; = 2 A D q; or to $2xx$,

That is $xx + 2xa + aa\ 2xx.$

Expunge then xx on both Sides, and it will be $2xa + aa = xx$, and then by Tranſpoſition, $xx + 2ax - aa.$ Compleat the Square, and it will be $xx - 2ax + aa = 2aa.$

Wherefore $x - a = \sqrt{:}\ 2aa$,

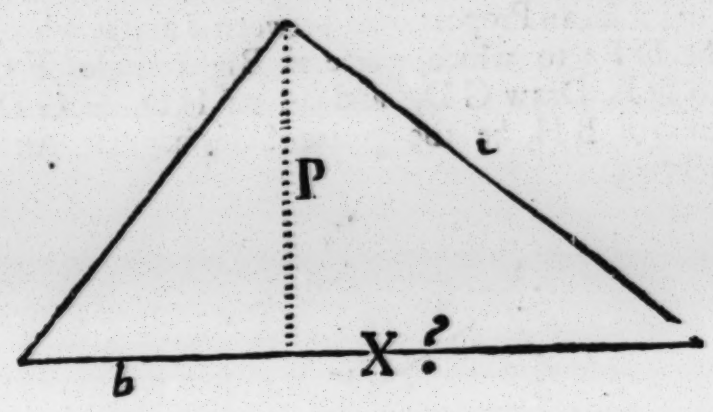
And conſequently $x = \sqrt{:}\ 2aa + a = 14.48.$

PROBLEM III.

Given one Segment of the Baſe of a Right-angled Triangle, as alſo the Side of the Triangle Adjacent to the other Segment of the Baſe; 'tis required to find the reſt, and to form the Triangle.

Suppoſe

Suppoſe it done; and let the Segment *b*, and the Side *c*, be both known or given. Let *x*, the other



Segment of the Baſe, be ſought; which is all that is neceſſary to ſolve the Problem.

Here therefore, ſince P is ſuppoſed to be a true Perpendicular;

1 | $cc + xx = pp$. 47 *è* 1 *Euclid.*

2 | And becauſe the Angle at the Top is a Right one, therefore $pp = bx$, which gives another way of expreſſing pp. So that,

3 | $cc - xx = bx$, and conſequently by Tranſpoſition,

4 | $cc = xx + bx$. which is an Adfected Quadratick of the firſt Form. Wherefore,

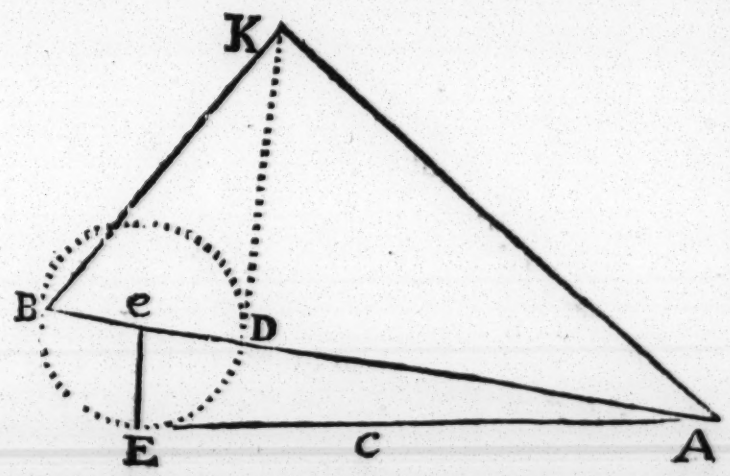
5 | $cc + \frac{bb}{4} = xx + bx + \frac{bb}{4}$ by compleating the Square. And,

6 | $\sqrt{cc + \frac{bb}{4}} = x + \frac{b}{2}$, by Evolution.

7 | Laſtly, $\sqrt{cc + \frac{bb}{4}} - \frac{b}{2} = x$.

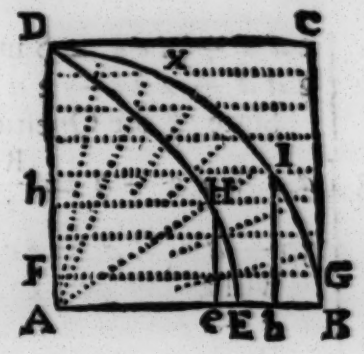
Geometrical Conſtruction.

Join together at Right-angles eE $= \frac{1}{2}b$ and EA $=$ C, Then with the Radius *e* E Deſcribe the Circle BED, and thro' the Centre *e* Draw the Line A D B. Erect then at D the Perpendicular D K,



which Limit, by Deſcribing a Semi-circle on BA that Semi-circle ſhall cut the Perpendicular in th Point K, the Vertex of the Triangle required, whence draw the two Legs BK and KA. So is BKA the Triangle ſought.

QUADRATRIX (in Geometry) is a Curve Line thus generated.



Let there be a Radius of a Circle, as AD, which imagine to move on the Centre A down the Circumference of the Quadrant D B, and at the ſame time let the Side of the Square C D move equally downwards, ſo that the Radius A D and the Side of the Square C D, may come to the Line A B together. Or let the Right Line D A, and the Quadrantal Ark D B, be both divided into a like Number of equal Parts, as in this Caſe they are each into 8. And to the Diviſions of the Quadrant let as many Radii be drawn from the Centre A, and through the Diviſions in A D as many Parallels to C D; for then if a Curve Line be drawn neatly connecting the Points of Interſection of theſe Radii and Parallels, it will be that Line which is called the *Quadratrix* (as D E). From this Geneſis of the Quadratrix ariſe theſe Corollaries.

1. That if through any Point, as H in this Quadratrix, you draw a Radius A H I, and the two Perpendiculars *Hb* and *He*, it will be, as the whole Quadrantal Ark D B, is to the Part I B :: ſo will the whole right Line D A be to the Part of it cut off *b* A, or its equal *He*, as is plain from conſidering the equal motion of the Radius A D, and the ſide of the Square D C, which interſect each other in H.

2. Wherefore any Ark of the Quadrant as I B, or any Angle as I A B, may by this Quadratrix be eaſily divided into 3 equal Parts, or any other Number at Pleaſure, or according to any given *Ratio*, by only drawing the Radius A I, and then from the Point of the Quadratrix H letting fall the Perpendicular *He*: for if *He* be divided into 3 or any given Number of equal Parts, Lines drawn from A the Center through thoſe Diviſions, ſhall divide the Ark or Angle after the ſame manner. For as the parts of *He*, are to the whole Line :: ſo will the parts of the Ark I B be to the whole Ark: By the former Corollary,

3. I ſay, *That the Baſe of the Quadratrix* A E *is a Third Proportional to the Radius* A D, *and the Quadrant* B D.

For D B. D A :: I B. H*e*, as follows (alternately) from *Cor.* 1.

And I*b*. H*e* :: *b* A : *e* A, by the Triangles being Similar.

Now if you conceive the Ark I B to grow infinitely ſmall, it muſt at laſt come to the ſame as its right Sine I*b*, and both will coincide in the Point B; and at the ſame time as H E and H*e* coincide in the Point E, (by the Geneſis of the Curve;) ſo that at laſt A*e* and A E, A*b* and A B will be coincident: And therefore at laſt D B . D A :: I B (*i. e.* I*b*)

(*i. e.* I *b*) H *e*. That is, as A *b* : A *e*. or which is the ſame at laſt, as A B (or A D) to A E.

Wherefore D B . D A :: D A . A E. *Q. E. D.*

4. Wherefore if on the Baſe of the Quadratrix A E, a Quadrantal Ark be deſcribed, it will be equal in length to D A the Side of the Square: And conſequently the Semicircle will be double, and the Periphery Quadruple, of D A.

5. Hence may a Right Line be found equal to D B or any other Quadrant of a Circle, by only making as A E . A D :: A D to a Third Proportional, which will be equal to the Quadrantal Ark, by *Cor.* 3.

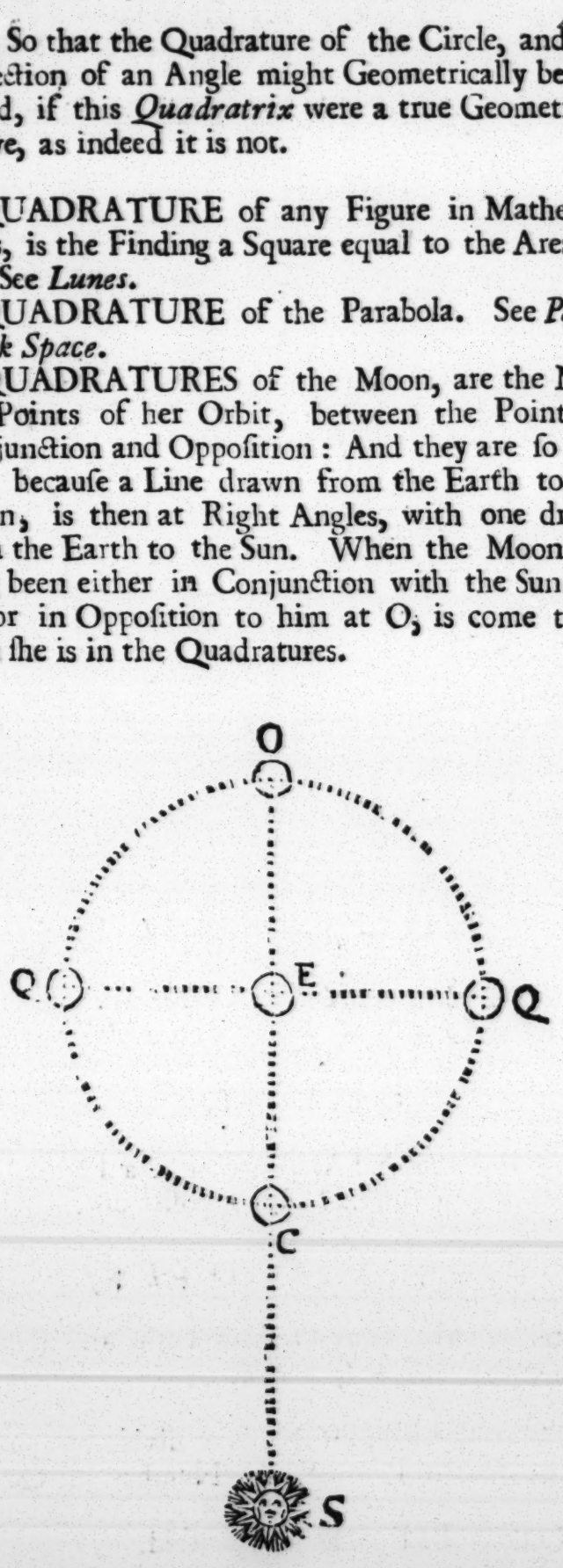
6. After the ſame manner may a Right Line be found equal to I B, or any other Ark of a Circle leſs than a Quadrant, if it be made as D A . H *e* :: D B . D B to a fourth Proportional by *Cor.* 1.

7. So that the Quadrature of the Circle, and the Triſection of an Angle might Geometrically be effected, if this *Quadratrix* were a true Geometrical Curve, as indeed it is not.

QUADRATURE of any Figure in Mathematicks, is the Finding a Square equal to the Area of it. See *Lunes*.

QUADRATURE of the Parabola. See *Parabolick Space*.

QUADRATURES of the Moon, are the Middle Points of her Orbit, between the Points of Conjunction and Oppoſition: And they are ſo called, becauſe a Line drawn from the Earth to the Moon, is then at Right Angles, with one drawn from the Earth to the Sun. When the Moon having been either in Conjunction with the Sun, at C, or in Oppoſition to him at O, is come to Q. then ſhe is in the Quadratures.



QUADRATUS *Femoris*, a Muſcle of the Thigh, ſo called from its Figure; it ariſeth broad and fleſhy, from the *Apophyſis* of the *Os Iſchium*, and paſſes tranſverſly with an equal breadth and thickneſs to its partly fleſhy, and partly Tendinous Inſertion at the Poſterior part of the *Os Femoris*, partly below the great *Trochanter*. This aſſiſts the *Marſupialis*, in turning the Thigh-bone outwards.

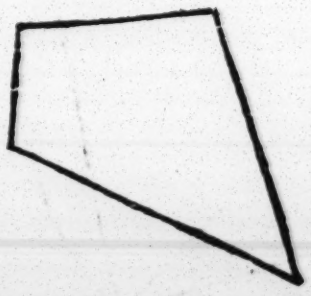
QUADRATUS *Genæ, Seu Tetragonus*, is a great Square Muſcle lying under the Skin of the Neck, and is ſpread over the whole inferior Region of the Face. It ariſes thin and membranous, from the Spines of the *Vertebræ*, the Skin on the Superior Part of the *Cucullaris*, and Pectoral Muſcle, from hence aſcending under the Skin of the Neck, becomes fleſhy, and one part adhering to the *Os Hyoides*, is ſoon inſerted to the Middle of the lower Jaw; the other broader portion proceeding farther to its Implantation in the Cheeks below the Angle of the Lips: It ſerves to draw down each Angle of the Mouth, together with the Cheeks, which Poſture of the Face is the proper expreſſion of Sorrow. But if the inferior Parts of theſe Muſcles (which lie on the Neck) Act alone, they diſtend the Superincumbent Skin, by making it approach to a direct Line with the *Clavicula* and lower Jaw-bone, which otherwiſe is Indented according to the Formation of the Part, whereby a double Skin (as they call it) is repreſented.

QUADRATUS *Lumborum*, is a ſhort thick, fleſhy Muſcle, ſituated in the Region of the Loins, or between the laſt Rib and Spine of the *Os Ilium*; it ariſeth from the Poſterior part of the Spine of the *Os Ilium*, and is inſerted to all the Tranſverſe Proceſſes of the *Vertebræ* of the Loins internally, under the *Pſoas* Muſcle. This like the *Muſculus Rectus Abdominis*, either moves the *Vertebræ* of the Loins nearer the *Os Ilium* laterally, when we are ſtanding on both Legs firm, or elſe moves the *Os Ilium* nearer the ſaid *Vertebræ* on the contrary ſide, when we ſtand upon one Leg only.

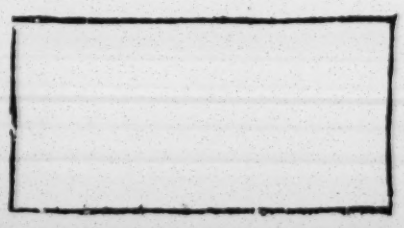
QUADRIGEMINI, according to ſome Anatomiſts, are four ſmall Muſcles that turn the Thigh toward the outſide, and are placed upon the Articulation, or jointing of the Thigh one by another.

QUADRILATERAL *Figures*, are thoſe whoſe Sides are four right Lines, and thoſe making four Angles; and they are either *Parallelogram, Trapezium, Rectangle, Square, Rhombus, Rhomboides*.

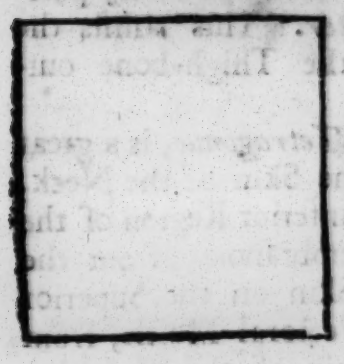
Parallelogram, is a *Quadrilateral* Figure, whoſe oppoſite Sides are Parallel and Equal.



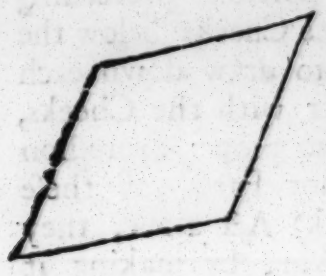
Trapezium, is a *Quadrilateral* Figure, whoſe Sides are unequal, as in this Figure.



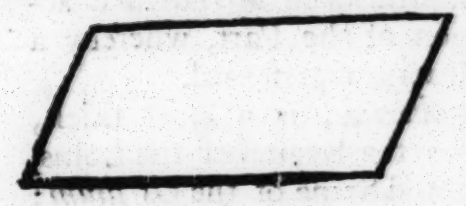
Rectangle, is a *Parallelogram* whoſe four Angles are Right, and is alſo called a *Rectangled Parallelogram*.



Square, is a *Quadrilateral* Figure having its Angles Right, and the Sides all Parallel and Equal, as in the Figure.



Rhombus, is a *Parallelogram*, having its oppoſite Angles and all its Sides equal, as in this Figure.



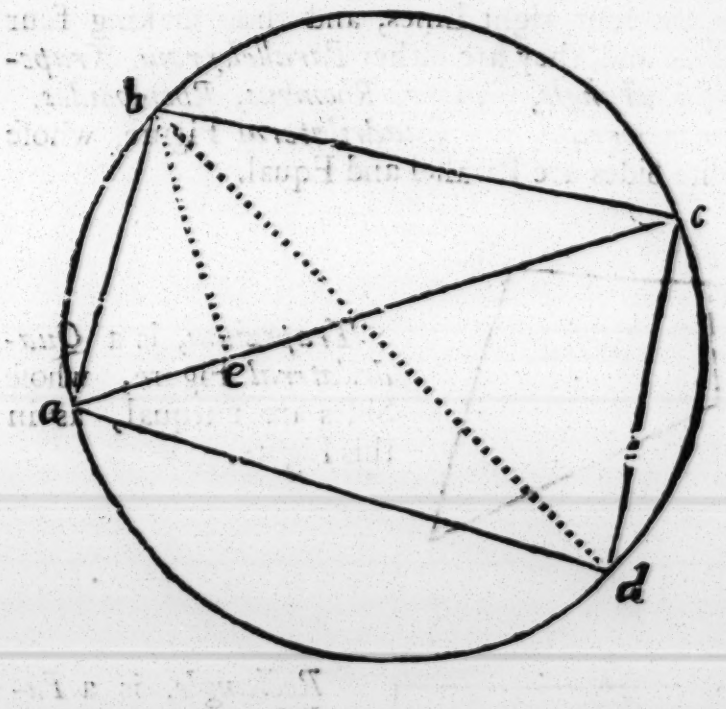
Rhomboides, is a *Parallelogram*, having neither its Angles nor Sides all equal.

PROPOSITION.

In a *Quadrilateral Figure* inſcribed in a Circle (as *a b c d*) the Rectangle under the two Diagonals (*a c* and *b d*) is equal to both the Rectangles made by the oppoſite Sides of the Figures *a b* × *c d*, and *b c* × *a d*.

That is, $\overline{a c \times b d} = \overline{b c \times a d} + \overline{b a \times c d}$. Make the Angle *a b e* = ∠ *c b d*.

DEMONSTRATION.



1. The Triangles *a b d* and *b c e* will be ſimilar; for ∠ *b d a* is equal to the ∠ *b c a*, (being in the ſame Segment) and the ∠ *a b d* = ∠ *e b c*, by the Addition of the common Angle *e b d*, to the two equal ones *a b e* and *d b c*.

Then will *b c* : *c e* :: *b d* : *d a*. and conſequently $\overline{b c \times d a} = \overline{c e \times b d}$. That is, the Rectangle under the oppoſite Sides *a d* and *b c*, is equal to the Segment *e c* multiplied by the Diagonal *b d*.

2. The Triangles *a b e* and *c b d* are Similar, becauſe the ∠ *a b e* = ∠ *c b d* (by conſtruction) and the ∠ *b a e* = ∠ *b d c*, being in the ſame Segment.

Therefore *a e* : *a b* :: *c d* : *b d*.

Conſequently $\overline{a e \times b d} = \overline{a b \times c d}$. That is, the ▭ under the remaining Segment *a e*, and the former Diagonal *b d* = ▭ under the oppoſite ſides *a b* and *c d*.

But *a c* = *a e* + *c e*.

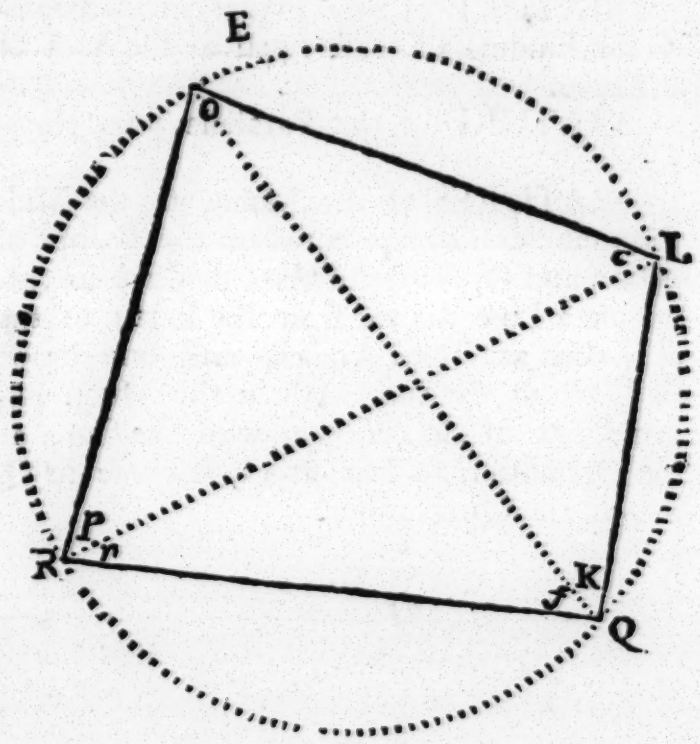
Wherefore $\overline{a c \times b d} = \overline{b c \times a d} + \overline{d c \times a b}$.

Q. E. D.

PROPOSITION.

The oppoſite Angles of any *Quadrilateral Figure* Inſcribed in a Circle, are always equal to two right ones.

I ſay O + *k* + *f* = 2 ∠. Draw the Lines R I. and E Q.



The Angles O + *p* + *c* = 2 ∠, by the 32 *q.* 1.

But ∠ *p* = ∠ *k*, and ∠ *c* = ∠ *f per* 21. *e.* 3.

Therefore O + K + *f* = 2 ∠. *q. e. d.*

COROL.

Hence the external Angle of ſuch a Figure, as E = *k* + *f*, the Internal and Oppoſite one.

For O + *e* = 2 ∠ = O + *k* + *f*.

Therefore take away O from both, and E will remain equal to *k* + *f*, *q. e. d.*

QUADRIPARTITION, is to divide by 4, or to take the fourth Part of any Number or Quantity.

QUADRUPLE, that is, Fourfold.

QUÆ *Plura*, was a Writ that lay where an Inquiſition had been made by an Eſcheator in any County, of ſuch Lands or Tenements as any Man died ſeized of, and all that was in his Poſſeſſion, was imagined not to be found by the Office: It differs

differs from the Writ called *Melius Inquirendum*, becauſe this is granted, where the Eſcheator formerly proceeded by Virtue of his Office; and the other, where he found the firſt Office by virtue of the Writ named *Diem clauſit extremum*.

QUÆ *Servitia*; ſee *Per quæ Servitia*.

QUALE *jus*, is a Writ judicial, that lies where a Man of Religion hath Judgment to recover Land, before Execution be made of the Judgment; for this Writ muſt go forth to the Eſcheator, between Judgment and Execution, to enquire whether the Religious Perſon hath any Right to recover, or whether the Judgment be obtained by Colluſion between the Demandant and the Tenant, to the intent that the true Lord be not defrauded.

QUALITY, ſignifies in the general the Properties or Affections of any Being, whereby it affects our Senſes ſo and ſo, and acquires ſuch and ſuch a Denomination.

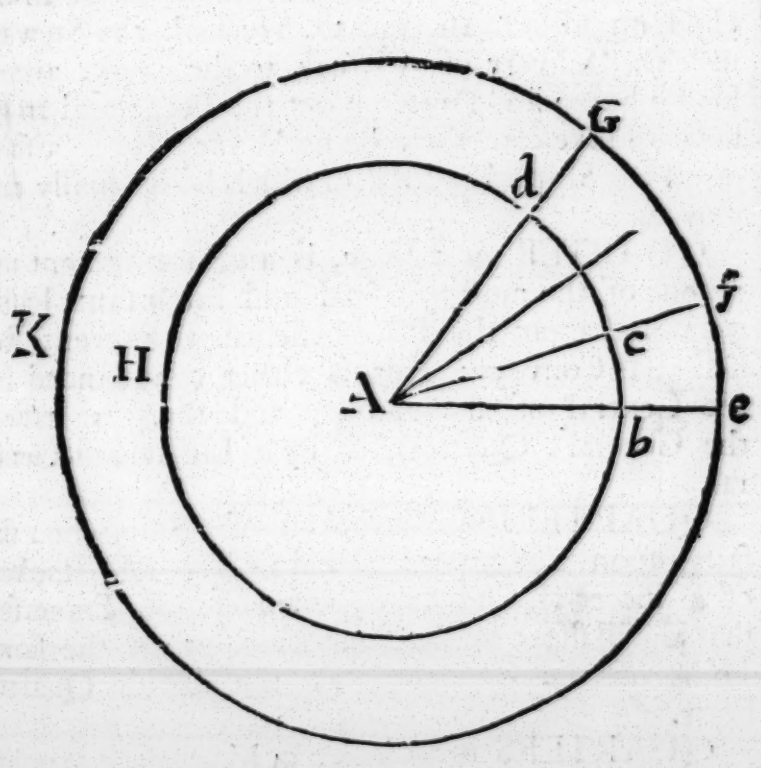
The Four *Firſt Qualities*, as they are accounted by ſome, are *Heat*, *Cold*, *Moiſture*, and *Dryneſs*.

The Four *Second Qualities*, or as they may be called, Chymical Qualities, are Volatility and Fixity, Corroſiveneſs and Corroſibility.

Senſible Qualities, are ſuch as are the more Immediate Objects of our Senſes.

Occult Qualities, were by the Ancients named ſuch, of which no rational Solution in their way or according to their Principles could be given.

Mr. *John Keill*, in his *Introductio ad Phyſicam*, thus proves that all Qualities are *Remitted*, or have their Power or Efficacy abated, in a *Duplicate Ratio* of the diſtance from the Centre of the *Radiation*, or Exertion of the Quality.



Let A be a Centre from whence any Quality exerts it ſelf round about, according to the right Lines A *e*, A *f*, A G, &c. The Efficacy of the Quality, be it Heat, Cold, Odour, &c. will be (at equal Diſtances from A) as the *Spiſſitude* or Thickneſs of the Rays A *b*, A *e*, A *f*. But the Rays within the Inner Circle, or rather Spherical Superficies *b c d* H, when they come to be extended to the outer Spherical Surface, *e f* G K, will be much leſs thick than before; and that in proportion *reciprocally*, as the Spaces they take up: That is, if the outer Surface be double of the inner, the Rays there will be but half as thick: But ſince Spherical Superficies are as the Squares of their Radij, therefore the Efficacy of the Quality in the inner Surface will be to that of the outer, as A *e* Square to A *b* Square. *q. e. d.*

QUAM *diu ſe bene geſſerint*, is a Clauſe often uſed in Letters-Patent of the Grant of Offices, as in thoſe of the *Barons* of the *Exchequer*, which muſt be intended only as to Matters concerning their Office; and is nothing but what the Law would have implied, if the Office had been granted for Life.

QUANTITY, ſignifies whatſoever is capable of any ſort of Eſtimation or Menſuration, and which being compared with another Thing of the ſame Nature, may be ſaid to be *greater* or *leſs* than, *equa* or *unequal to it*.

Quantity may have theſe Four Diviſions.

1. *Natural Quantity*, is what Nature furniſhes us with in Matter and its Extenſions, and in the Powers and Forces of natural Bodies; ſuch as Gravity, Motion, Light, Heat, Cold, Rarity and Denſity, &c.

2. *Moral Quantity*, which depends on the Manners of Men, and the free Determination of their Wills; as the Prizes and Values of Things, Dignity and Power, Good and Evil, Merit and Demerit, Rewards and Puniſhments, &c.

3. *Notional Quantity*, ariſing from the Operation of the Underſtanding only; ſuch as the Largeneſs or Narrowneſs of the Mind's Capacity, and of its Conceptions: In Logick, *Univerſals*, *Prædicaments*, and all ſuch Terms: In Grammar, the *Quantity* and *Meaſure* of *Syllables*, *Accents*, *Tones*, &c.

4. *Tranſcendental Quantity*, as Duration, the Continuation of any Being's Exiſtence, Time, &c. Quantity is divided alſo into *Continued* and *Diſcrete*, which ſee.

The QUANTITY of Matter in any Body, is its Meaſure ariſing from the joint Conſideration of its Magnitude and Denſity: As if a Body be twice as Denſe, and take up twice as much Space as another, it will be four Times as great. And this Quantity of Matter is beſt diſcoverable by the Weight of Bodies, which Sir *Iſ. Newton* found by his Nice Experiments on Pendulums, ſo exactly proportional to the Matter of Bodies. *Newton. Princip.*

The QUANTITY *of Motion* in any Body, is its Meaſure ariſing from the joint Conſideration of Quantity of Matter in, and the Velocity of the Motion of that Body. For the Motion of any Whole is the Sum or Aggregate of the Motion in all the ſeveral Parts: And tho' in a Body twice as great as another, moved with an equal Velocity, it will be double; yet if the Velocity be double alſo, the Quantity of the Motion will be Quadruple. *Newton. Princip.*

In *Philoſophical Tranſactions*, Numb. 195. is an Account by the Learned Captain *Halley*, of the ſeveral Species, or Kinds of *Infinite Quantity*.

Where he proves, That beſides *Infinite Length*, and *Infinite Area*, in which there are great Varieties;

There are alſo no leſs than three ſorts of *Infinite Solidity*. See *Infinite Quantities*.

QUANTUM *Meruit*, is an Action of the Caſe ſo called, grounded upon a Promiſe to pay a Man for doing any Thing, ſo much as he ſhould Deſerve, or *Merit*.

QUARE *ejecit infra terminum*; is a Writ that lieth for a Leſſee, where he is caſt out of his Farm, before his Term be expired, againſt the Feoffee or Leſſor that ejecteth him: And it differs from *Ejectione firmæ*, becauſe this lieth where the Leſſor, after the Leaſe made, infeoffeth another, which ejecteth the Leſſee: And the *Ejectione firmæ*, lieth againſt any other Stranger that ejects him. But the Effect of Both is all one; that is, to recover the reſidue of the Term.

QUARE *Impedit*, is a Writ that lies for him that hath purchaſed a Manor with an Advowſon thereto belonging, againſt him that diſturbs him in the Right of his Advowſon, by preſenting a Clerk thereto, when the Church is void: And it differs from the Writ called, a *Darreine preſentment*, *Aſſiſa ultimæ præſentationis*, becauſe that lies where a Man, or his Anceſtors formerly preſented: and this for him that is the Purchaſer himſelf: Note, That where a Man may have an *Aſſiſe Darreine Preſentment*, he may have a *Quare impedit*, but not contrariwiſe.

QUARE *Incumbravit*, is a Writ that lieth againſt the Biſhop who within ſix Months, after the Vacation of a Benefice, conferreth it upon his Clerk, while two others are contending in Law for the Right of Preſenting. This Writ always lies depending the Plea.

QUARE *intruſit Matrimonio non ſatisfacto*, is a Writ that lies where the Lord proffers convenable Marriage to his Ward, and he refuſes, and enters into the Land, and Marries himſelf to another; then the Lord ſhall have this Writ againſt him. But all Wardſhips being taken away by the Statute 12 *Car.* 2. *cap.* 24. this Writ is become uſeleſs.

QUARE *non admiſit*, is a Writ that lies againſt a Biſhop, refuſing to admit his Clerk that hath recovered in a Plea of *Advowſon*.

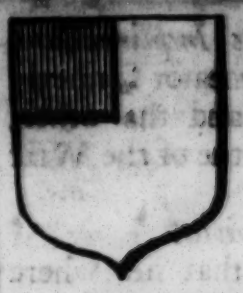
QUARE *non permittit*, is a Writ that lies for one that has Right to preſent for a Turn, againſt the Proprietary.

QUARE *obſtruxit*, is a Writ that lies for him who having Liberty to paſs through his Neighbours Ground, cannot enjoy his Right, for that the Owner has ſo Strengthened it.

QUARENTINA *habenda*, is a Writ that lies for a Widow to enjoy her *Quarentine*.

QUARENTINE, is a Benefit allowed by the Law of *England*, to the Widow of a Man Dying Seized of Land; whereby ſhe may challenge to continue in his Capital Meſſuage or chief Manſion-houſe (ſo it be not a Caſtle) by the Space of Forty Days after his Deceaſe; and if the Heir, or any other attempt to eject her, ſhe may have the Writ *de quarentina habenda*.

QUARTATION, is a way of Purifying of Gold, uſed by Refiners who melt three Parts of Silver with one of Gold (whence the Name) and then caſt the Mixture into *Aqua fortis*, which will diſſolve the Silver, and leave the Gold in a blak Powder at the Bottom.



QUARTER in Heraldry, ſignifies a Partition made of juſt a fourth Part of the Field, by Two Right Lines, thus;

He beareth *Argent*, a *Quarter Gules*.

QUARTER of a Ship, is that Part of the Ship's Hull which lieth from the Steerage Room to the Tranſom.

QUARTER-*deck*. See Deck.

QUARTER, in a Military Senſe, ſometimes is uſed to ſignify the good Treatment given to a vanquiſh'd Enemy: Thus ſay they, *The Enemy aſked Quarter*; *We gave no Quarter*, &c.

QUARTER ſignifies the Ground a Body of Men is Encamp'd upon; as when they ſay, Such a Quarter is well fortify'd; and oftentimes the Troops themſelves that are there Quartered; for they ſay alſo, *We beat up the Enemies Quarters*.

QUARTERS (*Winter*.) Winter Quarters ſometimes is uſed for the Interval between two Campaigns, but more generally for the Place or Places where Troops are lodged during the Winter.

QUARTERS *of Refreſhment*, are ſuch Places as Troops which have been much fatigued and haraſſed, are put into, to recover their Strength or Health, during ſome time of the Summer or Seaſon of the Campaign.

QUARTER-*Maſter*, in the Land Forces, is either the Quarter-Maſter General of an Army, who is to ſee out for good Quarters for the whole; or of any Regiment of Foot, or Troop of Horſe; whoſe Office it is to do the ſame for thoſe Bodies.

QUARTER-*Maſter*, is an Officer Aboard a Ship (of which there are more or fewer according to her Burthen) whoſe Buſineſs is to rummage in the Hold on all Occaſions, to overlook the Steward in this Delivery of Victuals to the Cook, and in his Pumping and Drawing out the Beer; and in general to take care there be no Waſte: He is alſo to mind the Ship's Loading, in which he is uſually employed.

QUARTER *at a Siege*, is an Encampment upon one of the moſt principal and important Paſſages round about the Place beſieged, to prevent Relief and Convoys: This is either commanded by the General of the Army, and then is called, the General's Quarters, or by a Lieutenant-General.

QUARTERING, is ſpoken of a Ship when ſhe ſails upon a Quarter Wind: 'Tis alſo ſpoken of a Piece of Ordnance, when 'tis ſo Traverſed that it will ſhoot on the ſame Line, or on the ſame Point of the Compaſs, as the Ship's Quarter bears.

QUARTERS in a Clock, or Movement, are little Bells which ſound the *Quarters*, or other Parts of an Hour. The Way of making any Clock ſtrike them, ſee in *Watch-Work*.

QUARTILE, is an Aſpect of the Planets, when they are 3 Signs, or 90 Degrees diſtant from each other, and is marked thus □.

QUAVER, a Note in Muſick ſo called: See the Words *Notes* and *Time*.

QUE *Eſtate*, in common Law, ſignifies a Plea, whereby a Man Entit'ling another to Land, &c. ſaith,

ſaith, That the ſame Eſtate he had, he hath from him.

For Example: In a *Quare Impedit*, the Plaintiff alledges, That ſuch four Perſons were ſeized of Lands whereunto the Advowſor in queſtion was appendant in Fee, and did preſent to the Church, and afterwards the Church became void, *Que eſtate del*, &c. that is, *Which Eſtate* of the four Perſons he has now during the Vacation, by Vertue whereof he preſented, *&c.*

QUE *eſt Meſme*, a Law Term uſed in an Action of Treſpaſs, or ſuch like, for a poſitive Juſtification of the very Act complained of by the Plaintiff, as a Wrong.

For Example: In an Action upon the Caſe, the Plaintiff ſays, That the Lord threatned his Tenants at Will, in ſuch ſort, that he forced them to give up their Tenures. The Lord, for his Defence pleadeth, That he ſaid unto them, That if they would not depart, he would ſue them at Law: This being the ſame Threatning that he uſed, or to ſpeak Artificially, *Que eſt le Meſme*, The Defence is good.

Queüe a'yronde, a Term in Fortification, being what we call Swallows Tail; and ſignifies a Detached or Out-work, whoſe Sides open towards the Head, or Campaign, or draw narrower or cloſer towards the Gorge. Of this kind are either ſingle or double Tenailles, and ſome Horn-works, whoſe Sides are not parallel, but are narrow at the Gorge and open towards the Head; like the Figure of a Swallow's Tail.

When theſe Works are caſt up before the Front of a Place, they are defective in this Point, that they do not ſufficiently cover the Flanks of the oppoſite Baſtions, but then they are very well Flanked by the Place, which covers all the length of their Sides the better.

QUEM *redditum reddat*, is a Writ Judicial, that lies for him to whom a Rent-ſeek, or Rent-charge is granted, by Fine levied in the King's Court againſt the Tenant of the Land that refuſeth to Attorn to him, thereby to cauſe to Attorn.

QUENE, as the Heralds write it, (but it ſhould be *Queüe*) the Word in Blazon for a Tail of a Beaſt, thus: If a Lyon have a forked or double Tail, they ſay he is *Double Quened*.

QUERELA, an Action preferred in any Court of Juſtice, in which the Plaintiff was *Querent*, or Complainant, and his Brief, Complaint, or Declaration, was *Querela*.

QUERELA *freſiæ fortice*, is a Writ of *Freſh-force*; which ſee.

QUERELA *coram Rege & concilio diſcutienda & terminanda*, is a Writ whereby one is called to Juſtify a Complaint of a Treſpaſs, made to the King himſelf, before him and his Council.

QUERENS *non invenit per legium*, is a Return made by the Sheriff upon a Writ directed to him, with this Condition inſerted, *Si* A. *fecerit* B. *ſecurum de clamore ſuo proſequendo*.

QUEST, or *Inqueſt*, an Inquiſition or Enquiry made upon Oath of an Impanell'd Jury.

QUEST-*Men*. See *Sidemen*.

QUESTUS, or *Quæſtus*, in Law, is taken for that Land which does not deſcend to us by Hereditary Right, but is gain'd by our own Labour and Induſtry: this is called *Purchaſed Lands*.

QUESTUS *eſt nobis*, is the Form of a Writ of *Nuſance* which lies againſt him to whom the Houſe, or other thing, that breeds the *Nuſance*, is alienated.

QUIA *improvide*, is taken to be a *Super ſedeas* granted in the behalf of a Clerk of the Chancery, ſued againſt the Privilege of that Court in the Common-Pleas, and purſued to the *Exigent*, or in many other Caſes, where a Writ is erroneouſly ſued out.

QUID *juris clamat*, is a Writ Judicial, iſſuing out of the Record of the Fine, which remaineth with the *Cuſtos brevium* of the Common-Pleas, before it be engroſſed; and it lies for the Grantee of a Reverſion or Remainder, when the particular Tenant will not Attorn.

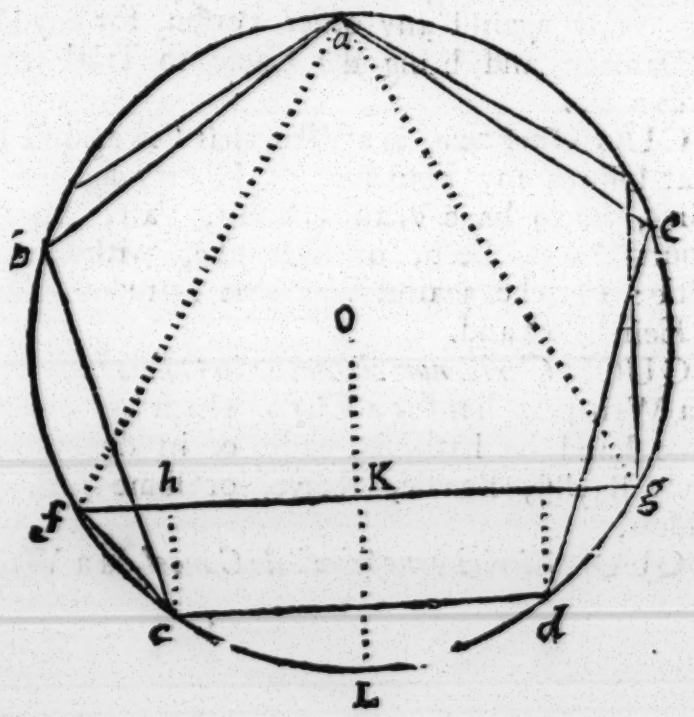
QUID *pro quo*, in Law is uſed for the Reciprocal Performance of both Parties to a Contract, and thereupon the giving of one thing of a Value for another thing of like Value, as 10*l.* for a Horſe, *&c.*

QUIETUS, is a Word uſed by the Clerk of the Pipe, and Auditors in the Exchequer, in their Acquittances or Diſcharges given to Accomptants, uſually concluding with an *abinde receſſit quietus*, which is called a *Quietus eſt*, and mentioned in the Act of *General Pardon*, 12 *Car.* 2. 11. and 14 *Car.* 2. *Cap.* 21. A *Quietus eſt*, granted to the Sheriff, ſhall diſcharge him of all Accounts due to the King.

QUINCUNX, that Poſition, or Aſpect, that the Planets are ſaid to be in, when diſtant from each other 150 Degrees, or 5 Signs, and is mark'd thus, *Vc.* or *Q*.

QUINDECAGON, is a plain Figure of 15 Sides and Angles, which if they are all equal to one another, is called a Regular Quindecagon; which how to deſcribe in a Circle, *Euclid* ſhews Prop. 16. *e.* 4.

The Side of a Regular Quindecagon, ſo deſcribed, is equal in Power to the half Difference between the Side of the Equilateral Triangle, and the Side of the Pentagon, and alſo to the Difference of the Perpendiculars let fall on both Sides, taken together.



Make the Pentagon *a b c d e*, and parallel to any one Side of it, ſet the Baſe of the Equilateral Triangle *f g a*. Then (by 16. *e.* 4 *Eucl.*) will *f c* be the Side of the *Quindecagon*, *f h*, $= \frac{1}{2}$ the Difference between the Side of the Triangle and Pentagon; and *h c* = to the Difference of the Perpendicular

pendiculars let fall from the Centre *o*, to both the Sides of the Figures.

But □ *f c* = □ *f b* + □ *b c*, by 47 *e. Euelid.*

Wherefore the Propoſition is true, &c.

QUINQUEANGLED, in Geometry, is a Figure conſiſting of five Angles.

QUINSIE, or rather *Squinancy*, a Diſeaſe ſo called. See *Angina*.

QUINTESSENCE, is a Medicine made of the Energetical and Active Particles of its Ingredients, ſeparated from all Fæces or Dregs.

QUINT *Exact*, in Law, is the laſt Call of a Defendant, who is ſued to the Outlawry, where, if he appear not, he is by the Judgment of the Coroners returned *Outlawed*; if a Woman, *Waved*. See *Exigent*.

QUINTILE, an Aſpect of the Planets when they are 72 Degrees diſtant from one another, and noted thus, *C* or *O*.

QUINTUPLE, Five-fold or five times as much as another thing.

QUITE *Claim*, is a Releaſe or Acquitting of a Man from any Action he hath, or might, or may have againſt him.

QUIT-*Rent*, is a certain ſmall Rent, payable yearly, by the Tenants of moſt Mannors; upon the payment whereof they are to quit, till it becomes due again.

QUO *Jure*, is a Writ that lies for him that has Land, wherein another challengeth *Common of Paſture*, Time out of Mind: And it is to compel him to ſhew *by what Title* he Challenges it.

QUO *Minus*, is a Writ that lies for him that hath a Grant of Houſe-bote and Hey-bote in another Man's Woods, againſt the Grantor, making ſuch Waſte as the Grantee cannot enjoy his Grant. This Writ lies alſo for the King's Farmer in the Exchequer, againſt him to whom he ſelleth any thing by way of Bargain touching his Farm, or againſt whom he hath any Cauſe of Perſonal Action: For he ſuppoſeth by the Vendees detaining any Due from him, he is made *leſs able* to pay the King's Rent; and under this pretence; any one who pays the King a Fee-Farm Rent, may have this Writ againſt any other Perſon, for any Debt or Damage, and bring the Cauſe to Trial in the *Exchequer*.

QUO *Warranto*, is a Writ that lies againſt him that Uſurps any Franchiſe or Liberty againſt the King, as to have Waife, Stray, Fair, Market, Court-Baron, Leet, or ſuch like, without good Title: Or elſe againſt him that intrudeth himſelf as Heir into Land.

QUOD *Clerici non eligantur in Officio Ballivi*, &c. is a Writ that lies for a Clerk, which by reaſon of ſome Land he hath, is made, or in doubt to be made Bayliff, Beadle, Reeve, or ſome ſuch like Officer.

QUOD *Clerici beneficiati de Cancel*, is a Writ to exempt a Clerk of the Chancery from Contribution towards the Proctors of the Clergy in Parliament.

QUOD *ei deforeat*, is a Writ that lies for the Tenant in Tail, Tenant in Dower, or Tenant for Term of Life, having loſt by Default againſt him that Recovered, or againſt his Heir.

QUOD *permittat*, is a Writ that lies for the Heir of him that is diſſeiſed of his Common of Paſture, againſt the Heir of the Diſſeiſor being Dead.

QUOD *Perſona nec Prebendarii*, &c. is a Writ that lies for Spiritual Perſons that are diſtrained in their Spiritual Poſſeſſions, for the Payment of a Fifteenth with the reſt of the Pariſh.

QUOILE, or *Coile*, at Sea; is ſpoken of Cables or Ropes, when they are placed in a round or Oval Ring one *Fake* (or Turn) upon another: that ſo they may the more eaſily be ſtowed out of the way, and alſo run out free and ſmooth, without *Knecks* or *Keuks* as they call them; *i. e.* without Twiſtings or Doublings: Then the Cable is ſaid to be *Quoiled* up.

QUOIN, a Sea Word, the ſame with *Coin*; which ſee.

QUORUM, a Word often uſed in our Statutes, as alſo in Commiſſions, both of Juſtices of the Peace, and others. As for Example, where a Commiſſion is directed to ſeven Perſons, or to any three of them, *whereof* A. B. and C. D. to be two, there A B C D. are ſaid to be of the *Quorum*, becauſe the reſt cannot proceed without them: So a *Juſtice of the Peace, and Quorun*, is one, without whom the reſt of the Juſtices, in ſome Caſes cannot proceed.

QUOTIDIAN *Ague*, is that, whoſe Fits return every Day.

QUOTIENT, is that Number in Diviſion which ariſes by dividing the Dividend by the Diviſor: And is called Quotient, becauſe it anſwers to the Queſtions *Quoties?* Or how often one Number is contained by another?

Thus:

If 360 be to be divided by 24, the Quotient will be 15, and the Numbers will ſtand thus:

24) 360 (15.

Where 15 is the Quotient.

QUOYLE, a Sea Word: They ſay a Cable is *Quoyled*, when 'tis laid round in a Ring on the Deck, or Floor of a Ship; in the middle of which Ring, or *Quoyle*, is a good Place to lay Shot in; which is more ſafe there than in Lockers along the Side; for there the Enemies Shot may fall into it, and beat it about among the Men.

RABANET. See *Rabinet.*

RABBETTING in a Ship, is the letting in of her Planks to the *Keel* which in the *Rake* and *Run* of the Ship, is hollowed away, that the Planks may join the better and closer, and this hallowing away, is called the Rabbet of the Keel.

RABDOIDES, the same that *Sutura sagittalis.*

RABINET, a sort of Ordnance, whose Diameter at the Bore is 1 ½ Inches, Weight 300 Pound, Length 5 Foot, Load ¾ of a Pound, Shot something more than an Inch and a quarter Diameter, and ½ a Pound Weight.

RACHITÆ, and *Rachiæi*, are Muscles belonging to the Back; so called by some Foreign Anatomists, and seem to be the same with what we call *Semispinati.*

RACHITIS. See *Rhachitis.*

RADIALES *Internus & Externus*, are Muscles of the Wrist, the one serves to bend it, and the other to extend it. *Blanchard.*

RADIATION, signifies the casting forth of Beams, or Rays of Light; and in Opticks it is considered as threefold, *viz. Direct*, *Reflected*, and *Refracted.* See *Ray.*

RADICAL *Moisture*, is a Term used by some, for the Fundamental Juice of the Body, which they will have to nourish and preserve the natural Heat, as the Oil in a Lamp preserves and feeds the Flame. *Blanchard.*

RADICLE, a Word used by Botanists, to denote that Part of the Seed of a Plant, which upon its Vegetation becomes its Root: This in Corn is that which Malsters upon its shooting forth, call the *Come.* 'Tis not easily to be discerned in many Seeds, by the naked Eye: but in that of Fenugreek, 'tis as big as one of the Lobes: And in the Garden-bean it appears visible on the Separation of the Coats, it is of a White Colour, more Glossy than the Main Body, and stands at the greater End without the Lobes: Therefore this End in setting Seeds, should always be placed lowermost.

RADIUS, in Geometry, is the Semi-diameter or half the Diameter of a *Circle:* See under the Word *Circle.*

RADIUS, is the left Bone of the Cubit, called *Focile minus*; it is more oblique than the great Bone, called *Ulna*, and is distant a little from it in the middle, where there occurs a small Ligament above the *Ulna*, which receives the *Radius*, and below the *Radius* receives it. The upper Part of the *Radius* is jointed with the outward Process of the Arm by *Diarthrosis* (which see); the lower by way of Appendix with the Wrist Bone, at the Middle Finger. It's upper end is small, and the lower thick. The greater Bone of the Leg also is called *Radius. Blanchard.*

RAGGULED, the Heralds Term for any Ordinary, *Ex. gr.* a Cross whose out Lines are of this Form.

He beareth *Sable, a Cross Ragguled Or*, by the Name of *Stoway.*

This differs from Indented, because that is regular, and this is not so, but rather ragged.

RAINBOW or *Iris*: the very Learned and Ingenious Mathematician, Mr. *Edward Halley*, in a Discourse *de Iride* in *Phil. Transact.* No. 267, gives the best Account that we have ever had, of the Cause of the various Colours of the Rainbow, and the Solution of their several Phænomena. He tells us there, that the Ingenious *Des Cartes* was the first, that by applying Mathematicks towards the Investigation of this surprizing Appearance, ever gave a Theory of the *Iris:* And he found the Laws of Refraction, which the Lucid Rays suffer in passing thro' any Diaphanous Bodies: And clearly demonstrated the *Primary Iris to be only the Sun's Image, reflected from the Concave Surfaces of an Innumerable Quantity of small spherical Drops of falling Rain: With this necessary Circumstance, that those Rays, which fell on the Objects, Parallel to each other, should not after one Reflection, and two Refractions,* (viz. *At going into the Drop, and coming out again*) *be dispersed, or made to Diverge, but come back again also to the Eye, parallel to each other.*

He shewed also, that the Colours, in the Rays of Light were produced by those Refractions as they are by passing through a Triangular Glass Prism. The *Seconddry Iris*, he supposes produced by those Rays of the Sun, which fall more Obliquely, but after the same Manner as before, only in these there are two Reflections, before the Sun's Rays refracted a second time, and tending towards the Eye, in a parallel Position, can get out from the Aqueous Globules. The Magnitude of the *Iris*, he makes to depend on the Degrees of Refraction; which is different, in different Liquors, or Transparent Solids: But supposing the Ratio of the Sines of Incidence, to those of the refracted Angles, to be in Water as :: 250. to 187, he determined thence the Semi-diameter of the *Iris*, near enough to Observation, *viz.* The Primary one to be 41 Degrees 30 Minutes, and the secondary one to be 51 Degrees 54 Minutes. See the 8 *Chap.* of his Meteors.

Mr. *Halley* observes, that *Des Cartes* using only a Tentative and Indirect Method, in determining his Angles, seems not to understand the Easiness of solving his own Problem.

Wherefore because hardly any one hath written well on this Subject since *Des Cartes*, he shews you there how to determine the Angle by which the *Iris* is distant from the opposite Point of the Sun, and the Ratio of the Refraction being given Geometrically, or *vice versa* the Iris being given, to determine the Refractive Power of the Liquor.

And first he saith, It is plain from *Des Cartes*'s Demonstrations, That the Primary Iris is made by the Sun's Rays, where the Excess of the two Refracted Angles above the one of Incidence, is the *greatest* possible.

And the Secondary Iris is formed by those Rays, where the Excess of three Refracted Angles above one of Incidence, is also the *greatest* possible.

And thus you may go on to 3, 4, 5, or 6 Iris's, which will all be formed where the Rays Emerge out of the Watery Cloud after 3, 4, 5, or 6 Reflections; but none but the Second will be ordinarily visible in the Heavens, because the Rays of the Sun

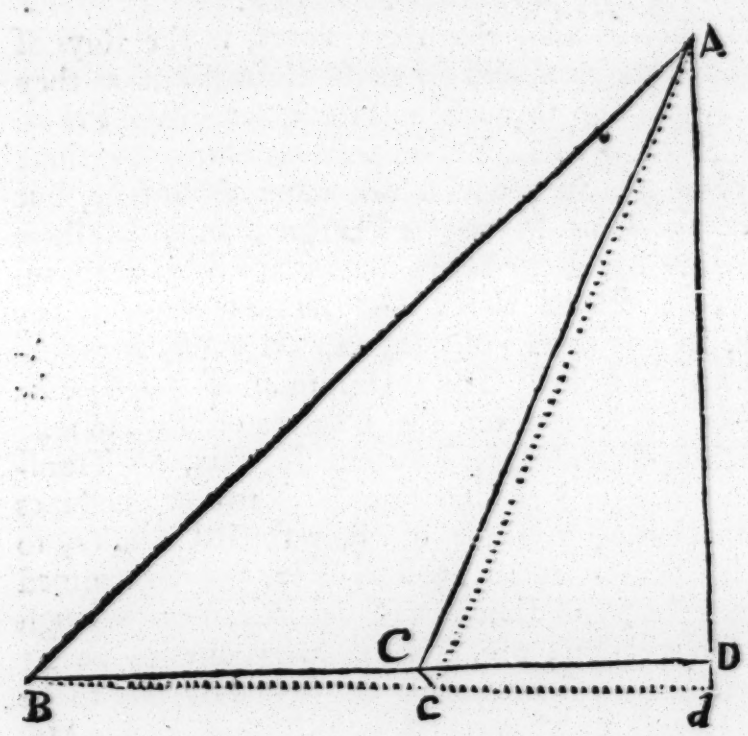
Sun grow at laſt very much attenuated and weakened.

Now if you double this greateſt poſſible Exceſs of the refracted Angles above that of Incidence, (if the Number of Reflections be odd) it will give the Diſtance of the Iris from the Point oppoſite to the Sun.

But if the Number of Reflections be even, then the double of the greateſt refracted Angle, will be the Diſtance of the Iris from the Sun himſelf.

Now to gain theſe Greateſt Exceſſes, having the Refraction of any Liquor, or the Ratio of the Sine of the Angle of Incidence to the Sine of the refracted Angle, you muſt obſerve, that the Exceſs of two refracted Angles, above one of Incidence, will be Greateſt where the Momentaneous Augment or Fluxion of the Angle of Incidence, is preciſely double to the Momentaneous Augment of the the refracted Angle. And if there be three refracted Angles, the Greateſt Exceſs will be where the Momentaneous Augment of the Angle of Incidence is Triple of the Moment of the refracted Angle, and ſo on, which is ſufficiently evident.

But in order to find the Angles themſelves, Mr. *Halley* premiſes the following Lemma.



Let there be a Triangle ABC, whoſe Vertex is at A; its Legs BA and CA, and the Baſe BC; on which produced, let fall the Perpendicular AD. Then let the Vertical Angle BAC be ſuppoſed to be increaſed by a Quantity infinitely ſmall, as ſuppoſe by the Moment CA *c*: Then drawing the Lines BC *d*, and *c* D, they will be only imaginarily different from BCD and CD.

This done, I ſay, That if the Legs of the Plane Triangle BAC, (or any other) continuing the ſame, the Vertical Angle be imagined to be encreaſed by any infinitely ſmall Moment or Fluxion, then will *the Moments of the Angles at the Baſe, be reciprocally as the Segments of the Baſe:* That is, CB*c*, is to the Moment of the Angle ACB, or ACD :: as CD is to BD.

For ſince the external Angle ACD = to ABC + Angle BAC, its Moment muſt alſo be equal to the Sum of their Moments, or to CB*c* + CA*c*: but now becauſe the Triangle ACD is right-angled at D, AC may be the Diameter of a Circle, whoſe Periphery will paſs through A, D, C, and *c*, and conſequently the Angles CA*c*, CD*c* being in the ſame Segment are equal. So that the Sum of the two Fluxionary Angles CB*c*, and *c*DC' (*i. e.* the external Angle D*c d*) will be the Moment of the Angle ACD; or ACB. But thoſe CB*c*, and D*c d*, being infinitely ſmall, will be to each other, as the Sides oppoſite to them, or as *c* D or CD is to BD: That is, reciprocally as the Segments of the Baſe. *Q. E. D.*

If B and C had been both Acute, the way of Proof is the ſame, all Things conſidered.

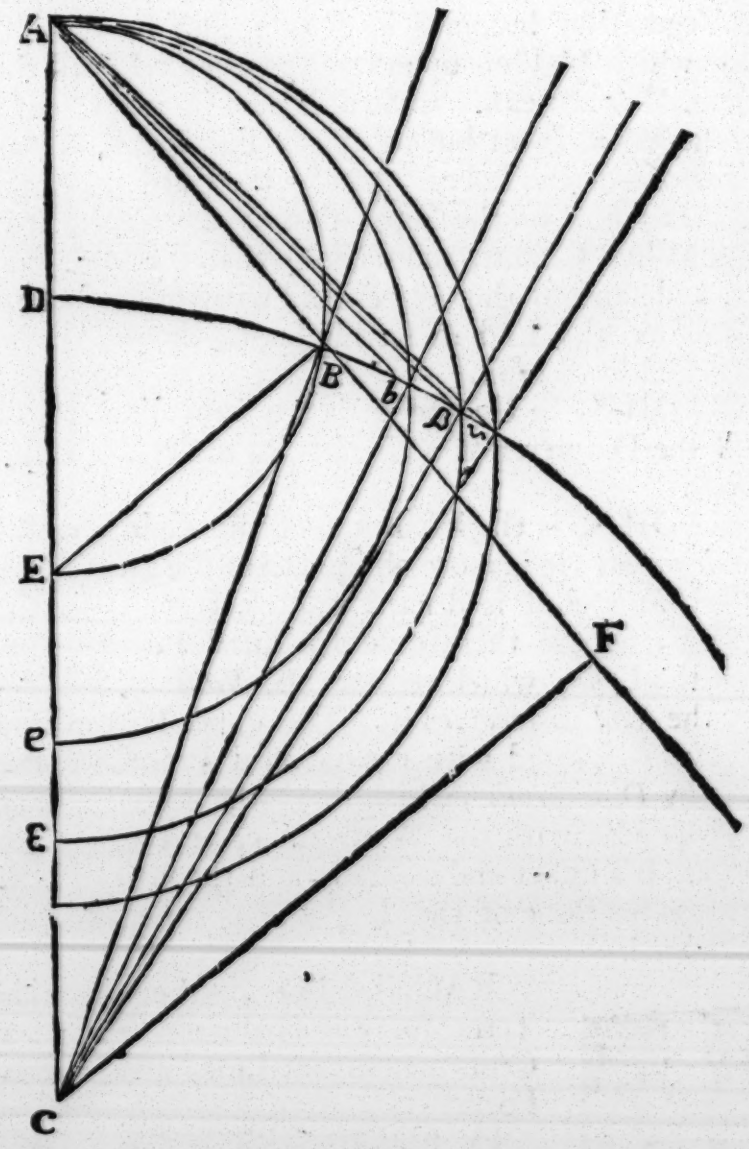
COROLLARY.

Hence it follows, That the Moments of the Angles at the Baſe, are to one another directly as the Tangents of theſe Angles.

By the help of this Lemma he ſhews how to obtain the Diameter of any Iris, either Geometrically, or by Calculation.

Let there be any Right Line as AC, and let it be ſo divided in D, that CA may be to CD:: according to the Ratio of Refraction; that is, in Water :: as 250 is to 187, or more nicely :: 529 is to 396. Then let it be divided again in E, ſo that CE ſhall be to AE :: as Unity is to the Number of Reflections which the Solar Rays muſt undergo in producing the Iris propoſed: This done; on the Diameter AE let the Semicircle ABE be deſcribed; and on the Centre with the Radius CD, draw the Ark BD, cutting the Semi-circle ABE in the Point B. Then drawing the Right Lines CB, AB, let the Perpendicular CF, be let fall on AB produced to F; and to that Perpendicular draw the Parallel EB.

I ſay the Angle CBF is the Angle of Incidence, CAB is the refracted Angle, both required for the producing the propoſed Iris.



DEMONSTRATION.

Since the Triangles ACF, AEB are Similar, AF will be to BF :: as AC to EC :: that is, as the

the Number of Reflections augmented by Unity, is to Unity; by the Construction.

Wherefore the Moment of the Angle CBF, is to the Moment of the Angle CAF in the same Ratio, by the Lemma.

But the Sine of the Angle CBF, is to the Sine of the Angle CAF:: in the Ratio of their Sides CA, CB: That is, in the Ratio of the Refraction given.

By the Construction also, the Angle of Incidence RBF, hath its corresponding Refracted Angle RAF: Wherefore since their Moments are in the Ratio proposed, those are the Angles sought or required. *Q.E.D.*

Now therefore multiplying the Refracted Angle by the Number of Reflexions augmented by Unity, and from the Product Substracting the Angle of Incidence, you will have half the distance of the *Iris* from the Sun, if the Number of Reflexions were even; but if they were odd, from the opposite Point of the Sun, as was said before.

And from hence, by a very easy, short, and elegant Construction, he shews how to exhibit to the Eye, the Incidences of all manner of *Iris*'s, as they will appear in any Liquor whose Refraction is given. For, if the Line A C in the last Figure, bisected in E, have a Third part cut off from it in *e*, a Fourth part in E, a Fifth part in *n*, &c. And then there be Semicircles described on the Diameters AE, A*e*, AE, A*n*, &c. all which shall be cut by the Circular Ark D B *b*, and *v*, described on the Centre C with the Radius C D, (which Radius CD is to AC in the Ratio of the given Refraction) in the Points B *b*, B *v*, &c. I say, the Lines AB, A*b*, AB, A*v*. shall make with the Line AC, Angles equal to the refracted Angles, and with the Radii CB, C*b*, CB, C*v*, respectively Angles equal to those of Incidence required; that is, ABC (or rather its Complement to a Semicircle) for the *Primary Iris* A*b*C for the Secondary one, ABC for the Third, and A*v*C for the Fourth, &c. and so on as far as you please.

He shews also, that the Reader, if skill'd in Algebra, may easily find these Angles by Accurate Calculation, derived from the same Fountain: Thus, Let the Radius be = 1. and the Ratio of Refraction, as *r* to *s*; then will the Sine of Incidence be $\sqrt{\frac{4}{3} - \frac{1}{2}\frac{r\,r}{S\,S}}$ but the Sine of the Refracted Angle will be $\sqrt{\frac{4}{3}\frac{S\,S}{r\,r} - \frac{1}{3}}$; from which Angles the Primary Iris will be found.

For the Second Iris $\sqrt{\frac{9}{8} - \frac{1}{8}\frac{r\,r}{S\,S}}$ will be the Sine of Incidence; and $\sqrt{\frac{9}{8}\frac{S\,S}{r\,r} - \frac{1}{8}}$ will be the Sine of the refracted Angle. And so on, as he further shews.

And if you proceed to Calculate according to *D. Cartes* his Proportion, the Primary Iris will be Distant *ab Oppositо Solis* 41° 30′, the Secondary one 51° 55′. But the Third and Fourth will be distant 40° 20′, and 45° 33′ from the Sun himself; but probably no one can ever see either of these, for the reasons above given.

As to the Colours with which this wonderful Bow is adorned, he observes, That our most Sagacious Sir *Is. Newton* was the first who shewed by most plain Experiments, that the Rays of Light do not come uniform and simple out of the Luminous Body; but that the pure white Light which we see, is compounded of the Corpuscles of all manner of Colours, blended one with another, by the most rapid Motion; and, That the Colours of all Bodies arise from their different Disposition to refract or reflect some peculiar Species of Light. This is principally proved from *Refractions*, by which these *distinct Species* are separated one from another; for Blue or Purple Light is, for Instance, more refracted in passing through a Diaphanous Body, than Yellow or Red. See the Words *Light* and *Colours*, where I have given you a large Account of Sir *Is. Newton*'s Experiments, as mentioned in his Letter in the *Phil. Trans.* N. 80, &c.

It being therefore certain that all kind or degrees of blue Light, are a little more refracted than any reddish Light whatsoever, 'Tis plain, saith Mr. *Halley*, that from this difference the breadth of the Iris must arise; but which, is hardly to be determined by Observation, by reason of the uncertain Limits of the Colours in the Clouds. But the greater the Ratio of Inequality between CA and CD, or the greater the Refraction is, by so much the greater will the Distance be of any *Iris* from the Sun; so that those which are more remote from the Sun, are always more adorned with a Purple Colour, but the more near ones with a Red one, as is apparent in the *Primary Iris*, which vanishes or disappears in *Oppositо Solis*, if the Sine of Incidence to that of the refracted Angle be as CA to CE:: or as 2. to 1. And if the Ratio be greater than this, the Primary Iris will not be at all visible, or no Primary Iris at all can be seen.

It is to be observed also, That the *Secondary Iris* will go off in a Point, in *Oppositо Solis*, whenever the Ratio of Refraction is as 1. to $\sqrt{\frac{1}{3}} + \sqrt{:\frac{4}{7}}$ or as 1 to 0. 847487. And from thence will run back towards the Sun himself, and there disappear, if the aforesaid Ratio be as 3 to 1, or as CA to C*e*.

But in the Intermediate Proportions, (which are found in all known Fluids, except Air) the greater the Ratio of Refraction, the further is the Iris distant *ab Oppositо Solis*, or rather from the Sun himself, the Ark being numbered beyond the Semicircle, and therefore the Colours will appear to be found in an Order diverse from that in the *Primary Iris*, unless you thus reckon the distance of the Secondary one from the Sun himself, which must also be taken notice of in the other *Iris*.

The Third *Iris* in *Oppositо Solis* is quite confused; the Ratio of the Refraction being as 1 to 91855, and from thence it runs back in the Ratio of 1 to 68250; from whence again, the order of the Colours being restored, in the Ratio of 4 to 1, or of CA to C*e*, it ends in *Oppositо Solis*.

But the Fourth *Iris* beginning from the Sun in the Ratio of Equality, passes off in the Points opposite to him in the Ratio of 1 to 94895, and thence returns to the Sun again, if the Ratio be as 1 to 4; and from thence is again dispersed or scattered towards the Parts opposite to the Sun, in the Ratio of 1 to 56337, within which Bounds are the Refractions of all known Fluids contained.

Lastly, if the Ratio were as 5 to 1, or as CA to C*n*, the Iris will vanish into the Sun himself; and the Colours to appearance will be inverted at

its Regreſs to the Sun, as they were right or direct at their Egreſs.

And from hence it is that the Primary and Fourth Iris in Watry Clouds obverts a reddiſh Colour towards the Sun, but the Secondary and Third, a Purple one.

After this, Mr. *Halley* ſhews how, having the Diſtance of the Iris from the Sun, to find the Ratio of the Refraction; and this by a very eaſy, but moſt accurate Obſervation.

Take a ſmall Glaſs Tube, and erecting it perpendicular to the Horizon, ſuſpend in its lower Orifice a ſmall drop of Water, or ſome ſuch clear Fluid; and then at ſome time when the Sun is near the Horizon, and ſhines very bright, let it be obſerved under what Angle *cum Oppoſito Solis*, the Colours of the Iris are ſeen in the pendulous drop; for then the Ratio of the Refraction may be had by an eaſy Calculation. And its Inveſtigation forms a Cubick Equation, having only one Root, by which the Primary Iris being given, the Ratio may be found. The Equation is this, $T^3 - \frac{3}{4} T^2 t - 4rrr = 0$. In which, T is the Tangent of the Angle of Incidence ſought, and t is the Tangent of half the Diſtance of the Iris *ab Oppoſito Solis*, to the Radius $r = 1$. Whence, according to *Cardan*'s Rules, there ariſes this Theorem, *viz.*

From the Cube t, let there be taken the Product of $2tr$ into the Exceſs of the Secant of the ſame Ark above the Radius, the remainder of difference ſhall be the leſſer Cube: But the Sum of them, adding $4trr$ ſhall be the greater Cube. The Sum of the Sides of both Cubes added to t, will be equal to the Tangent of the Angle of Incidence; and the half of that Sum, the Tangent of the refracted Angle. Whence the *Ratio* of the Refraction is known.

Of this he gives the following Example.

In a drop of Oil of Turpentine, the diſtance of the Primary Iris *ab Oppoſito Solis*, was obſerved to be 25° 40′.

The Ratio of the Refraction was required.

t = Tangent 12° 50′	= 0. 2278063
s = Secant of the ſame	= 1. 0256197
ttt =	0. 01182217
$s - r$ into $2rt$ =	0. 01167265
Difference, Cube of the leſs	0. 00014952 whoſe
$\sqrt[3]{}$	0. 053c773
The Sum	0. 02349482
Adding $4trr$ =	0. 91122525
The Cube of the greater	0. 93472007 whoſe
$\sqrt[3]{}$ =	0. 9777486
t =	0. 2278063
	1. 2586322 = Side of the Cube of leſſer. = T The natural Tangent of the Angle of Incidence 51° 32′ and its Half,

viz. 0. 6293161 is the natural Tangent of the Refracted Angle, *viz.* 32° 11′.

Laſtly, as $\sqrt{} : T^2 + 4. \sqrt{} : T^2 + 1 :: r.s.$ or ſo, is 1 to 68026. Which Ratio comes very near to that which by Experiment is found to be in Glaſs and moſt diaphanous Solids.

Only, indeed, a Diamond exceeds the reſt of Pellucid Stones, in this Power of Refraction; for its Ratio is nearly as 5 to 2, or more accurately, as 100 to 41. See Vol. 2.

RAKE *of a Ship*, is ſo much of her Hull as over-hangs at both ends of her Keel. That part of it which is before, is called her *Rake forward on*; and that part which is at the ſetting on of the Stern-Poſt, is called her *Rake aft-ward on*: When a Ship hath but a ſmall *Rake forward on*, but is built with her Stern too ſtrait up, ſhe is called *Bluffe-headed*.

The common Proportion for a Ship's *Rake forward on*, is more than a Third, but leſs than $\frac{1}{3}$ the length of her *Keel*: and the *Rake aft* is about a 4th or 5th of her *Rake before*. Tho' in this Proportion, there is no certainty, ſome *Nations*, and ſome *Carpenters* building with longer *Rakes* than others. A *Long Rake forward on*, if a Ship have alſo a *good fat Bow*, gives her a good Way, and helps her to keep a good Wind; but then this makes her apt to pitch under Water in a Head-Sea, and beſides is a great Streſs and Charge to a Ship, becauſe ſhe over-hangs ſo a Head. Therefore the middle Proportion is beſt, conſidering all things.

RAKE *of the Rudder*. See *Rudder*.

RAKED *Table*, a Term in Architecture. See *Table*.

RAM *Head*, is the Name of a great Block (aboard a Ship) belonging to the Fore and Main-Halliards; it hath in it 3 Shivers, into which the Halliards are put, and at its Head the *Tyes* are reeved into an Hole made there for that Purpoſe.

RAMIFICATION, is a Collection of ſmall Branches iſſuing out from one large one. Thus in *Anatomy*, the ſeveral Branches of the *Aorta* or *Great Artery*, by which the Arterial Blood is convey'd to all the extream Parts of the Body, are called the *Ramifications* of the Artery: and when they are exceeding ſmall, they are called *Capillary Arteries*; which ſee.

RAMMER, is a Staff with a round piece of Wood at one end, in order to drive home the Powder to the Breech of the Great Gun, as alſo the Shot and the Wad, which keeps the Shot from rowling out. At the other end of theſe *Rammers*, are uſually rolled in a certain Piece of Ships-skin fitted to the Bore of the Piece, in order to clear her after ſhe has been diſcharged: And this is called Spunging the Piece.

RAMPANT: The Term in Heraldry for a Lion, or any Beaſt of Prey, in a Poſture of Climbing, or Standing upright on his hinder Legs, and rearing up his Fore-feet. 'Tis different from *Salient*, which is a Poſture not ſo erect. See *Salient*.

RAMPART, in Fortification, is the Maſs of Earth which is raiſed about the Body of any Place, to covert it from Great Shot, and conſiſts of ſeveral *Baſtions* and *Curtains*; having its *Parapet*, *Platform*, *interior* and *exterior Talus*, and *Berme*, as alſo ſometimes a Stone Wall, and then they ſay it is Lined. The Soldiers continually keep Guard here, and Pieces of Artillery are Planted for the Defence of the Place.

The Height of the *Rampart* muſt not exceed three Fathom, as being ſufficient to cover the Houſes from the Batteries of the Cannon: Neither ought its Thickneſs to be above ten or twelve, unleſs more Earth be taken out of the Ditch, than can be otherways beſtowed.

The *Ramparts* of Half-Moons are the better for being low, that the ſmall Fire of the Defendants may the better reach the Bottom of the Ditch; but yet

yet it muſt be ſo high, as not to be commanded by the Covert-way.

RAMUS *Anterior*, *Sc. Vena Subcutanea*, is a Branch of the *Subcutaneous* Vein, (which takes its Name from its ſhallow running juſt under the Skin) and is it ſelf a Branch of the *Baſilica*; it goes under the Muſcles of the *Ulna* to the little Finger, where it joins a Branch of the *Cephalica*.

RAMUS *Poſterior*, another Branch of the *Subcutaneous* Vein of the Arm, running near the Elbow; it ſends out a Branch which goes to the Wriſt, then it unites with the *Cephalica Interior*, and forms the *Mediana*.

RANDOM-*Shot*, is a Shot made when the Muzzle of a Gun is raiſed above the Horizontal Line, and is not deſigned to ſhoot directly or Point-blank. The utmoſt *Random* of any Piece, is about ten times as far as the Bullet will go Point-blank; and the Bullet will go fartheſt when the Piece is mounted to about 45 Degrees above the Level-Range. The Diſtance of the *Random* is reckoned from the Platform to the Place where the Ball firſt Grazes.

RANGE, a Term in Gunnery, ſignifying the Line a Shot goes in from the Mouth of the Piece. If the Bullet go in a Line parallel to the Horizon, that is called the *Right* or *Level-Range*; if the Gun be mounted to 45 Degr. then will the Ball have the higheſt or utmoſt Range, and ſo proportionably all others between 00 Degr. and 45°, are called the *Intermediate Ranges*.

RANGES, in a Ship, are two Pieces of Timber going a-croſs from Side to Side; one aloft on the *Fore-Caſtle* a little abaft the *Foremaſt*; and the other in the *Beak-Head* before the *Wouldings* of the *Bow-Sprit*.

That in the Fore-Caſtle, is faſtened into the Timbers of the Ship's-Sides, and hath two Knees about the Middle, on either Side the Fore-Maſt, faſtened to the Deck and the Timber, in which the Top-Sail-Sheets run in a Shiver: In it alſo are ſeveral Wooden Pins to belay the *Fore-bowling*, the *Fore-Tack*, and the *Fore-looſ Hook*.

That in the Beak-Head lies in the Form of the other, and hath the Sprit-Sail, and Sprit-Sail-Top-Sail-Sheets and Ropes belayed about its Pins.

RANGER, is a Sworn Officer of the Foreſt, whereof there are Twelve: His Buſineſs chiefly conſiſts in three Points; To walk daily through his Charge, to ſee, hear, and enquire, as well of Treſpaſſes, as Treſpaſſers in his Bailywick; To drive the Beaſts of the Foreſts, both of Venery and Chaſe, out of the Diſforeſted into the Foreſted Lands; And, To preſent all Treſpaſſes of the Foreſt. This *Ranger* is made by the King's Letters-Patent, and hath yearly Penſion out of the *Exchequer*.

RANULA. See *Hypogloſſum*.

RANULARES, are thoſe Branches of the external Jugular Veins which run to the Tongue, and are very apparent under it.

RAPHE. See *Satura*.

RAPINE, in Law; to take a Thing in private againſt the Owner's Will, is properly Theft; but to take it openly, or by Violence, is *Rapine*.

RAPSODY, originally ſignifies a Connection together, or a Repetition of a vaſt Number of Heroick Verſes, ſuch as thoſe of *Homer*, &c. But now we uſually underſtand by it, a long, tedious, impertinent ſpinning out of a Diſcourſe to little or no Purpoſe, or Benefit to the Reader.

RAPTU *Hæredis*; is a Writ lying for the taking away of an Heir holding in Socage; of which there are two Sorts; one when the Heir is Married, the other when he is not. Of both theſe, ſee the *Reg. Orig. Fol.* 163.

RARE Bodies, are ſuch as have more Space, or take up more Room in Proportion to their Matter, than other Bodies do.

RAREFACIENTIA, rarifying Remedies, are ſuch as by diſſipating a little the Vapours and Humours, make the Pores of Bodies larger. *Blanchard.*

RAREFACTION, of any natural Body, is when it takes up more Dimenſions, or a larger Space than it had before.

There are three Ways of Explicating of Rarefaction.

1. That of the *Ariſtotelians*, which is called the Rigorous Way, who ſuppoſe the ſame Body doth not only obtain a greater Space in Rarefaction, but alſo adequately fill it; and acquires larger Dimenſions, without either having any Pores or Vacuities between its Corpuſcles, or admitting any other Body or ſubtle Matter to be joined with them.

2. That of the *Carteſians*, which was alſo the Opinion of many of the Old Philoſophers, who aſſert, That in Rarefaction the Pores of the rarefied Body are dilated, and repleniſhed with ſome fine ſubtle and ethereal Subſtance, which inſinuates it ſelf freely into the Interſtices between its disjoined Particles.

3. That of the *Atomiſts* or *Vacuiſts*, who ſuppoſe the Parts of the rarefied Body to be disjoined and removed farther from each other, and yet no other Body (neceſſarily) comes in between them. See this explained under *Air*.

RASANT *Line of Defence*, in Fortification, is a Line drawn from the Point of the Baſtion along the Face, and prolonged till it come to the Curtain, and therefore ſhews how much of the Curtain will clear or ſcour the Face. This is called alſo the Second Flank, the Hanking, or Stringent Line.

RASETTA, the ſame with *Carpus*.

RASH. See *Ratch*.

RASPATORIUM, or *Scalprum Raſorium*, is a Chirurgeon's Inſtrument to ſcrape or ſhave filthy or ſcabby bones with.

RATCH, is a ſort of a Wheel of 12 large Fangs, that runneth Concentrical to the Dial Wheel, and ſerveth to lift up the *Dentes* every Hour, and make the Clock ſtrike: and are by ſome called *Raſh*.

RATCHET, in a Watch, are the ſmall Teeth at the Bottom of the Fuſy or Barrel, that ſtop it in winding up.

RATE-Tythe, is when Sheep or other Cattle are kept in a Pariſh for a leſs Time than a Year, the Owner muſt pay *Tythe* for them *pro rata*, according to the Cuſtom of the Place.

RATIFICATION, a Law-Term, uſed for the Confirmation of a Clerk in a Prebend, &c. formerly given him by the Biſhop, &c. where the Right of Patronage is doubted to be in the King.

RATIO. When two Quantities are compared one with another in reſpect of their Greatneſs or Smallneſs. That *Compariſon* is called *Ratio*, and ſignifies the *Rate*, *Reaſon* or *Proportion* in Quantity, that one hath to the other. Though ſome, indeed, confine Ratio or Reaſon only to two Numbers, and call it *Proportion*, when it is between 3, 4, or more Numbers or Quantities. But the Word Proportion is often uſed inſtead of Ratio or Reaſon, to expreſs the Compariſon of one ſingle Quantity to another, by very good Authors.

RATIOCINATION, a Rational way of Arguing.

RATIONABILI *parte bonorum*, is a Writ that lies for the Wife againſt the Executors of her Huſband, denying her the third Part of her Huſband's Goods.

RATIONABILIBUS *diviſis*, is a Writ that lies where two Lords, in divers Towns, have Seigniories joining together, for him that findeth his Waſte by little and little to have been encroached upon, againſt the other that hath Encroached, thereby to rectify their Bounds. And this is a King of *Juſticies*, and may be removed by a *Pone*, out of the County to the Common Bench. By the *Civilians* it is called *Judicium finium Regundorum*.

RATIONAL *Horizon*. See *Horizon*.

RATIONAL *Quantities*. Any Quantity being propoſed, (for which we may always put 1.) and which *Euclid* (Book 10.) calls *Rational*, there may be infinite others which are Commenſurable, or Incommenſurable to it; and that either Simple, or in Power. Now, all ſuch as are Commenſurable any how to the given Quantity, he calls Rational Quantities, and all the others Irrational.

RATLINES, (or as the Seamen call them, *Ratlings*) are thoſe Lines which make the Ladder Steps, to get up the Shrouds and Puttocks; therefore they are called the Ratlings of the Shrouds.

RAVELIN, in Fortification, is a ſmall Triangular Work compoſed only of two Faces, which make a Saliant Angle, without any Flanks. It is generally raiſed before the Curtains or Counterſcarp, and commonly called a Half-Moon by the Soldiers.

A *Ravelin* is like the Point of a Baſtion with Flanks cut off. The reaſon of its being placed before a Curtain, is to cover the oppoſite Flanks of the two next Baſtions. 'Tis uſed alſo to cover a Bridge or a Gate; and 'tis always placed without the Moat.

What the Engineers call a Ravelin, the Soldiers generally call a Half-Moon, which ſee.

RAY Common, is a right Line drawn from the Point of the Concourſe of the two Optical Axes, through the Middle of the right Line which paſſeth by the Centre of the Pupil of the Eye.

RAY Direct, is that which is carried from a Point of the viſible Object directly to the Eye, through one and the ſame Medium.

RAY of Incidence, or Incident Ray, in Catoptricks, is a right Line which falls from ſome Point of an Object upon the Surface of the Looking-Glaſs or poliſhed Metal.

RAY of Incidence, or Incident Ray, in Dioptricks, is the Ray of Light which goes in a right Line from a certain Point of the viſible Objects in one Medium, until it meet with a Second Medium.

RAY in Opticks, is a Line imagined to paſs from the Eye toward the Object, or from the Object toward the Eye, and is called a Viſual Ray. But there is alſo a Pyramid of Rays, which ſtrike the *Tunica Retina* of the Eye, and are broken or refracted in the Cryſtalline.

RAY Principal, in Perſpective, is the perpendicular Diſtance between the Eye and the Vertical Plane, or Table, as the *French* call it.

RAY of Reflection is the right Line whereby the Reflection is made.

RAY of Refraction, or broken Ray, is a right Line whereby the Ray of Incidence changeth its rectitude; or is broken in traverſing the Second Medium, whether it be thicker or thinner.

RAYS, or Beams of the Sun, or Rays of Light, are either according to the Atomical Hypotheſis, thoſe very minute Particles or Corpuſcles of Matter, which continually iſſuing out of the Sun, do thruſt on one another all around in Phyſically ſhort Lines; (and that this is the right Opinion, many Experiments do evince, particularly the Incomparable Sir *Iſ. Newton* about Light and Colours) or elſe as the *Carteſians* aſſert, they are made by the Action of the Luminary on the Contiguous Æther and Air, and ſo are propagated every way in ſtrait Lines, through the Pores of the Medium.

RAYS Convergent, are thoſe which going from divers Points of the Object, incline towards one and the ſame Point tending to the Eye.

RAYS Divergent, are thoſe which going from a Point of the viſible Object, are diſperſed, and continually depart one from another, according as they are removed from the Object.

RAYS Parallel, are thoſe that keep an equal Diſtance from the viſible Object to the Eye, which is ſuppoſed to be infinitely remote from the Object.

RAZANT *Line of Defence*. See *Raſant Line of Defence*.

REACH, is the Diſtance between any two Points of Land, that lie in a right Line one from another.

REALGAL, or *Sandaracha*, is red Arſenick.

REAL Horizon. See *Horizon*.

REAR-Guard, is that Part of an Army which follows the main Body, to hinder and ſtop Deſerters.

REASON, in Mathematicks, the ſame with Proportion; 'tis better called by the *Latin* Name *Ratio* (which ſee) to avoid confounding it with the common Signification of the word *Reaſon*.

REATTACHMENT, is a Second *Attachment* of him that was formerly attached and diſmiſſed the Court without Day, as by the not coming of the Juſtices, or ſome ſuch Caſualty. And is ſaid to be either General or Special. General-Reattachment, is where a Man is reattached for his Appearance upon all Writs of Aſſize lying againſt him: Special-Reattachment, muſt be for one or more certain.

REBUSSES, are in Heraldry ſuch Coats of Arms as bear an Alluſion to the Surname of the Perſon, as 3 Coneys for *Coniſby*, 3 Cups for *Butler*, 3 Caſtles for *Caſtleton:* And ſuch Bearings are very ancient.

REBUTTER, in Common-Law, when a Man grants Land to the uſe of himſelf, and the Iſſue of his Body, to another in Fee with Warranty: And the Donee leaſeth out his Lands to a Third for Years; the Heir of the Donor impleadeth, the Tenant alledging, That the Land was in Tail to him: The Donee comes in, and by virtue of the Warranty made by the Donor, repelleth the Heir, becauſe tho' the Land was Entailed to him, yet he is Heir to the Warrantor likewiſe; and this is called a *Rebutter*. And if I grant to my Tenant, to hold *Sine impetitione vaſti*, and afterwards implead him for Waſte made; he may debar me of this Action, by ſhewing my Grant; and this is alſo a *Rebutter*.

RECAPTION, is a Second Diſtreſs of one formerly diſtrained for the ſame Cauſe, and alſo during the Plea grounded on the former Diſtreſs: It likewiſe

likewiſe ſignifies a Writ lying for the Party thus Diſtrained.

RECEIVER. See *Recipient.*

RECEPTACULUM *Chyli*, was firſt found out by *Pecquet*, *A. D.* 1651, 'tis a Cavity into which all the Lacteal Veins empty themſelves: it is of a Veſicular Subſtance, which is thicker in Men than in Beaſts, but the Cavity is larger in Beaſts than Men: Out of it goes the *Ductus Thoracicus*; which ſee.

RECESSION *of the Equinoxes*, is the going back of the Equinoctial Points every Year about 50 Seconds. The Reaſon of which is, That the Axis of the Earth, after many Annular Revolutions round the Sun, really deviates from that Parallelism, which it ſeems to keep with it ſelf all the time of one Annular Revolution: By this Aberration it deſcribes a Conical Superficies; and the Earth's Equator moving round the Sun, together with the Earth's Axis, the Interſections of the Celeſtial Equator with the Ecliptick, will *run back*, or move *in Antecedentia*, as will all other Points of the Ecliptick, (as well as thoſe Equinoctial ones.) And therefore the Signs or Fix'd Stars that make the 12 Zodiacal Conſtellations, will appear to move forward, or *in Conſequentia*; as they now ſeem to have done by the Quantity of a whole Sign; for which Reaſon, you find the Picture of the *Ram* painted on our Globes at the beginning of the Sign *Taurus*, &c.

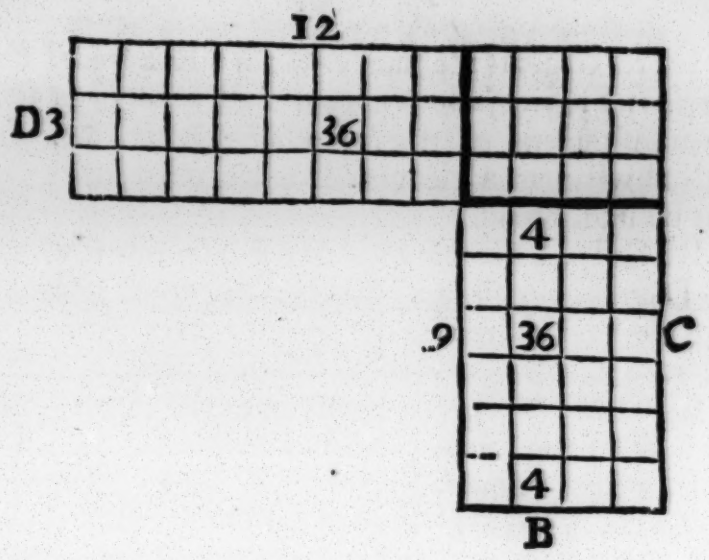
Dr. *Gregory* in his Excellent *Aſtronomia Phyſica & Geometrica*, Prop. LXIV. Lib. 1. makes the Prolate Spheroidical Figure of the Earth, to be the Primary Occaſion of this Receſſion of the Equinoctial Points; and withal ſhews that the Earth's Axis in every Annual Revolution round the Sun, twice changes its Inclination to the Ecliptick, and as often returns again to its former Poſition.

RECIDIVUS *Morbus*, a Relapſe, is when the Morbifick Matter, that was left in the firſt Diſtemper, begins to work and ferment again.

RECIPIENTS, or *Receivers*, are thoſe Veſſels, which in Diſtillation, are Luted to the Beak, or Noſe of Alembick, Retort, &c. to receive the Matter which is raiſed or forced over the Helm by the Fire. That Glaſs alſo which is exhauſted of Air by Mr. *Boyle*'s Air-Pum, and within which any Animal or other Bodies, are included to make Experiments upon, is by him uſually called the *Receiver*.

RECIPROCAL *Figures* in Geometry, are ſuch as have the Antecedents and Conſequents of the Ratio in both Figures.

Here A : B :: C : D,
i. e. 12 : 4 :: 9 : 3.



That is, as much longer as the Side A in the firſt Rectangle is than B : : ſo much deeper is the Side C in the ſecond Rectangle, than the Side D in the firſt; and conſequently the Length of one is compenſated by the Depth of the other; and alſo as the Side A is $\frac{1}{4}$ longer than the Side C, ſo the Side B is one 4th longer than D. Wherefore the Rectangles muſt needs be equal.

And this is the Foundation of the *Catholick Theorem*; That *the Rectangle of the Extreams muſt always be equal to that of the Means:* And conſequently the Reaſon of the *Rule of Three*, or *Golden Rule*; for ſuppoſe there was given any three Numbers or Quantities Geometrically proportional, as A, B, and C, and that it were required to find a fourth D proportional to them.

Since it is that A : B : : C : D therefore A D = B C, and conſequently $D = \frac{B C}{A}$; that is, the Fourth Term is equal to the Quotient of the Second, multiplied by the Third Term, divided by the Firſt:

Or thus in Numbers.

Suppoſe given 12, 4, and 9; required a fourth Proportional.

Now as 12 : 4 : : 9 : Q.

But 12 Q = 4 × 9 = 36.

Therefore $Q = \frac{4 \times 9}{12}$ (: 3. by dividing both Sides by 12.

COROLLARY.

And from hence 'tis plain, That if any two Triangles, Parallelograms, Priſms, Parallelopipeds, Pyramids, Cones, or Cylinders, have their Baſes and Altitudes *Reciprocally proportional*, thoſe two Figures or Solids are equal to one another; and *vice verſa*, if they are equal, their Baſes and Altitudes are Reciprocally proportionable.

RECIPROCAL *Proportion*, is when in four Numbers, the Fourth is leſſer than the Second, by ſo much as the Third is greater than the Firſt, and

vice

vice verſa; on which is founded the Inverſe or Indirect *Rule of Three*, thus.

4 : 10 : : 8 : 5.

See the *Corollary* after Reciprocal Figures.

There is great uſe made of this *Reciprocal Proportion*, by Sir *Iſaac Newton*, and others, in their Demonſtrations of the *Laws of Motion*, &c. and indeed without a clear knowledge of it, they cannot be underſtood.

RECLINATION *of a Plain*, is the Quantity of Degrees which any Plain, on which a Dyal is ſuppoſed to be drawn, lies or falls backwards from the truly upright or vertical Plain.

RECLINING, in Dyalling, the Plane that leans from you when you ſtand before it, is ſaid to be a *Reclining Plane*.

RECLINING *Declining Dyals*. See *Declining Reclining Dyals*.

RECOGNIZANCE, in Law, is a Bond or Obligation of Record, teſtifying the *Recogniſor* to owe to the *Recogniſee* a certain Sum of Money, and is acknowledged in ſome *Court of Record*, or before ſome Judge, Maſter of the Chancery, or Juſtice of Peace; and thoſe that be meer *Recogniſances*, are not Sealed but Enrolled, and Execution by force thereof, is of all the *Recogniſor*'s Goods or Chattels, (except Draught Beaſts and Implements of Husbandry) and the Moiety of his Lands.

RECOGNISEE, is he to whom one is bound in a *Recogniſance*.

RECOGNITIONE *adnullanda per vim & duritiem facta*, is a Writ to the Juſtices of the Common Bench, for the ſending of a Record touching a *Recogniſance* which the *Recogniſor* ſuggeſts to have been acknowledged by force and dureſſe, that if it be ſo, it may be annulled.

RECOGNITORS, is a Word often uſed for the Jury Impannelled upon an Aſſize: The reaſon why they are ſo called, is, becauſe they acknowledge a Diſſeiſin by their Verdict.

RECOLLECTION, is a Mode of Thinking, whereby thoſe Ideas ſought after by the Mind, are with Pain and endeavour found, and brought again to view.

RECORD, in Law, ſignifies an Authentick and Uncontroulable Teſtimony in Writing, contained in Rolls of Parchment, and preſerved in Courts of Record; and they are ſaid to be *vetuſtatis & veritatis veſtigia*. An Act committed to Writing in any of the King's Courts, during the Term wherein it is Written, is alterable, being no *Record*; but that Term once ended, and the Act Enrolled, it is a *Record*, and of that Credit, that admits no alteration or proof to the contrary. Lawyers Reckon three ſorts of Records, *viz. Record Judicial*, as Attainder, &c. *Record Miniſterial* upon Oath, as an Office or Inquiſition found. And a *Record* made by Conveyance and Conſent, as a Fine or Deed Enrolled, or the like.

RECORDARE *facias*, or *Recordari facias*, is a Writ directed to the Sheriff, to remove a Cauſe depending in an Inferior Court, as Court of ancient Demeſne, Hundred or County, to the King's-Bench, or Common-Pleas; it ſeems to be called *Recordare*, becauſe it commands the Sheriff to make a Record of the Proceedings by himſelf and others, and then to ſend up the Cauſe.

RECORDER, is he whom the Mayor, or other Magiſtrate of any City, or Town Corporate having Juriſdiction, or a Court of Record within their Precincts, by the King's Grants, doth aſſociate unto him for his better Direction in Matters of Juſtice and Proceedings according to Law; and is therefore for the moſt part a Man verſed and experienced in the Law.

RECORDO *& proceſſu Mittendis*, is a Writ to call a Record together, with the whole Proceeding in the Cauſe, out of an Inferior Court into the King's-Bench Court.

RECORDO *utlagariæ Mittendo*, is a Judicial Writ; which ſee in *Reg. Judic. fol.* 32.

RECOVERY, in a Legal Senſe, ſignifies an obtaining any thing by Judgment or Tryal at Law, as *Evictio* doth among the *Civilians*.

And there is a *True* and a *Feigned Recovery*: A *True Recovery* is an actual or real Recovery of any thing, or the Value thereof by Judgment; as if a Man ſue for any Land, or other thing moveable or immoveable, and have a Verdict and Judgment for him.

A *Feigned Recovery*, is, (as the Civilians call it) *Quædam fictio Juris*, a Certain Form or Courſe ſet down by Law, to be obſerved, for the better aſſuring of Lands and Tenements unto us; and the end and effect thereof is to diſcontinue and deſtroy Eſtates Tail, Remainders and Reverſions, and to bar the Intails thereof.

And in this Formality are required three Perſons, *viz.* The *Demandant*, *Tenant*, and *Vouchee*.

The *Demandant*, is he that brings the Writ of Entry, and may be termed the *Recoverer*.

The *Tenant*, is he againſt whom the Writ is brought, and may be termed the *Recoveree*.

The *Vouchee*, is he whom the Tenant voucheth, and calls to Warranty for the Land in demand.

A Recovery with double Voucher, is, where the Tenant voucheth one, who voucheth another, or the common Vouchee.

And a *Recovery with treble Vouchers*, is where three are vouched: As when a Man that is deſirous to cut off an Eſtate Tail in Lands or Tenements, to the end, to ſell, give, or bequeath it, cauſes a Feigned Writ of Entry, *Sur diſſeiſin en le poſt*, to be brought for the Lands of which he intends to cut off the Entail, and in a Feigned Count, or Declaration thereupon made, pretends he was diſſeiſed by him, who by a Feigned Fine or Deed of Bargain and Sale, is named and ſuppoſed to be the Tenant of the Land. This Feigned Tenant, if it be a *Single Recovery*, is made to appear and Vouch the *Bag-bearer of Writs* for the *Cuſtos brevium*, in the *Common Pleas*, (for there only can ſuch *Recoveries* be ſuffered) who makes Default. Whereupon the Land is recovered by him that brought the Writ, and a Judgment is by ſuch fiction of Law entred, that the Demandant ſhall recover the Value of the Lands againſt the Lands of the *Vouchee*.

Bag-bearer is a Poor Unlanded and Illiterate Perſon, which is feigned to be a Satisfaction to the Heir in Tail, tho' he is never to have or expect it.

This *Feigned Recovery*, is alſo called a *Common Recovery*, becauſe it is a beaten and common Path to that end for which it is appointed, *viz.* to cut off the Eſtates above ſpecified. But a *True Recovery* is as well of the Value as of the Thing: As if a Man buy Land of another with Warranty, which Land a third

a third Perſon afterwards by Suit of Law recovereth againſt me, I have my Remedy againſt him that ſold it me, to recover in Value; that is, to recover ſo much in Money, as the Land is Worth; or ſo much other Land by way of Exchange.

RECOUPE, in Law, is a quick and ſharp Reply to a peremptory Demand, and uſed by Lawyers to defalk or diſcount; as if a Man hath Ten Pounds iſſuing out of certain Lands; and he diſſeiſes the Tenant of the Land in an Aſſiſe brought by the Diſſeiſee, the Diſſeiſor ſhall *Recoupe* the Rent in the Damages.

RECREMENT, any Superfluous Matter in the Blood or Body, or any of its Parts.

RECREMENTS, a Word uſed by the Phyſicians and Anatomiſts, for ſuch Juices as are ſeparated in the ſeveral Glands of the Body for proper and peculiar Uſes; as the Spirits, the Lympha, the Gall, the Pancreatick Juice, the proper Ferments of the Stomach, Guts, *&c.* and theſe are diſtinguiſh'd from Excrements, which are expelled out of the Body, as being of no further Uſe to it.

RECTANGLE, in Arithmetick, is the ſame with Product; which ſee.

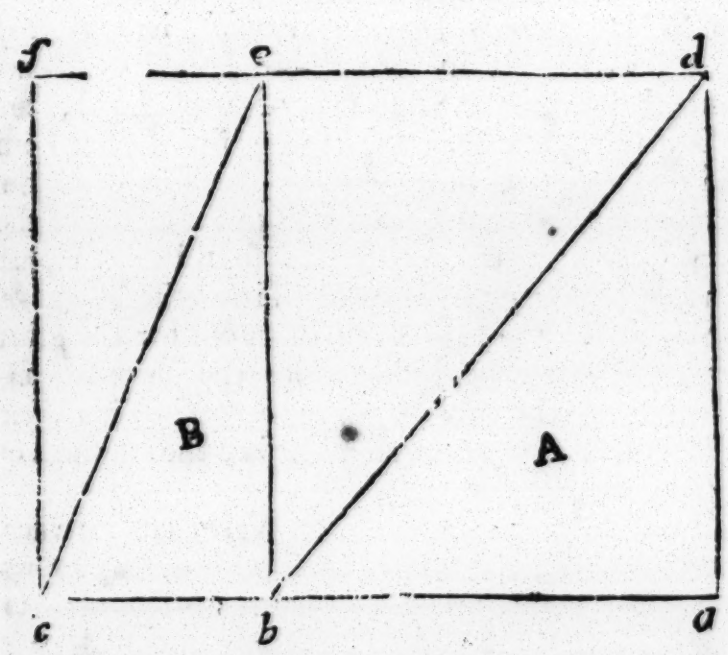
RECTANGLES in Geometry, are Parallelograms, whoſe Sides are unequal, but Angles right. Their Area is found by multiplying the two unequal Sides one into another, for then the Product is the Superficial Content or Area.

RECANGLED Triangle, the ſame with Right-angled Triangle.

All Rectangles, (as A and B) which have the ſame Height, are to one another as their Baſes.

That is,

□ A : □ B :: *ab* : *bc*.



For A is made by the Multiplication of *b a* its Baſe by the Line *b e*; and B is alſo made by multiplying *c b* its Baſe by the ſame Line *b e* (or its equal *c f*.)

But the Product of any two Numbers Multiplied by the ſame Third Number, are as thoſe Numbers were to each other before Multiplication. Therefore,

A : B :: *ab* : *bc*. Q. E. D.

Hence all Rectangles, or Parellelograms, between the ſame Parallel Lines, or which have the ſame Height, muſt be to one another as their Baſes are.

For they are all equal to Rectangles; on the ſame or equal Baſes with themſelves, and conſequently muſt have the ſame Proportion to each other, as ſuch Rectangles; that is, be to each other as their Baſes. *Q. E. D.*

And the ſame Thing muſt be true of all Triangles that are between the ſame Parallels, or which have the ſame Height, becauſe they are the halves of thoſe Parallelograms. See the Figure.

RECTANGULAR, or Right-angled, is ſpoken of a Plain Figure in Geometry, when one or more of its Angles are right. Of Solids, 'tis ſpoken in reſpect of their Situation: For if their Axes be perpendicular to the Plane of the Horizon, they are therefore Rectangular, or Right Cones, Cylinders, *&c.*

RECTANGULAR Section of a Cone; by this the Ancient Geometers always meant a *Parabola*, which Conick Section, before *Apollonius*, was only conſidered in a Cone, whoſe Section by the Axe would be a Triangle, Right-angled at the Vertex. And hence it was that *Archimedes* entituled his Book of the *Quadrature of the Parabola*, (as 'tis now called) by the Name of *Rectanguli Coni Sectio*.

RECTIFIE, or Rectification, in Chymiſtry, is the Diſtilling over again of any Spirit, in order to a more fine and pure State; and to ſeparate from it any Heterogeneous Parts, that might riſe with it before.

RECTIFIE, is a Word uſed in the Deſcription and Uſe of Globe, or Sphere. For the firſt Thing to be done before any Problems can be wrought on the Globe, is to *Rectify it*. That is, to bring the Sun's Place in the Ecliptick on the Globe, to the graduated Side of the Braſs Meridian, to elevate the Pole above the Horizon, as much as is the Latitude of the Place, and to fit the Hour Index exactly to Twelve at Noon, ſcrewing alſo the Quadrant of Altitude, (if there be Occaſion) to the Zenith. All this is comprehended under the Word *rectify the Globe*: And when this is done, the (Celeſtial) Globe repreſents the true Poſture of the Heavens, for the Noon of that Day it is Rectified for.

RECTIFIER (in Navigation) is an Inſtrument conſiſting of two Parts, which are two Circles either laid one upon, or let into the other, and ſo faſtened together in their Centers, that they repreſent two Compaſſes, one fixed, the other moveable; each of them divided into the 32 Points of the Compaſs, and 360 Degrees, and numbred both Ways, both from the North and the South, ending at the Eaſt and Weſt, in 90 Degrees.

The Fixed Compaſs, repreſents the Horizon, in which the North, and all the other Points of the Compaſs are fixed and immoveable.

The Moveable Compaſs repreſents the Mariners Compaſs, in which the North, and all the other Points are liable to Variation.

In the Centre of the Moveable Compaſs is faſtned a Silk Thread, long enough to reach the out-ſide of the Fixed Compaſs. But if the Inſtrument be made of Wood, there is an Index inſtead of the Thread.

Its Uſe is to find the Variation of the Compaſs, to rectify the Courſe at Sea; having the Amplitude or Azimuth given.

RECTIFYING of Curves, (in Mathematicks) is to find a ſtrait Line, equal to a Curved one; or a Plane equal to a curved Surface.

Of

Of this Dr. *Wallis* gave the firſt Hint to the World, in his Arithmetick of Infinites, *Prop.* 38. *& Scholium.*

Soon after which, Mr. *William Neil* applied thoſe Conſiderations to the *Semi-cubical Paraboloid*, where the Cubes of the Ordinates are as the Squares of the Diameters: And ſhewed that there the ſmall Segments of the Curve, cut by the Ordinates at equal Diſtances, are as the Ordinates in a Parabola, and therefore their Squares increaſed by Equals, in Arithmetical Progreſſion: Wherefore that Curve muſt be to a Right Line :: as the Trunk of a Parabola, to the Parabola: Which, the Quadrature of the Parabola being known, is a known Proportion; and this was the firſt Attempt of this Nature. But it was afterwards ſoon demonſtrated alſo by Sir *Chriſtopher Wren*, my Lord *Brouncker*, and by Dr. *Wallis*. And the Year following, *viz.* 1658. Sir *Chriſtopher Wren* ſhewed the Curve of the Cycloid, to be Quadruple of its Axis: Which was the ſecond Demonſtration of a Straight Line equal to a crooked one. Of which ſee Dr. *Wallis*'s *Engliſh Algebra*, p. 292, *&c.* See more alſo in his Excellent Book *de Cycloide*.

RECTILINEAL, or Right-lined, in Geometry, is ſpoken of ſuch Figures as have their Extremities all Right Lines.

RECTI *Minores*, are two ſmall Muſcles of the Head, appearing both in Sight at once: They ariſe fleſhy from the Poſterior Part of the firſt *Vertebræ* of the Neck; and are ſo inſerted to the middle Part of the *Os Occipitis* in two ſhallow Depreſſures of the ſaid Bone. Theſe from their Uſe, may be called *Renuentes* or Nodders backwards, and are Antagoniſts to thoſe we call *Annuentes*.

RECTO, is a Writ of Right, and is of ſo high a Nature, that whereas other Writs in real Actions are only to recover the Poſſeſſion of Lands or Tenements in Quſtion, which have been loſt by our Anceſtors or our ſelves; this aimeth to recover both the Seiſin, which ſome of our Anceſtors or we had, and alſo the Property of the Thing whereof the Anceſtor died not Seized, as of Fee, and whereby are Pleaded and Tried both their Rights together, *viz.* as well of Poſſeſſion as Property: So that if a Man once loſe his Cauſe upon this Writ, either by Judgment, Aſſize, or Battle, he is without all Remedy, and ſhall be excluded *per exceptionem rei Judicatæ*.

It is divided into two Kinds, *Rectum Patens*, a Writ of right Patent; and *Rectum Clauſum*, a Writ of right Cloſe. This the *Civilians* call *Judicium Petitorum*. The *Writ of right Patent* is ſo called, be auſe it is ſent upon, and is in Nature the higheſt Writ of all others, lying always for him that hath Fee-ſimple in the Lands or Tenements ſued for, and not for any other. And when it lieth for him that Challengeth, Fee-ſimple, and in what Caſes, ſee F. N. B. *Fol.* 1. 6. This Writ is alſo called *Breve magnum de recto*. *A Writ of right Cloſe*, is a Writ directed to a Lord of *Ancient Demeſne*, and lieth for thoſe which hold their Lands and Tenements by Charter in Fee-ſimple, or in Fee-Tail, or for Term of Life, or in Dower, if they be ejected out of ſuch Lands, *&c.* or diſſeiſed. In this Caſe, a Man or his Heirs may ſue out this *Writ of right Cloſe*, directed to the Lord of the *Ancient Demeſne*, commanding him to do him right, *&c.* in his Court. And this is called, *Breve parvum de recto*.

RECTO *de Advocatione Eccleſiæ*, is a *Writ of Right* lying where a Man hath right of Advowſon, and the Parſon of the Church dying, a Stranger preſents his Clerk to the Church, and he not having brought his Action of *Quare Impedit* nor *Darrein Preſentment* within Six Months, but ſuffered the Stranger to Uſurp upon him. And this Writ he only may have, that claimeth the *Advowſon* to himſelf, and to his Heirs in Fee; and as it lies for the whole *Advowſon*, ſo it lies alſo for the half, third or fourth Part.

RECTO *de Cuſtodia terræ & hæredis*, was a Writ that lay for him whoſe Tenant holding of him in Chivalry, died in Nonage, againſt a Stranger that entred upon the Land, and took the Body of the Heir; and is now become uſeleſs as to Lands holden *in Capite*, or by *Knights Service*, but not when there is Guardian in *Socage*, or appointed by the laſt Will and Teſtament of the Anceſtor.

RECTO *de Dote*, is a Writ of Right of Dower, which lieth for a Woman that hath received Part of her Dower, and purpoſes to demand the Remainder in the ſame Town, againſt the Heir, or his Guardian, if he be a Ward.

RECTO *de dote unde nihil habet*, is a *Writ of Right*, which lies in caſe where the Huſband having divers Lands or Tenements, hath aſſured no Dower to his Wife; and ſhe thereby is driven to ſue for her Thirds, againſt the Heir or his Guardian.

RECTO *de rationabili parte*, is a Writ that lies always between Privies of Blood; as Brothers in *Gavelkind*, or Siſters, or other Coparceners, as Nephews or Nieces, and for Land in Fee-ſimple; as if a Man leaſe his Land for Term of Life, and afterwards dies, leaves iſſue two Daughters, and after that the Tenant for Term of Life dieth alſo, the one Siſter entreth upon all the Land, and ſo deforcing the other, the Siſter ſo deforced ſhall have this Writ to recover part.

RECTO *quando Dominus remiſit*, is a *Writ of Right*, which lies in caſe where Lands or Tenements being in the Seigniory of any Lord, are in Demand by a *Writ of Right*; for if the Lord hold no Court, or otherwiſe, at the Prayer of the Demandant, or Tenant, ſhall ſend to the Court of the King his Writ, to put the Cauſe thither for that Time, (ſaving to him at other Times the Right of his Seigniory) then the Writ iſſues out for the other Party, and hath the Name from the Words contained, being the true Occaſion thereof. This Writ is *Cloſe*, and muſt be returned before the Juſtices of the *Common-Bench*.

RECTO *ſur Diſclaymer*, is a Writ that lies when a Lord in the King's *Court of Common-Pleas* avows upon his Tenant, and the Tenant *diſclaimeth* to hold of him; upon which *diſclaimer* he ſhall have this Writ; and if the Lord averr and prove, That the Land is held of him, he ſhall recover the Land for ever.

RECTUM *Inteſtinum*, is the ſtrait Gut which begins at the firſt *Vertebra* of the *Os Sacrum*, and paſſeth ſtrait downward to the Extremity of the *Rump*, or utmoſt End of the Back-bone. It is about a Foot in length, and not ſo wide as the *Colon*, but its Membranes are thicker.

RECTUS *Femoris*, is a Muſcle of the Leg, ſo named from its ſtreight Progreſs and Situation; it ariſeth fleſhy from the Tubercle of the *Os Ilium*, that is in the Mid-way between the fore-part of its Spine and the *Acetabulum*, from thence deſcending directly between the *Vaſtus Externus* and *Internus*, and over the *Crureus*. Its Fibres externally deſcend from a middle Line obliquely Laterally: Internally

nally they run according to the Length, and become entirely Tendinous four Fingers breadth above the *Patella*, where it is united with the Tendons of the *Vaſtus Externus* and *Internus*, and *Cruræus*, and inſerted together with 'em at the Upper part of the *Tibia*. It ſerves to help to extend the *Tibia*.

RECTUS *in Curia*, ſignifies one that ſtands at the Bar, and no Man objects any thing againſt him. Alſo, when a Man hath reverſed the Outlawry, and can participate of the benefit of the Law, he is *Rectus in Curia*.

RECTUS *Internus Major*, is a Muſcle of the Head which ariſes Tendinous, but chiefly Fleſhy, from the fore-part of all the Tranſverſe Proceſſes of the *Vertebræ* of the Neck, except the firſt and ſecond, and in its Aſcent becoming Fleſhy, paſſes over thoſe two ſuperior *Vertebræ*, and is inſerted to the Anterior *Appendix* of the *Os Occipitis*, near the great *Foramen*, that tranſmits the *Medulla Oblongata*. This manifeſtly bends the Head forwards, and therefore may be called *Flexor Capitis*, from its Uſe.

RECTUS *Internus Minor*, is a Muſcle of the Head, which with its Partner appears on the Fore-part of the 1ſt *Vertebræ*, like the *Recti Minores* on the Back-part, and ariſe near its Tranſverſe Proceſſes, and aſcending directly, are inſerted to the Anterior *Appendix* of the *Os Occipitis* immediately under the former. Theſe nod the Head forward, and are Antagoniſts to the *Recti Minores*. Wherefore they may be called *Annuentes*.

RECTUS *Lateralis*, is a ſhort, thick, fleſhy, Muſcle of the Head, ariſing from the ſuperior part of the Extremity of the Tranſverſe Proceſs of the firſt *Vertebræ* of the Neck, between the former and *obliquus Superior*, thence aſcends directly to its Inſertion to the *Os Occipitis* in the Interſtice made by the *Proceſſus Mammillaris* and *Styloides*. This nods the Head to one ſide.

RECTUS *Major*, is a Muſcle of the Head, which ariſeth partly Tendinous, but chiefly Fleſhy, from the ſuperior Part of the double Spines of the ſecond *Vertebræ* of the Neck, and in its aſcent becomes broader and Fleſhy, and is ſo inſerted to the poſterior Part of the *Os Occipitis*: This Muſcle with its Partner acting, pulls the Head directly back on the firſt *Vertebræ*.

RECTUS *Muſculus*, one of the Muſcles of the *Abdomen*, ſo called from the Uprightneſs of its poſition. Its Uſe in common with the other Muſcles of this Part, is to help to exclude the *Fæces* and Urine, by the compreſſion of the *Abdomen*.

RECTUS *Palpebræ Superioris*, is a Muſcle which lifts up the upper Eye-lid.

RECURRENT *Nerves*, by ſome called *Vocal*, becauſe they are ſpent upon the Inſtruments of Speech, and which *Galen* ſaith he tried to cut, and by that means rendred the Animal *Mute*. This Dr. *Willis* takes to be a diſtinct Pair by it ſelf, but 'tis uſually reckoned a Branch of the *Par-vagum* or 8th Pair, ſpringing out of their Trunks, and ſo called, becauſe firſt they deſcend, and then aſcend again to ſupply the Muſcles of the *Larynx*.

REDDENDUM, a Word uſed ſubſtantively for the Clauſe in a Leaſe, *&c.* whereby the Rent is reſerved to the Leſſor.

REDDITION, is a Judicial Confeſſion and Acknowledgment, that the Land or thing in Demand, belongs to the Demandant, or at leaſt not to the Perſon ſo ſurrendring.

REDENT, in Fortification, is a Work made in Form of the Teeth of a Saw, with *Saliant* and *Reentring-Angles*, to the end that one part may defend another. Theſe ſort of Works are uſually erected on that ſide of a Place which looks towards a Marſh or River.

REDINTEGRATION, a reſtoring any Mixt Body or Matter whoſe Form is deſtroyed, to the ſame Nature and Conſtitution, and that it ſhall have the ſame Properties it had before.

The Honourable Mr. *Boyle*, hath a particular Tract about the *Redintegration* of Salt-petre; in which he proves, that after Nitre had been fluxed in a Crucible over a ſtrong Heat, and after all its volatile Parts had been forced away by the injection of lighted Coals ſo often into the Crucible, that no farther Detonation would happen; by which means the Salt-petre was turned into that Body which is called *Fixt Nitre*, and which is very nearly akin, in all its Properties, to fixt Salt of Tartar; yet he could very ſpeedily, by pouring to this fixt Salt-petre, either diluted with a due proportion of Water, or let run *per ſe* into a Deliquium, a ſufficient quantity of Spirit of Nitre, (which by the by amounted nearly to the quantity of that volatile Part which was burnt off) he could, I ſay, ſuddenly reproduce true Cryſtals of Salt-petre of the common Form and Virtue.

REDISSEISIN, is a *Diſſeiſin* made by him that once before was made and adjudged to have *Diſſeiſed* the ſame Man of his Lands or Tenements; for which there lies a ſpecial Writ, called a Writ of *Rediſſeiſin*.

RED-*Lead*, how made. See *Minium*.

REDOUBT, in Fortification, is a ſmall Fort of a ſquare Figure, having no Defence but in the Front, its uſe being to maintain the *Lines of Circumvallation*, *Contravallation*, and *Approach*. In Marſhy Grounds, theſe *Redoubts* are often made of Maſon's Work for the Security of the Neighbourhood. Their *Face* conſiſts of from ten to fifteen Fathom; the Ditch round about being from eight to nine Foot broad and deep, and their *Parapets* having the ſame thickneſs.

REDUBBORS, are thoſe which buy ſtollen Cloath, knowing it ſuch, and change it into ſome other Form or Colour that it may not be known.

REDUCING *Scale*, is a thin broad piece of Box with ſeveral different *Scales* of equal Parts, and Lines to turn Chains and Links into Acres and Rods, by Inſpection; and is uſed by Surveyors to reduce any Map or Draught. It is ſometimes called, the *Surveying-Scale*.

REDUCT, a Military term, ſignifying an advantageous piece of Ground, entrenched and ſeparated from the reſt of the Place, to retire to in caſe of ſurprize.

REDUCTION, in Aſtronomy, is the difference between the Argument of Inclination and the Eccentrical Longitude; that is to ſay, the Difference of the two Arches of the Orbit, and the Ecliptick, intercepted between the Node and the Circle of Inclination.

REDUCTION *of Decimals*. See *Decimals*.

REDUCTION *of Equations*, in Algebra, is the clearing of them from all ſuperfluous Quantities, and the ſeparating of the known Quantities from the unknown, to the end that at length every reſpective Equation may remain in the feweſt and ſimpleſt *Terms*, and ſo diſpoſed, that the known Quantity or Quantities may poſſeſs one

part thereof, and the unknown the other. See *Equation.*

REDUCTION *of Fractions.* See *Fractions.*

REDUCTION of Money, Weights, Meaſure, *&c.* is of two kinds. 1. When a Quantity is to be brought from any higher Denomination into a lower, and this is done, by conſidering how many of the next leſſer Denomination are contained in the next greater before, and by that number multiplying the greater; as *Pounds* are brought into *Shillings* by Multiplying by 20, *Shillings* into *Pence* by 12, and *Pence* into *Farthings* by 4. Alſo, *Troy-Weight* may be reduced into Grains, by Multiplying by 12, 20, and 24. And *Averdupois Great Weight* into Ounces, by 4, 28, and 16.

2. If it be to bring the lower to a higher, then divide the leaſt by ſo many of its Denominations as are contained in the next greater. Thus 24720 Pence is 103 Pounds: But if there remains any thing after Diviſion, they are the odd Pence and Shillings; as 6713 Pence *Reduced*, gives 27 *l.* 19 *s.* 5 *d.*

Note, That the way to *reduce* Shillings into Pounds, is to cut off the laſt Figure, and take half of the reſt, as in the laſt Inſtance.

13) 6713 (551 | 9 (27 *l.* 19 *s.* 5 *d.*

71

113

5 *d.*

After the ſame manner may *Troy* Weight, *Averdupois* Weight, or any other Weight or Meaſure be reduced.

Likewiſe *Foreign* Coin may be reduced into *Engliſh*, by turning the Value into *Engliſh* Coin of any Part: As, what is the value of 223 *Scotch Marks*, each equal to 13 *d.* $\frac{1}{2}$ *Engliſh?* which is 54 Farthings, and 223 by 54 = 12042 Farthings, which reduced backwards to Pounds, Shillings, and Pence, makes 12 *l.* 18 *s.* 10 $\frac{1}{2}$ *d.*

REDUPLICATIVE *Propoſitions*, are ſuch wherein the *Subject* is repeated: Thus, Men, as Men, are Rational; Kings, as Kings, are ſubject to none but God.

RE-ENTRING *Angle*, a Term in Fortification. See *Angle.*

RE-ENTRY, in Law, ſignifies the reſuming and retaking that Poſſeſſion which we had lately forgone: As if I make a Leaſe of Land or Tenement, I do therefore forego the Poſſeſſion; and if I do condition with the Leſſee, That for Non-payment of the Rent at the Day, it ſhall be lawful for me to *Re-enter*; this is as much as if I condition'd to take again the Lands, *&c.* into my own Hands, and to recover the Poſſeſſion by my own Fact, without the aſſiſtance of Judge, or other Proceſs.

REEF, a Term in Navigation: When there is a great Gale of Wind, they commonly roll up part of the Sail below, that by that means it may become the narrower, and ſo not draw ſo much Wind. And this contracting or taking up the Sail, they call a *Reef* or *Reefing* the Sail; and when it is done, they ſay the Sail is *Reefed.*

Alſo, when a Top-Maſt is *Sprung*, as they call it, *i. e.* crackt or almoſt broken in the Cap, they cut off the lower piece that was near broken off, and ſetting the other part, now much ſhorter, in the Step again, they call it a *Reeſt* Top-Maſt.

REEVE, is to put a Rope through a Block; and to pull a Rope out of a Block is called Unreeving.

REFLECTION, in general, is the regreſs or return that happens to a moving Body, becauſe of the meeting of another Body, which it cannot penetrate. Thus the material Rays of Light are reflected variouſly from ſuch Bodies as they cannot paſs through.

REFLECTION, in *Metaphyſicks*, Mr. *Lock* defines to be, That Notice which the Mind takes of its own Operations, and the Manner of them; by reaſon whereof there come to be Ideas of thoſe Operations in the Underſtanding.

REFLECTION *of the Rays of Light.* Sir *Iſaac Newton*, finding by Experiment that Light was an Heterogeneous Body, conſiſting of a Mixture of differently refrangible Rays; and conſequently concluding no farther Improvement could well be made in Optical Inſtruments in the Dioptrick way, he took *Reflections* into Conſideration, and tells us, that by their help, Optick Inſtruments might be brought to *any degree of Perfection*, if we could but find a reflecting Subſtance which would Polliſh as finely as Glaſs, reflect as much Light as Glaſs tranſmits, and be formed into a Parabolical Figure.

An Experiment of which he made in the kind of a Catoptrick Teleſcope, (which I have ſeen at *Greſham* College) and by which, tho' not above two Foot long, he could (he ſaith) diſcern the Jovial Satellites, and the Phaſes of *Venus*. *Phil. Tranſ.* N. 18. See Vol. 2.

REFLECTED *Ray*, or *Ray of Reflection*, is that whereby the *Reflection* is made upon the Surface of a reflecting Body.

REFLECTING, or *Reflexive Dyals*, are made by a little piece of Looking-Glaſs-Plate, duly placed, which reflects the Sun's Rays to the top of a Ceiling *&c.* where the Dial is drawn. This Glaſs ſhould be as thin as can well be ground. For the making of theſe Dials, there are many Methods: Of the two following, the 1ſt is Mr. *Collins*'s, the 2d Dr. *Clark*'s.

Firſt, Determine the moſt convenient Point in the Window, where to place the *Reflecting Glaſs*, as near the Ceiling as you can conveniently, provided it be not ſo near as that the Corniſh of the Window will ſhade the Glaſs when the Sun is high in Summer; ſuppoſe within about 10 or 11 Inches of the Ceiling, at leaſt of that Ceiling which belongs to the Window it ſelf; then from that Point draw a true Meridian upon a plane Horizontally placed againſt the determined Point in the Window, and to that Meridian fit an Horizontal Dial; but invert it ſo, that the Axis or Stile may point downward, and be under the Horizontal Plane, according to the Elevation of the Pole, which Stile muſt be placed truly alſo in the Plane of the Meridian; then by the help of a Thread running from the Centre along the Stile, find where that Stile would cut the Floor, or any other Place, if it were produced, and drive a Nail into that Point, and faſten alſo a Thread there long enough to be extended to any part of the Ceiling.

Faſten

Faſten alſo another long Thread to the Centre of the Horizontal Dial, which let it be extended Horizontally, as the Plane will direct, and exactly over every Hour-Line in order, whilſt in the mean time you extend the Thread which was faſtened to the Nail in the Stile, to the Ceiling, but ſo as it may touch the other Horizontal Thread: Then mark that Point in the Ceiling which the extended Thread toucheth, and make more ſuch Marks, whereby to draw the Hour-Lines upon the Ceiling; and do this in like manner for the reſt of the Hours, Half-Hours, and Quarters.

Then take all away, and place your Glaſs Horizontally; and becauſe your Glaſs hath ſome Thickneſs, place it a little under the determined Point, that the Centre of the Glaſs may be juſt in the imaginary Axis, which goes to the Nail; for whereſoever you place it, in that it will go true.

But becauſe it may be troubleſome to place an Horizontal Dial faſt enough and exactly, as alſo to find the Point where the Nail is to be driven, I will ſhew you another Method, which may be more eaſily practiſed.

Firſt, Draw an Horizontal Dial upon the back of ſome Table or Floor, and draw a Meridian upon the Bay-board of the Window, by a Thread or perpendicular black Line, paſſing through the Point where you intend your Reflecting Glaſs ſhall be, and by a Plumb-Line tranſlate it from the Bay-board to the Ceiling. Take the neareſt Diſtance between the Glaſs and the Ceiling; with this Diſtance come to the Horizontal Dial, and ſet one end of it on that Part of the Axis where the other will juſt touch the Meridian; that Point in the Axis may be called the Glaſs Point; from which erect a Perpendicular; and where it cuts the Meridian, make a Point, which will be the Equinoctial Point, from which alſo erect a Perpendicular, which will be a Tangent; then at ſome Diſtance on which Side of the Equinoctial Point you find moſt convenient, erect another Tangent there, two Tangets will cut the Hour-Lines in Points, which may be called the Hour-Points.

Then take the Diſtance betwixt the Glaſs-Points and the Equinoctial-Point, and extend it from the Glaſs toward the Meridian, and where it toucheth, that is the Equinoctial-Point upon the Ceiling.

Laſtly, Set off correſpondent Tangent-Lines upon the Ceiling, and make like Hour-Points, draw the Hour-Lines, you need not blot out the Equinoctial Tangent, it being pleaſant to ſee how the Sun will go in that Line all Day, when it is in the Equinoctial. Beſides, the Equinoctial-Point will tell you on that Day whether your Glaſs lie Horizontally, which is ſomewhat difficult otherwiſe to determine. Or upon any Day you may Calculate the Sun's Meridian Altitude, and ſee whether it falls juſt upon that Point in the Meridian at 12 a Clock.

This Dial is nothing but an Horizontal Inverted, the Center whereof is in the Air without, except you make a North Dial, and then it will be upon the Ceiling, which you muſt find by its Diſtance from the Equinoctial Point, and let that Centre govern your Tangents. The Ground of this Dial is, that the Angles of Reflection are equal to the Angles of Incidence.

Sometimes, inſtead of two Tangents, you may uſe two Circles, eſpecially when the Centre of the Dial is upon the Ceiling, or when your Glaſs is near the Window-Ceiling, then the Equinoctial Point will be upon that Ceiling, and you may project the Hour-Lines upon the Chamber Ceiling, or the Walls, by one Thread extended over the Hour-Lines, and another Thread touching that, and extended from the Equinoctial-Point, or any Point in the imaginary Axis to the Ceiling or Wall.

REFLECTING Teleſcope. See *Teleſcope*.

REFLEXION of the Moon, is (according to *Bullialdus*) her 3d Inequality of Motion; This *Tycho* calls by the Name of her *Variation*, which ſee.

REFLUX of the Sea, is the *Ebbing* of the Water off from the Shore; as its coming on upon it, or Tide of Flood, is called the Flux of the Sea. See *Tide*.

REFRACTED Angle, in Opticks, is the Angle contained between the refracted Ray and the Perpendicular.

REFRACTED Dials, may be made thus: Stick up a Pin, or aſſign any Point in any Concave Bowl, and make that the Center of the Horizontal Dial, aſſigning the Meridian-Line on the Edges of the Bowl, and taking away the Horizontal Dial, elevate a String or Thread from the end of the ſaid Pin faſtened thereto, over the Meridian-Line, equal to the Elevation of the Pole or Latitude of the Place; then with a Candle, or if you bring the Thread to the Shade upon any Hour-Point formerly marked out on the Edges of the Bowl, at the ſame time the Shade in the Bowl is the Hour-Line.

And if the Bowl be full of Water, or any other Liquor, you may draw the Hour-Lines, which will never ſhew the true Hour, unleſs filled with the ſaid Liquor again.

REFRACTION, in general, is the Incurvation or change of Determination in the Body moved, which happens to it, whilſt it enters or penetrates any *Medium*.

In Dioptricks, it is the Variation of a Ray of Light, from that right Line which it would have paſſed on in, had not the Denſity of the Medium turned it aſide.

Dr. *Hook* diſcovered by Experiment, That the *Sines* of the Angles of Incidence of the Rays of Light, are proportionable to the *Sines* of Refraction. See the Preface to *Micrographia*, where his Inſtrument is deſcribed, by which he made the Diſcovery.

Sir *Iſaac Newton* found that the Rays of Light are Incurvated or Refracted in their Motion, whenever they come near the Edges of any Body, tho' it be not Diaphanous. See *Light*.

And he thinks that the Errors of Refraction in Optick Glaſſes might be corrected, if two Spherical Glaſſes were combined together with Water included between them. And ſuch Glaſſes he judges preferable to Elliptical or Hyperbolical ones, becauſe (beſides that they can be more eaſily ground) they do more accurately refract the Pencils of Rays poſited without the Axis of the Glaſs.

Dr. *Wallis* in *Philoſ. Tranſ.* N. 187, ſaith, That tho' Refraction by Vapours near the Horizon, may make a thing appear higher, yet it cannot make it appear broader; whereas in Refraction by Glaſſes, the thing is apparently enlarged every way.

From whence it is, that the diverſe Power of Refraction in Fluids ariſes, is not eaſy to determine, tho' it would be of great Advantage if it could be diſcovered: Pure clear Water, of all Flu-

ids, refracts the Rays of Light the leaſt; and if it be impregnated with Salts, it increaſes the Refraction in Proportion to the Quantity and Weight of the Salts diſſolved in it.

The *Aquæ Stygiæ*, or corroſive Menſtruums, ſuch as *Aqua fortis*, &c. which are Salt diſſolved and rendred Corroſive by the Violence of the Fire, do yet much more refract the Sun's Rays; which need not be wondred at, becauſe theſe are much denſer and heavier Fluids than the former. But then why in ſuch light fine Fluids as Spirit of Wine and other Ardent Spirit; in Oil of Turpentine, which is ſo light and fine a Fluid, as to be generally called, an *Ethereal Oil*; why theſe, I ſay, ſhould produce ſo great a Degree of Refraction, as 'tis known they do, is a thing of great Difficulty to account for, and well deſerves a farther Enquiry into.

Dr. *Gregory* in his Aſtronomy, very well accounts for the Oval Figures which the Sun near the Horizon (eſpecially in high Latitudes) is ſometimes ſeen to put on from Refraction. For having before demonſtrated, That becauſe of the Earth's Atmoſphere all Bodies near the Horizon, will appear ſomething higher in the vertical Circle than they really are, and this the more, the nearer they are to the Horizon: He ſhews that the upper Margin of the Sun's Diſk being raiſed a little more than it ought to be, and the lower one a great deal more, the Sun's Vertical Diameter will ſeem to be contracted, but the Horizontal one will not, and therefore he will appear Oval. And for the ſame Reaſon, the obſerved Diſtance of two Fix'd Stars, is ſenſibly leſs (when meaſured by an Inſtrument) if they are in the ſame Vertical Circle, and one of them near the Horizon, than when they both have a conſiderable Altitude.

After this he ſhews how to determine the Quantity of the Refraction in any given Degree of Altitude, and to make a Table of it; thus.

Let ſome Fix'd Star having no ſenſible Parallax, and much elevated above the Horizon, be choſen, whoſe Place he ſhews how to determine at *P.* 164, *Prop.* 26, by Obſervations made when the Star is ſo high as to have no ſenſible Refraction. Then let the Time be noted when this Star hath any known Altitude, (as taken by an Inſtrument) and Calculation made for the true Altitude, (according to the Star's known Place) the Exceſs of the obſerved Altitude above this is the Refraction.

REFRACTION Aſtronomical, is that which the Atmoſphere produceth, whereby a Star appears more elevated above the Horizon than really it is.

REFRACTION Horizontal, is that which cauſeth the Sun or Moon to appear on the Edge of the Horizon, when they are as yet ſomewhat below it.

REFRACTION from the Perpendicular, is when a Ray falling, inclined from a thicker Medium into a thinner, as from Glaſs into Air, in breaking, departs farther from that Perpendicular.

REFRACTION to the Perpendicular, is when a Ray falling inclin'd from a thinner or more diaphanous Medium, upon a thicker or leſs tranſparent, as from Air upon Water, in breaking, comes nearer the Perpendicular, drawn from the Point of Incidence at Right Angles, on the Surface of the Water wherein the Refraction is made.

REFRANGIBLE, is whatever is capable of being Refracted.

REFRIGERATORY, is that Part of an Alembick or Diſtilling Veſſel which is placed about the Head of the Still, and filled with Water to cool the Head of the Alembick, that the Spirituous Vapours may the ſooner and the more eaſily condenſe into Drops. Cold Water muſt continually be put into the Refrigeratory, as the Veſſel grows hot. Moſt Apothecaries, Diſtillers, &c. that have Occaſion for drawing off large Quantities of Spirits, do now-a-days uſe the *Veſica* or Copper Body with its *Moors-Head* of the ſame Metal: and without any Refrigerations about the Head of the Still: But there is below, a long Worm or Serpentine in a Tub of Water, where the Spirituous Vapours are very eaſily condenſed into a Liquor. And this may as well be called a Refrigeratory as the former.

REFUTATIO *Feodi*, a Term in Civil-Law ſignifying the Loſs of a *Feudal Tenure* by Forfeiture; which is of two Kinds, either by not performing the Service required, or by committing ſome villanous Act againſt the Lord or Sovereign.

REGALIA, the Royal Rights of a King, reckoned by the *Civilians* to be Six. 1. Power of Judicature. 2. Power of Life and Death. 3. Power of War and Peace. 4. Materleſs Goods. 5. Aſſeſſments. 6. Minting of Money. Alſo, the Crown, Scepter with the Croſs, Scepter with the Dove, St. *Edward*'s Staff, four ſeveral Swords, the Globe, the Orb with the Croſs, and ſuch other like Things uſed at the Coronation of our Kings, are called *Regalia*.

REGARDANT, the Heralds Term for a Lion or ſuch kind of Beaſt of Prey, born in a Poſture of looking back behind him.

REGEL, or *Rigel*, a fix'd Star of the firſt Magnitude in *Orion*'s left Foot; its Longitude is 72 deg. 19 min. Latitude 30° 10′.

REGIMENT, is a Body of Troops of Horſe, or Companies of Foot, commanded by a Colonel; but the Number is as undetermin'd as that of the Men in a Troop or a Company. There are Regiments of Horſe that are not above 300 Men; and there are ſome in *Germany* of 2000; and the Regiment of *Picardy* in *France* conſiſts of 6000 Men.

REGIO *Aſſenſu*, is a Writ whereby the King gives his Royal Aſſent to the Election of a Biſhop.

REGION: *Fernelius* with ſome Anatomiſts, diſtinguiſh the *Cavities* of an Animal Body into ſeveral Regions or Parts, which they ſpecify into *Publick* and *Private*. The Publick are Three. The firſt includes the *Vena Porta*, and all Parts to which its Branches reach. 2. The Second begins at the Roots of the *Vena Cava*, and ends in the ſmall Veins before they become Capillary. The Third they make to contain the Muſcles, Bones, and Bulk of the Body: But this is not much received. The *Abdomen* is uſually diſtinguiſhed alſo into thre Regions, the *Uppermoſt*, *Middle*, and *Lower*.

REGION, is alſo taken for our *Hemiſphere*, or the Space within the Four Cardinal Points of the Heavens, or of the Air, &c.

—— In Geography, it ſignifies a large Extent of Land inhabited by many People of the ſame Nation, and encloſed within certain Limits or Bounds.

REGION *Elementary*, according to the *Ariſtotelians*, is a Sphere terminated by the Concavity of the Moon's Orb, comprehending the Earth's Atmoſphere.

REGION *Æthereal*, in Coſmography, is the vaſt Extent of the Univerſe; wherein are comprized all the Heavens and Celeſtial Bodies.

REGIONS of the Air, are diſtinguiſhed into *Upper*, *Middle*, and *Lower*.

REGISTERS, in a Chymical Furnace, are Holes purpoſely left in the Sides of the Furnace with Stopples to them, to let in or keep out the Air, according as the Fire is required to be greater or leſs.

REGIUS *Morbus*. See *Icterus*.

REGRATOR, ſignifies him that Buys and Sells any Wares or Victuals in the ſame Market or Fair, or within five Miles thereof. In the *Civil Law*, ſuch an one is called *Dardanarius*.

REGULAR *Body*, is a Solid whoſe Surface is compoſed of *Regular* and Equal Figures; and whoſe Solid Angles are all equal. Such as the,

1. *Tetrahedron*, which is a Pyramid, comprehended under Four Equal and Equilateral *Triangles*.

2. *Hexahedron*, or Cube, whoſe Surface is compoſed of ſix equal *Squares*.

3. *Octahedron*, which is bounded by eight Equal and Equilateral *Triangles*.

4. *Dodecahedron*, which is contained under 12 Equal and Equilateral *Pentagons*.

5. *Icoſihedron*, conſiſting of 20 Equal and Equilateral *Triangles*.

That there can be no more *Regular Bodies* beſides theſe, may be thus proved.

1. Of Equilateral Triangles, there muſt be three at leaſt to make a Solid Angle; and three of them joined together will make the *Tetrahedron*; for thoſe three Triangles meeting in a Point, do form a Triangular Baſe ſimilar and equal to the Sides; as appears by the bare Compoſition of the Figure. Four ſuch Triangles joined together in a Point, make the Angle of the *Octahedron*.

By joining five ſuch Triangles together, the Angle of the *Icoſihedron* is formed.

But ſix ſuch Triangles joined in a Point, cannot make a Solid Angle; becauſe they make four right ones; (for every Angle of an Equilateral Triangle is $\frac{1}{3}$ of two; or $\frac{2}{3}$ of one right Angle; either of which Fractions multiplied by Six, gives four right Angles) whereas every Solid Angle is made up of four ſuch plane Angles as all together muſt be leſs than four right ones: So that with Triangles 'tis impoſſible to form any more *Regular Bodies* than theſe three.

If you take *Squares* and join three of them together, they will make the Angle of a *Cube*; and there can no other *Regular Body* but a *Cube* be made with *Squares*; for four *Squares* joined together, will not make a Solid Angle, but a Plane.

If you join the Angles of three *Pentagons* together, you will conſtitute the Angle of the *Dodecahedron*. But four ſuch Angles cannot make a Solid one.

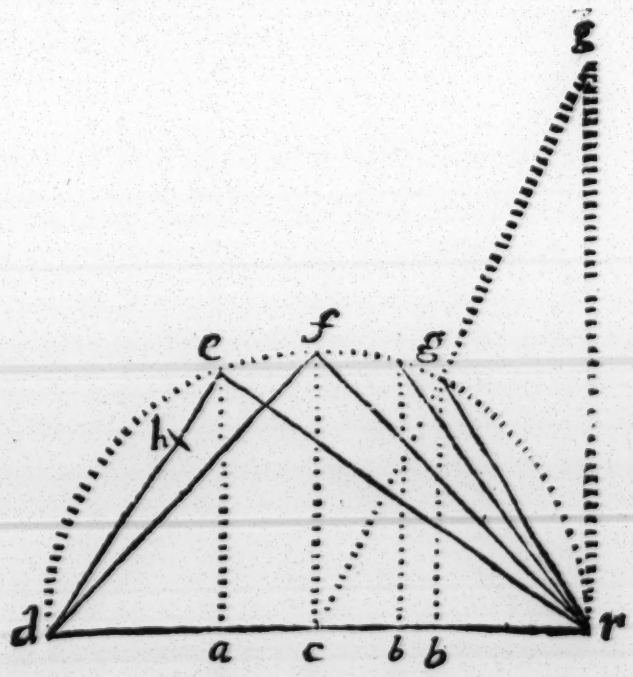
And three *Hexagons* joined together, do make juſt four right Angles, and therefore they cannot make a Solid Angle. And as for three *Heptagons*, or other Figures yet of more Sides, they can much leſs do it; becauſe their Angles being very obtuſe, three of them will exceed four right ones. So that upon the whole, 'tis plain, that of theſe Five *Regular Bodies*, three are made of *Triangles*, one of *Squares*, and one of *Pentagons*, and there can be no other.

The Proportion of the Sphere, and of the Five Regular Bodies *inſcribed in the ſame; from* Peter Horigon, Curſus Matth. *Vol.* 1. *P.* 779, *And* Barrow's *Euclid*, Lib. 13.

The Diameter of the Sphere being 2.

The Circumf. of the greateſt *Circle*	6. 28318
Superficies of the greateſt *Circles*.	3. 14159
Superficies of the *Sphere*	12. 56637
Solidity of the *Sphere*	4. 18859
Side of the *Tetrahedron*	1. 62299
Superficies of a *Tetrahedron*	4. 6188
Solidity of a *Tetrahedron*	0. 15132
Side of a *Cube* or *Hexahedron*	1. 1547
Superficies of the *Hexahedron*	8.
Solidity of the *Hexahedron*	1. 5396
Side of an *Octahedron*	1. 41421
Superficies of the *Octahedron*	6. 9282
Solidity of the *Octahedron*	1. 33333
Side of the *Dodecahedron*	0. 71364
Superficies of the *Dodecahedron*	10. 51462
Solidity of the *Dodecahedron*	2. 78516
Side of the *Icoſihedron*	1. 05146
Superficies of the *Icoſihedron*	9. 57454
Solidity of the *Icoſihedron*	2. 53615

If one of theſe *Five Regular Bodies* were requir'd to be cut out of the Sphere of any other Diameter, 'twill be as the Diameter of the Sphere 2 is to the Side of any one Solid inſcribed in the ſame, (ſuppoſe the Cube 1. 1547) ſo is the Diameter of any other Sphere (ſuppoſe 8.) to 9. 2376, the Side of the *Cube* inſcribed in this latter Sphere.



Let *dr* be the Diameter of any Sphere, and *da* $\frac{4}{3}$ of it. $= ab = br$. Erect the Perpendiculars *ae*, *ef*. and *bg*, and draw *de*, *df*, *er*, *fr*, and *gr*.

Then

Then will

1. *re* be as the Side of the Tetrahedron.
2. *df* is the Side of the Hexahedron.
3. *de* is the Side of the Octahedron.
4. Cut *de* in extream and mean Proportion in *h*, and *dh* will be the Side of the Dodecahedron.
5. Set the Diameter *dr* up perpendicularly at *r*, and from the Centre *c*, to its Top, draw the Line *cg* cutting the Circle in *g*. Let fall the Perpendicular *gb*. So is *br* the Side of the *Icosihedron*.

REGULAR *Figures*, in Geometry, are such whose Sides, and consequently their Angles, are all equal to one another.

Whence all *Regular* Multilateral Planes are call'd *Regular Polygons*.

The Area of such Figures is speedily found by multiplying a Perpendicular let fall from the Centre of the Inscribed Circle to any Side by half that Side, and then that Product by the Number of the Sides of the Polygon.

REGULAR *Fortification*. See *Fortification*.

REGULAR *Curves*, are such *Curves* as the Perimeters of the Conick Sections, which are always curved after the same Regular Geometrical manner

But *Irregular* Curves, are such as have a *Point of Inflexion*; and which being continued, do turn themselves a contrary way, as the *Conchoid*, and the Solid *Parabola* which hath a Square for its *Parameter*.

REGULATOR, a small Spring belonging to the *Balance* in the new Pocket-Watches.

REGULUS. See *Basilicus*.

REGULUS, or *Regule*. When any Metal or Mineral is separated in a Crucible, by Purification, from its more gross and terrene Parts, the finer and metalline Parts will sink to the Bottom of the Crucible. And this the Chymists call *Rex* or *Regulus*, the Royal or Noble Part of the Mixt.

REGULUS *of Antimony*, is thus made. Mix together 16 Ounces of Antimony, 12 of Crude Tartar, and 6 of Salt-petre, all well powdered; then heat a large Crucible red hot, and throw into it a Spoonful of the Mixture, presently Covering the Crucible with a Tile; repeat this Spoonful by Spoonful till all the Matter is thrown in. Then make a great Fire about the Crucible, and when the Matter hath been a while melted, pour it into an Iron Mortar greased a little with Suet, and warm'd; knock the Mortar on the Side with the Pestle, to make the Regulus precipitate to the Bottom. When 'tis cold separate it from the Dross, then Powder it, and melt it again in another Crucible, with a little Salt-petre thrown on it when 'tis in Fusion. Cast it out as before into a greased Morter, or mould it into Pills, Cups, &c.

For of this Regulus is made the *Antimonial Cup*, and the Regulus. If you powder four Ounces of it, and Calcine it in an Earthen Pan, unglazed, over a small Fire, stirring the Powder all the while with a Spatula, a Fume will arise, for about an Hour and half or two Hours, the Powder will turn grey, and at the End of that small Time, will Weigh near two Drams and an half, more than the Powder did at first, tho' it fumed all the time; which may satisfy us, that some Bodies have their Pores so adapted, that they can detain the very Particles of Fire themselves, and Incorporate with them. An Augmentation of Weight happens in making the Calx of Lead, and some others, but not in such a degree, nor so soon as this.

If an Ounce of the Dross of the Regule of Antimony, be boiled in a Pint of Water, and then set to stand and cool without stirring it, it will coagulate into a Substance very like to Blood, but not so red.

The Chymists make much ado about a Regulus of Antimony made with Steel, because of a kind of Star that appears in the Bottom of it: But it hath no other Virtues than this described above. You may see the way of making it in *Lemery*, *p.* 265. last Edit. and in many other Chymical Authors.

If Antimony be calcined in an Earthen Pot unglazed, and continually stirring till no more Fumes arise; and afterwards the Matter be put into a Crucible, and in a very violent Fire melted and kept an Hour in Fusion, it will be turned into a reddish Opake Glass, which they call Glass of Antimony, and is a most violent Emetick.

REJOYNDER, in Law, signifies an Answer or Exception to a Replication; for first the Defendant puts in an Answer to the Plaintiff's Bill, which is sometimes called, *An Exception*, the Plaintiff's Answer to that is called, a *Rejoynder*, especially in Chancery. 'Tis by the Civilians called *Duplicatio*.

RELAIS, a *French* Term in Fortification, the same with *Berme*.

RELATION *Inharmonical*, a Term in Musical Composition, signifying a harsh Reflection of Flat against Sharp, in a cross form, *viz.* When some harsh and displeasing Discord is produced, in comparing the Present Note of another Part.

RELATIVE *Gravity*, the same with *Specifick*; which see.

RELATIVE *Propositions*, are those that include some Comparison, and some Relation, thus: Where the Treasure is, there is the Heart: As much as thou hast, so much art thou worth.

RELAXANTIA. See *Chalastica*.

RELAXATION, is a Dilatation of parts or Vessels.

RELEASE, in Law, is an Instrument whereby Estates, Rights, Titles, Entries, Actions, and other things, be sometimes extinguished, sometimes transferred, sometimes abridged, and sometimes enlarged; and is either *in Fact* or *in Law*.

A *Release in Fact*, is that which the very Words expresly declare.

A Release in Law, is that which doth Acquit by way of Consequence or Intendment of Law.

RELEGATION, in Law, signifies a Banishment for a certain time.

RELEIFE, or *Relievo*, is the Protuberant jetting or standing out of any Figures or Images above the Plain on which they are formed. And whatever Figures or Representations are thus cut, stamped, or otherwise wrought, so that not the entire Body, but only part of it is raised above the Plain, is said to be done in *Releife*; and when the Work is low, flat, and but a little raised, 'tis called *Basse Releife*, or *Low Releife*. When a Coin or a Medal hath its Figure low and thin, and hardly distinguishable from the Plain, we say its *Releife* is low and weak; but when 'tis much raised, we say 'tis Bold, and its Releife is Strong.

RELEVISH, in Law, signifies to let one to Mainprise upon Surety.

RELICTA

RELICTA *Verificatione*, is when a Defendant hath Pleaded, and the Iſſue is entred of Record, and after that the Defendant *Relicta Verificatione*, (*que eſt ſon Plea*) acknowledges the Action, and thereupon Judgment is entred for the Plaintiff.

REMAINDER, in Law, is an Eſtate limited in Lands, Tenements, or Rents, to be enjoyed after the Expiration of another particular Eſtate. As a Man may let to one for Term of his Life, and the Remainder to another for the Term of his Life; and this Remainder may be either for a certain Term, or in Fee-ſimple, or Fee-taile; the Difference between a Remainder and Reverſion, is this, That by a Reverſion, after the appointed Term the Eſtate returns to the Donor, or his Heirs, as the proper Fountain; whereas by Remainder, it goes to ſome third Perſon, or a Stranger.

REMEMBRANCE, is when the Idea of ſomething formerly known, recurs again into the Mind, without the Operation of the like Object on the External Senſory.

REMEMBRANCERS *of the Exchequer*, are three Officers or Clerks there, viz. *The King's Remembrancer*, *the Lord Treaſurer's Remembrancer*, and *the Remembrancer of the firſt Fruits*.

The King's Remembrancer enters into his Office all Recognizances, taken before the Barons for any of the King's Debts, for Appearance, or for obſerving Orders; and maketh out Proceſs againſt the Collectors of Cuſtoms, Subſidies, and Fifteenths for their Accounts: All Informations upon Penal Statutes, are entred in this Office, and there all Matters upon *Engliſh* Bills in the Exchequer-Chamber remain: He makes the Bills of Compoſition upon Penal Laws, takes the Scalment of Debts, has Delivered into his Office all manner of Indentures, Fines and other Evidences whatſoever, that concern the aſſuring of any Lands to the Crown: He every Year *in craſtino animarum* reads in open Court, the Statute for Election of Sheriffs, and gives them their Oath: and he reads in open Court the Oath of all the Officers of the ſame, when they are admitted, beſides many other Things.

The Lord Treaſurer's Remembrancer, upon whoſe Charge it lies, to put the Lord Treaſurer, and the reſt of the Judges of that Court, in Remembrance of ſuch Things as are to be call'd on, and dealt in for the King's Behoof. He makes Proceſs againſt all Sheriffs, Eſchearors, Receivers and Bailiffs, for their Account: He makes Proceſs of *Fieri facias* & *Extent*, for any Debts due to the King either in the Pipe or with the Auditors; makes Proceſs for all ſuch Revenues as are due to the King, by reaſon of its Tenures: He makes Record, whereby it appears whether Sheriffs, and other Accountants, pay their *Profers* due at *Eaſter* and *Michaelmas*. He makes another Record, whether Sheriffs, and other Accountants, keep their Days of Preſixion. All Eſtreats of Fines, Iſſues, and Amerciaments, ſet in any Courts at *Weſtminſter*, or at the Aſſizes, or Seſſions, are certified into this Office, and are by him delivered to the Clerk of the Eſtreats, to write Proceſs upon them, &c.

The Remembrancer of the Firſt Fruits, takes all Compoſitions and Bonds, for Firſt Fruits, and Tenths, and makes Proceſs againſt ſuch as do not pay the ſame.

REMINISCENCE, is the Power which the Humane Mind hath of recollecting it ſelf, or calling again to its Remembrance ſuch Ideas or Notions which it had really forgot: In which it differs from *Memory*, which is a treaſuring up of things in the Mind, and keeping them there without forgetting them.

REMISSION, is a Word uſed by Phyſical Writers, to ſignify the Abatement of the Power or Efficacy of any Quality, as when it is increaſed, they ſay 'tis Intended; and all Qualities are thus capable of *Intenſion* or *Remiſſion*.

See in the Word Quality, a Demonſtration that the *Intenſion* of all Qualities decreaſes, as the Squares of the Diſtance from the Centre of Action reciprocally.

REMITTER, in a Legal Senſe, is to reſtore one that hath two Titles to Lands or Tenements, and is ſeized of them by a latter Title which is diſcovered to be defective, to the former and more ancient Title, that ſo he may continue in Quiet Poſſeſſion.

RENAL *Artery*, is ſaid by ſome, to come out of the *Aorta*, and to enter into the Kidneys, bringing to it the Seroſity of the Arterial Blood.

RENALIS. See *Adipoſa Vena*.

RENDER, in Law, is a Word uſed in levying of a Fine, which is either ſingle, whereby nothing is granted or rendred back again by the Cogniſee to the Cogniſor, or double, which containeth a Grant or render back again of ſome Rent, Common, or other Thing out of the Land it ſelf to the Cognizor, &c.

Alſo, there be ſome Things in a Mannor that lie in *Prender*: that is, which may be taken by the Lord or his Officer, when they change, without any Offer made by the Tenant, as Eſcheats, and the like: and ſome that lie in *Render*; that is, muſt be delivered or anſwered by the Tenants, as Rents, Reliefs, Heriots, and other Services. Alſo ſome Service conſiſts in Seiſance, ſome in *Render*.

RENDS in a Ship, are the ſame as the Seams between her Planks.

RENES, the *Reins* or *Kidneys*; there are always two of them, and placed in the *Abdomen* between the two Membranes of the *Peritonæum*, and adjoining to the Sides of the *Aorta* and *Vena Cava*, the Right Kidney lies lower in Men, and is ſomething leſs than the left: They are covered with a double Membrane; of which the outwardmoſt is common, proceeding from the *Peritonæum*: and is called the *Membrana Adipoſa*, from its being covered with Fat, in Fat and Corpulent People: into this the *Arteria Adipoſa* enters from the *Aorta*; and the *Vena Adipoſa* goes out from it, which the right Kidney uſually ſends into the *Emulgent Vein*, rarely into the *Cava*, but the left Kidney generally into the *Cava*. By means of this *Membrane*, both the Kidneys are joined to the *Loins* and *Diaphragma*: The right one to the *Cæcum Inteſtinum*, and ſometimes to the Liver, and the left is connected by it to the Spleen and Colon.

Its Interior Membrane or Tunick, and which is proper to it, is taken from the External Root of thoſe Veſſels which enter the Kidneys, (and which do enter it but with a ſingle Coat:) and this hath ſome ſmall Nerves from a Branch of the ſixth Pair, and from the *Stomachick Branch*, which give the Kidneys but a dull ſmall Senſe, but afterwards branched out into the *Ureters*, render them extreamly ſenſible; and thoſe Nerves (by Conſent of Parts) cauſe that Vomiting which uſually accompanies Nephritick Pains. The Kidneys have two Eminent Blood Veſſels, the *Emulgent Vein and Artery*; of which the later diſtributes the Blood from

the *Aorta* into the Body of the Kidneys, and the former brings it back again.

RENES *Succenturiati*, are a Pair of Glandulous Bodies placed above the Reins or Kidneys: Their Uſe (by ſome) is ſuppoſed to be, to receive the Lympha into their Cavities, thereby to attenuate and render more fluid and capable of Circulation, the Blood returning from the Kidneys, where it hath parted with its *Serum*. But we are yet, ſaith Dr. *Gibſon*, in the dark as to their true Uſe: They are called alſo *Glandulæ Renales*, and by *Bartholin Capſulæ Atrabilariæ*: By Dr. *Wharton*, *Glandulæ ad Plexum Nerveum ſitæ*. They are larger in Children than in Men; being in the former near as big as the Kidneys, but they do not increaſe proportionably as other Parts do.

RENITENCY, is that Reſiſtance which there is in Solid Bodies when they preſs upon, or are impelled one againſt another, or that Reſiſtance that any heavy Body makes on the Account of its Weight, to our Arm or Hand when we lift it up.

RENT, ſignifies a Sum of Money, or other Conſideration iſſuing Yearly out of Lands or Tenements; of which Lawyers reckon three Sorts, *viz. Rent-ſervice*, *Rent-charge*, and *Rent-ſeck*: *Rent-ſervice*, is where a Man holds his Lands of his Lord by Fealty, and certain Rent, or by Fealty Service, and certain Rent, or that which a Man making a Leaſe to another for Term of Years, reſerveth Yearly to be paid for them. *Rent-charge*, is where a Man makes over his Eſtate to another, by Deed indented, either in Fee, or Fee-taile, or for Term of Life, yet reſerves to himſelf, by the ſame Indenture, a Sum of Money Yearly to be paid to him, with Cauſe of Diſtreſs for Non-payment. *Rent-ſeck*, or Dry Rent, is that which a Man making over his Eſtate by Deed indented, reſerveth Yearly to be paid to him without Cauſe of Diſtreſs, mentioned in the Indenture.

REPARATIONE *facienda*, is a Writ which lies, in divers Caſes, whereof one is, where three are Tenants in Common, or Joint-tenants, *pro indiviſo*, of a Mill or Houſe which is fallen to decay, and the one being willing to repair it, the other two will not; in this Caſe the Party willing ſhall have this Writ againſt the other two.

REPELLENT *Medicines*, are ſuch Things as by ſtopping the Heat and Afflux of Humours, and by ſhutting up the Pores with their cold and binding Qualities, decreaſe the ſwelling of a Part, and drive the Humours another way.

REPETITION, (a Figure in Rhetorick) is when a Perſon thinking his firſt Expreſſion not well underſtood, and is impatient to make his Hearers know what he means, repeats or explains it, another way.

REPLEADER, in Law, is to plead againſt that which was once pleaded before.

REPLEGIARE, ſignifies properly to redeem a Thing detained or taken by another, by putting in legal Sureties. See *Replevin*.

REPLEGIARE *de averiis*, is a Writ brought by one whoſe Cattle are diſtrained, or put in the Pound, upon any Cauſe by another, upon Surety, given to the Sheriff to proſecute or Anſwer the Action in Law.

REPLEVIN, is a Writ that lies where a Man is Diſtrained for Rent or other Thing, then he ſhall have this Writ to the Sheriff, to deliver to him the Diſtreſs, and ſhall find Surety to purſue his Action againſt the Diſtrainer; and if he purſue it not, or if it be found or judged againſt him, then the Diſtrainer ſhall again have the Diſtreſs, and he ſhall have in ſuch Caſe a Writ called, *Returno habendo*. Goods may be replevied two Ways, *viz.* by Writ; and that is by the Common Law; or by Plaint, and that is by Statute Law for the more ſpeedy having again of their Cattle and Goods.

REPLICATION, is an Exception of the ſecond Degree, made by the Plaintiff, upon the firſt Anſwer of the Defendant: It is alſo, that which the Plaintiff replies to the Defendant's Anſwer in Chancery, which is either *General* or *Special*.

The Special is grounded upon Matter ariſing out of the Defendant's Anſwer, *&c.*

The General is ſo called from the general Words therein uſed.

REPORT, in Law, is a publick Relation of Caſes Judicially argued, debated, reſolved, or adjudged, in any of the King's Courts of Juſtice, with the Cauſe and Reaſons of the ſame delivered by the Judges. Alſo when the *Chancery*, or other Court, refer the ſtating of ſome Caſe, or comparing an Account, *&c.* to a Maſter of Chancery, or other Referree, his Certificate therein is called, a Report.

REPRISALIA, the ſame with *Clarigatio*.

REPRISES, is commonly (in Law) taken for Deductions and Duties which are Yearly paid out of a Mannor and Lands, as *Rent-charge*, *Rent-ſeck*, *Penſions*, *Corrodies*, *Annuities*, *Fees of Stewards or Bailiffs*, &c. Wherefore when we ſpeak of the clear Yearly Value of a Mannor, we ſay it is ſo much *per Annum ultra repriſas*, beſides all Repriſes.

REPRIEVE, in Law, is properly to take back, or ſuſpend a Priſoner from the Execution and Proceeding of the Law for that time.

REPTILS, are all thoſe *Creeping Animals* which reſt upon one Part of their Body while they advance the other forward; as *Adders*, *Aſps*, *Snakes*, *Earthworms*, &c.

RESCEIT, is an Admiſſion, or reciving a third Perſon to plead his Right in a Cauſe formerly commenced between other two; as if a Tenant for Life or Years bring an Action, he in the Reverſion comes in, and prays to be received to defend the Land, and to plead with the Demandant. The Civilians call this *Admiſſionem tertii pro ſuo intereſſe*.

Reſceit is alſo applied to an Admittance of Plea, tho' the Controverſy be only between two.

RESCOUS, or *Reſcue*, in Law, is a Reſiſtance againſt lawful Authority; as if a Bailiff, or other Officer, upon a Writ do Arreſt a Man, and others by Violence take him away, or procure his Eſcape, this is a *Reſcous in Fact*: So, if one diſtrain Beaſts for Damage feaſant in his Ground, and as he drives them in the High-way towards the Pound, they enter into the Owner's Houſe, and he withholds them there, and will not deliver them upon Demand, this Detainer is a *Reſcous in Law*. It is alſo uſed for a Writ which lies for this Fact, called *Breve de Reſcuſſu*. *Reſcous*, in Matters relating to Treaſon, is Treaſon; and in Matters concerning Felony, is Felony.

RESCUSSOR, is he that commits ſuch a *Reſcous*.

RESERVATION, in Law, ſignifies a Keeping or Providing; as when a Man lets his Land, he reſerves a Rent to be paid to himſelf for his Maintenance. Sometimes it ſignifies as much as an Exception; as when a Man lets a Houſe, and reſerves

ſerves to himſelf one Room, that Room is excepted out of the Demiſe.

RESIANCE, or *Reſidence*, ſignifies a Man's Abode or Continuance in one Place: And it is all one indeed with *Reſidence*; but that Cuſtom ties this only to Perſons Eccleſiaſtical.

RESIDENCE, is a Word peculiarly uſed both in the Common and Canon-Law, for the Continuance or Abode of a Parſon or Vicar upon his Benefice.

RESIDUAL *Figure*, in Geometry, ſignifies the remaining Figure after Subſtraction of a Leſſer from a greater.

RESIDUAL *Root*, in Mathematicks, is one compoſed of two Parts or Members only connected together with the Sign — : Thus $a - b$, or $5 - 3$, is a *Reſidual Root*; and is ſo called, becauſe its true Value is no more than its *reſidue* or difference between the Parts *a* and *b*.

RESIGNATION, is a Word uſed for the giving up of a Benefice into the Hands of the Ordinary, otherwiſe by the *Canoniſts* termed *Renunciation*: And though it ſignifies all one in Nature with the Word *Surrender*, yet it is by Cuſtom reſtrained to the yielding up a Spiritual Living, and *Surrender* to the giving up of Temporal Lands into the Hands of the Lord.

RESINA, in *Pharmacy* and *Botany*, is a fat and oleaginous Liquor flowing either Spontaneouſly, or elſe let out by Inciſion from any Tree or Plant. It will not diſſolve in Water, but in Oil only, and is eaſily Inflammable.

RESINE, or *Roſine*, of Jalap, Benjamin, Scammony, Turbith, &c. or of any Vegetable which abounds with Roſinous Particles, is thus made in Chymiſtry.

The Vegetable groſly Powdered, is put into a Matraſs, and then well rectified Spirit of Wine is poured on it to the Height of four Fingers above the Matter; then another Matraſs hath its Neck fitted and luted into the former to make a double Veſſel; and thus the Matter is digeſted for 3 or 4 Days in a Sand Heat, or till it hath given a good Tincture to the Spirit of Wine: Then the Diſſolution is filtrated; and two Thirds of the clear Liquor is evaporated off, the Remainder is poured into a large Veſſel of Water, and it will turn into a Milk, and the *Reſine* will in time precipitate to the Bottom in a white Powder. It muſt be waſh'd and dry'd in the Sun, and it will grow hard like common *Roſine*.

RESISTENCE *of the Medium*, is the Oppoſition againſt, or Hindrance of the Motion of any Body moving in a Fluid; as in the Air, the Water, the Æther, &c. And *this*, together with the Gravity of Bodies, is the Cauſe of the Ceſſation of the Motion of Projectiles, &c. This *Reſiſtence*, in Mediums which are very Denſe and Rigorous, ſo that Bodies can there move but very ſlowly, is nearly as the Velocity of the moving Body: But in a Medium free from all ſuch Rigor, as the Squares of the Velocities, *Newt. Princip.* P. 245. For by the Action of a ſwifter Body, there is communicated to the ſame Quantity of the Medium, a greater Motion, in Proportion to that greater Swiftneſs or Velocity; and therefore in an equal Time, (by reaſon of the greater Quantity of the Medium being moved) the Motion will be communicated in a duplicate Ratio: But the Reſiſtance muſt always be as the Motion communicated, becauſe Action and Re-action are equally contrary.

He found alſo the Thing to be true by Experiment, in a Pendulum of 10 Feet in Length; that the Reſiſtence againſt a Globe or Ball moving ſwiftly in our Air, is nearly in a duplicate Ratio of its Velocity: But if it move Slower, a little greater than in that Proportion, P. 339.

He found alſo by making a Leaden Bullet ſwing as a Pendulum in a Veſſel of Water, that the Reſiſtence of Water in Proportion to Air, is as 535 to $\frac{123}{110}$.

Dr. *Wallis* hath an entire Diſcourſe on this Subject in *Phil. Tranſ.* N°. 186, where he premiſes as a *Lemma*, That ſuppoſing all other Things equal, the Reſiſtence of Bodies is always proportionable to the Velocity; ſince in a double Degree of Velocity there is twice as much Air to be moved in the ſame time, &c.

As to the different Reſiſtences which Bodies of different Figures will find in paſſing through any Medium, Sir *Iſ. Newton* proves, *Prop.* 34. *Theor.* 28.

That if a Globe and Cylinder with equal Diameters be moved according to the Direction of the Axis of the Cylinder, that the Globe's Reſiſtence will be but half of the Cylinders.

And in the following Scholium, he ſhews what kind of Figure revolving round an Axis, will generate a Solid that ſhall move in any Medium, with the leaſt Reſiſtence; and gives a Hint of the Uſe that this may be of for *Building of Ships*.

After this, ſeveral Inveſtigations of the Figure of a roundiſh Solid, which ſhould move through a Medium with the leaſt Reſiſtence, were publiſh'd by the Marquis *Hoſpital*, *Bernoulli*, and very briefly and clearly by Mr. *John Craig* in the *Phil. Tranſact.* N. 268. Where he ſolves the Problem, to determine the Curve, by whoſe Rotation round an Axis, a round Solid ſhall be generated, which being moved according to the Direction of that Axis, ſhall have the leaſt Reſiſtence in any Medium.

RES *Naturales*: Natural Things are Three; Health, the Cauſes of Health, and its Effects. Others reckon Seven; as the Elements, Temperaments, Humours, Spirits, Parts, Faculties, Actions: but Elements and Temperaments belong to Natural Philoſophy; Humours, Spirits and Parts, are reckoned amongſt the Cauſes of Health, which conſiſt of a good Temperature, and a due Conformation; Faculties and Actions are comprehended under the Effects of Health. *Blanchard.*

RES *Non-naturales*: Things that are not Natural, are Six; Air, Meat and Drink, Motion and Reſt, Sleeping and Waking, the Affections of the Mind, Things that are let out of, and Things retained in the Body. They are ſo called, becauſe that if they exceed their due Bounds, they often occaſion Diſeaſes. *Blanchard.*

RESOLVEND, a Term in the Extraction of the Square and Cube Roots, &c. ſignifying that Number which ariſes from augmenting the Remainder after Subſtraction, by drawing down the next Square Cube, &c. and writing it after the ſaid Remainder.

RESOLUTION (in Mathematicks) is a Method of Invention, whereby the Truth or Falſhood of a Propoſition, or its Poſſibility or Impoſſibility is diſcover'd, in an Order contrary to that of *Syntheſis*, or Compoſition: For in this Analytical Method, the Propoſition is propoſed as already known, granted, or done; and then the Conſequences thence deducible are Examined, till at laſt you come to

ſome known Truth or Falſhood, or Impoſſibility, whereof that which was propoſed is a neceſſary Conſequence, and from thence juſtly conclude the Truth or Impoſſibility of the Propoſition: Which if true, may then be demonſtrated in a Synthetical Method. This Method of Reſolution conſiſts more in the Judgment, Penetration, and Readineſs of the Enquirer or Artiſt, than in any Particular Rules: Tho' thoſe of Algebra are of neceſſary Uſe, and a good Treaſure of Geometry in his Head will be of great Advantage to him in all Manner of Inveſtigations.

RESORT, or *Reſtort*, is a Law Word, properly uſed in a Writ of Tail of Couſenage, as *Deſcent* is in the Writ of Right.

RESPECTU *computi vice-comitis habendo*, is a Writ for the reſpiting of a Sheriff's Account, upon juſt Occaſion directed to the Treaſurer and Barons of the *Exchequer*.

RESPIRATION, Ἀναπνοή, includes both In-and Expiration, and is an alternate Dilatation and Contraction of the Cheſt, whereby the Air is taken in by the Wind-pipe for the Accenſion of the Blood, and by and by is driven out again with other Vaporous Effluviums. The Cauſe of Reſpiration does not ſeem to conſiſt in the Dilatation and Contraction of the *Thorax*, as is commonly thought, but in the Contraction of the Tunic, which covers the upper Part of the *Oeſophagus* and the Wind-pipe, as far as its cloſeſt Receſſes. *Blanchard.*

There are many Opinions about the Uſes of Reſpiration: Some think the chief, if not the ſole Deſign of it, is to cool and temper the Heat of the Blood, and the Heart.

Others will have the Subſtance of the Air to get by Reſpiration into the Veſſels of the Lungs to the left Ventricle of the Heart; not only thereby to cool the Blood, but alſo help to generate aerial Spirits. This was the Opinion of *Hippocrates*, *Ariſtotle* and *Galen*.

Others take, with more Probability, *Reſpiration* to ſerve for the *Ventilation* of the Blood in the Lungs, in its Paſſage through them, whereby 'tis diſburthened of many Excrementitious Steams and Superfluous Seroſities, which are carried off by the Breath in Expiration; ſo that the Blood may be advantageouſly depurated, by what is carried off by the Emunctory of the Lungs.

In the *Philoſ. Tranſ.* N° 65, there is a very pretty Account of the Cauſe and Manner of Reſpiration, by the Famous *Laur. Bellini*.

RESPITE, a Word uſed in Law, for Delay, Forbearance, or Continuance of Time.

RESPITE *of Homage*, is the Forbearing of *Homage*, which ought firſt of all to be performed by the Tenant that holdeth by *Homage*; and it had the moſt frequent Uſe in ſuch as held by Knight-Service in *Capite*, who did pay into the *Exchequer* every fifth Term, ſome ſmall Sum of Money, to be *reſpited* the doing of their *Homage*. See the *Stat.* 12. *Car.* 2. *cap.* 24. whereby this is taken away as a Charge incident or ariſing from *Knights-Service*.

RESPONSALIS, in Law, he who gives an Anſwer, is he that appears for another in Court at a Day aſſigned: As if *Eſſoigniator* came only to declare the Cauſe of the Parties Abſence, whether Demandant or Tenant; and *Reſponſalis* came for the Tenant, not only to excuſe his Abſence, but alſo ſignify, what Trial he meant to undergo.

REST, in Muſick. See *Pauſe*.

RESTITUTION, the returning of Elaſtical Bodies forcibly bent to their natural State, is called the *Motion of Reſtitution*.

RESTITUTION, in Law, ſignifies the yielding up again, or reſtoring of any Thing unlawfully taken from another: As alſo the ſetting him in Poſſeſſions of Lands or Tenements that hath been unlawfully diſſeiſed of them.

RESTITUTIONE *extracti ab Eccleſia*; is a Writ to reſtore a Man to the Church, which he had recovered for his Sanctuary, being ſuſpected of Felony.

RESTITUTIONE *Temporalium*, is a Writ that lies where a Man being Elected and Confirmed *Biſhop* of any Dioceſe, hath the King's Royal Aſſent thereto for the *Recovery of the Temporalities* or Barony of the ſaid Biſhoprick; and it is directed from the King to the Eſcheator of the County.

RESTRAINT, is when any Action is hindred or ſtopped contrary to Volition or Preference of the Mind.

RESUMMONS, in Law, ſignifies a *Second Summons*, and Calling of a Man to anſwer an Action, where the *Firſt Summons* is defeated upon any Occaſion, as the Death of the Party, or the like.

RESUMPTION, in a large Senſe, ſignifies the taking again into the King's Hands ſuch Lands or Tenements, as before, upon falſe Suggeſtion, or other Error, he had delivered to the Heir, or granted by Letters-Patent to any Man.

RETAINING *Fee*, is the firſt *Fee* given to any Serjeant or Counſellor at Law, whereby to make him ſure that he ſhall not be on the contrary Part.

RETE *Mirabile*. In thoſe Creatures, that have the *Glandula Pituitaria* large, (as in Calves for Inſtance) the two Carotid Arteries meeting about the *Sella* of the Wedge-like Bone, preſently divide themſelves into ſmall Twigs, which being interwoven with (tho' not ſo numerous) Twigs from the internal Jugular Veins, and alſo with nervous Fibres from the larger Trunk of the fifth Pair of Nerves, make on each Side a notable *Plexus*, called *Rete Mirabile*. There enter into this *Rete* ſome Twigs alſo from the Cervical Arteries; and there paſs out of it ſeveral Twigs into the *Glandula Pituitaria*. So that in theſe Creatures that Gland ſeems to be of the ſame Uſe to the *Rete Mirabile*, as the *Glandula Pinealis* is to the *Plexus Choroides*, *viz.* To ſeparate a ſerous Matter from the arterial Blood. But in Man (according to moſt Anatomiſts) this *Rete* is wholly wanting; ſo that there paſſing only ſometimes a Twig or two, and ſometimes none, from the Trunk it ſelf of the Carotid Artery, into the *Glandula Pituitaria*, that Gland is of leſs Uſe in him than in other Creatures that have the *Rete*. Yet Dr *Ridley* affirms, That he never found this *Rete* wanting, or with any Difficulty diſcoverable in Men, ſpringing from, and lying on the Inſide of each Carotid Artery: But confeſſes, that it is far ſmaller in them than in Brutes; for which Difference he thus accounts. Brutes by reaſon of their prone Poſition, would, but for this *Rete*, be in danger of having their Brains deluged as it were with an over-great Quantity of the influent Blood, and of a Rupture of the Veſſels by its violent Ingreſs, and this Danger is ſo much the more threatned, by how much the ſame Cauſe which brings it into the Brain with that Force, is equally as great and effectual to hinder its proportionable

tionable return. For the Relief of which Inconvenience, Nature hath contrived a Means for its more eaſy and ſafe Deſcent into the Brain, by turning that one largeſt Stream of Blood (which through its being pent in one Channel, becomes ſo rapid) into many more, (by which means the Carotid Trunk above the *Dura Mater* in thoſe Creatures, is very ſmall to what it is beneath; whereas that Artery in Men, &c. hath the ſame Bigneſs on both Sides the Membrane) and they not only reticulated and contorted for the more ſlow and laborious Deſcent of the Blood; (which Contrivance the Ancients thought was only for a more exact Preparation of the Blood for Animal Spirits) but alſo many of them by their Inſertion into the *Glandula Pituitaria*, attended with ſmall Veins iſſuing thence, to take off ſome Part of the Burthen too. And that to the aforeſaid Poſition of ſeveral Creatures ought chiefly to be aſcribed the Variety of Magnitude of this *Rete* in ſeveral of them, its Size in *Dogs* ſeems highly to evince; in whom, by reaſon of their Horizontal Poſition, being neither ſo prone as ſeveral Brutes who feed on Graſs, nor ſo erect as Man, this *Rete* is found ſmaller than in the firſt, and larger than in the laſt.

RETENTION, is a Faculty of the Mind, whereby it makes a farther Progreſs towards Knowledge.

RETICULARIS *plexus*, the ſame with *Choroides*

RETICULUM, the ſame with *Omentum*.

RETIFORMIS *plexus*. See *Plexus Retiformis*.

RETIFORMIS *tunica*, is the principal Organ of Sight, being a certain Expanſion of the inner Subſtance of the Optic Nerve in the Eye, which is to the Eye like a whited Wall in a dark Chamber, and receives and repreſents the viſible Species that are let in by a Hole as it were into a darkened Room.

RETINA *tunica*, the ſame with *Retiformis*.

RETIRADE, in Fortification, is a kind of Retrenchment made in the Body of a Baſtion or other Works, which is to be diſputed Inch by Inch, after the firſt Defences are Diſmantled. It uſually conſiſts of two Faces, which make a Re-entring Angle.

RETIRED *Flank*. See *Flank*.

RETORT, is an Inſtrument or Veſſel in Chymiſtry, commonly of this Figure, uſed for Diſtillations of Oils and Volatile Salts, and alſo of Acid Spirits. 'Tis ſometimes made of Glaſs, ſometimes of Earth', and ſometimes of Iron, according to the Nature of the Matter to be Diſtilled, and the Degree of Fire neceſſary to perform the Operation.

Earthen Retorts are beſt for the drawing of Acid Spirits, becauſe they will bear the utmoſt Heat, and not Melt, as Glaſs ones ſometimes do. Therefore when you are forced to uſe a Glaſs Retort in ſo ſtrong a Fire, it muſt be *coated* or covered over with *Lute*. See that Word.

There is alſo another kind of Earthen Retorts, which are flat at the Bottom, and whoſe Noſe or Beak turns upwards, which in great Furnaces are uſed for the Diſtillation of Acid Spirits; and they have Earthen Receivers Luted to them.

RETRACTORES *Alarum Naſi, & Elevatores Labii Superioris*: Theſe Muſcles ariſe broad and fleſhy from the fourth Bone of the Upper Jaw, whence deſcending obliquely, they are ſoon inſerted to the Upper Lip, and *Alæ Naſi*. Their Name ſhews their Uſe is to lift up the Noſe and Upper Lip.

RETRAHENS *Auriculam*, is a Muſcle by ſome called *Triceps Auris*, becauſe it has ſometimes 3 Beginnings. *M. du Verney* ſays it is compoſed of five or ſix fleſhy Fibres, which have their Origination from the Superior and Forepart of the *Apophyſis Maſtoides*, and deſcend obliquely to their Inſertion in the Middle of the *Concha Auriculæ*.

RETRENCHMENT, in Fortification, is a Ditch bordered with its Parapet, and ſecur'd with Gabions or Bavins laden with Earth. It is ſometimes taken for a ſimple *Retirade* in Part of the *Rampart*, when the Enemy is ſo far advanced, that he is no longer to be Reſiſted, or beaten from the firſt Poſt.

RETROCESSION of the Equinoxes, is the Annual going backward of the Equinoctial Points about 50 Seconds. See *Equinoxes*.

RETROGRADE, in Aſtronomy, is uſually appropriated to the Planets, when by their proper Motion in the Zodiack, they move backward or contrary to the Succeſſion of the Signs: As from the ſecond Degree of *Aries* to the firſt, &c. But this Retrogradation is only apparent, and occaſioned by the Obſerver's Eye being placed on the Earth: For to an Eye at the Sun, the Planet will appear always Direct, and never either Stationary or Retrograde.

RETURN, in Law, hath two ſeveral Applications: The one is the *Return* of Writs by Sheriffs and Bayliffs, which is only a Certificate made to the Court, of that which he hath done touching the Execution of their Writ directed to him. And this among the *Civilians* is termed *Certificatorium*: Of *Returns* in this Signification ſpeaks the Statute of *Weſtmin.* 2 *Cap.* 39. So is the *Return* of a Commiſſion, a Certificate or Anſwer to the Court, of that which is done by the Commiſſioners, Sheriffs, or other, to whom ſuch Writs, Commiſſions, Precepts or Mandates are directed. Alſo, certain Days in every Term are called *Return Days*, or Days in Bank; and ſo *Hilary* Term hath four *Returns*, viz. *Octabis Hilarii*, *Quindena Hilarii*, *Craſtino Purificationis & Octabis Purificationis*. *Eaſter* Term hath Five, *viz. Quindena Paſchæ*, *Tres Paſchæ*, *Menſe Paſchæ*, *Quinq. Paſchæ*, and *Craſtino Aſcenſionis Domini*. *Trinity* Term hath Four, *Craſtino Trinitatis*, *Octabis Trinitatis*, *Quindena Trinitatis*, *Tres Trinitatis*; and *Michaelmas* Term Six, *viz. Tres Michaelis*, *Menſe Michaelis*, *Craſtino Animarum*, *Craſtino Martini*, *Octabis Martini*, *Quindena Martini*. The other Application of this Word is in Caſe of *Replevin*; for if a Man Diſtrain Cattle for Rent, &c. and afterwards juſtify or avow his Act, ſo as it is found lawful, the Cattle before delivered unto him that was deſtrained, upon Security given to follow the Action, ſhall now be *returned* to him that diſtrained them.

RETURNO *habendo*, is a Writ that lies upon him that has avowed a Diſtreſs made of Cattle, and proved his Diſtreſs to be lawfully taken, for *returning* to him the Cattle diſtrained, which before were *replevied* by the Party diſtrained, upon Surety given to Proſecute the Action; or when the Plaint or Action is removed by *Recordari*, or *Accedas ad Curiam*, into the Court of *Common Pleas*, and he whoſe Cattle were diſtrained makes default, and doth not proſecute his Suit.

RETURNUM *averiorum*, is a Writ Judicial, granted to one Impleaded for the taking the Cattle of another, and unjuſt detaining them *contra Vadium & Plegios*, and appearing upon Summons, and is diſmiſſed without Day, becauſe the Plantiff makes Default; and it lies for the *return* of the Cattle to the Defendant, whereby he was Summoned, or which were taken for Security of his Appearance upon the Summons.

RETURNUM *irreplegiabile*, is a Writ Judicial, ſent out of the *Common-Pleas* to the Sheriff, for the final Reſtitution or *return* of Cattle to the Owner, unjuſtly taken by another, as *Damage-feaſant*, and ſo found by the Jury before Juſtices of Aſſize in the Countrey, or otherwiſe by Default of Proſecution.

REVENUE, ſignifies properly the Rent that accrues to every Man from his Lands and Poſſeſſions.

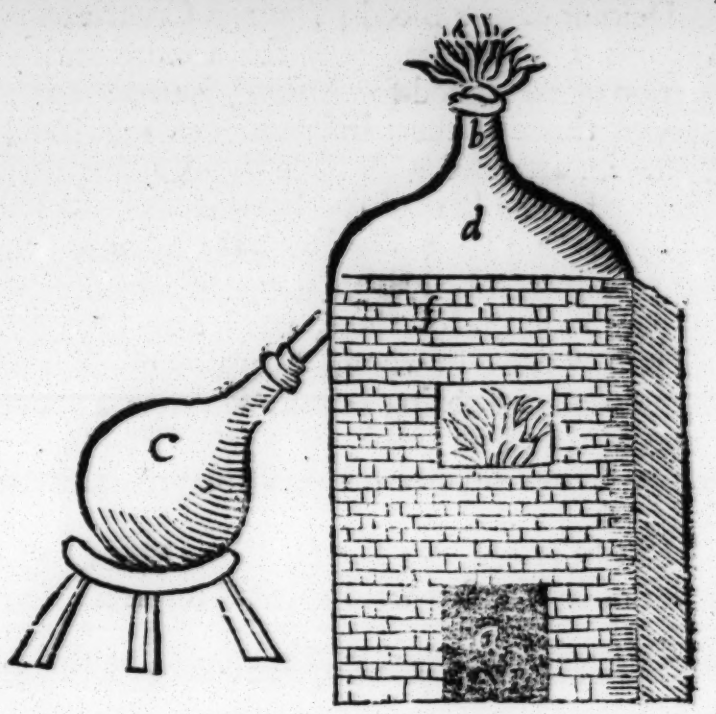
REVERBERATE: The Word ſignifies properly to ſtrike, reflect, or beat back again. The Chymiſts ſay, *Make the Flame* reverberate *on the Coppel.* That is, Let either the Flame of the Wood be ſo blown with the Bellows, as that it may be beaten back down on the Metal; or elſe make the Sides of the Furnace ſo cloſe all about, that the Flame ſtriking againſt its Sides, may be beat back again down on the Matter to be melted. For which latter Purpoſe they have a Particular Furnace called the

REVERBERATORY *Furnace*; which is a ſtrong fix'd Furnace of two Bricks thickneſs, and muſt be large enough to hold a Retort, or more than one, for the Diſtillation of Acid Spirits, and other Things. The Mortar or Lute for ſuch a Furnace is uſually one Part Potters Earth, as much Horſe-dung, and two Parts of common Sand kneaded in Water. The Aſh-hole muſt be about a Foot high, and the Door contrived, if poſſible, ſo as that the Air may come freely to it, to light the Fire the more eaſily, or to increaſe the Flame. The Fire-place need not be quite ſo high: At the top of it are two Iron Bars placed croſs-wiſe, to ſet the *Retort* on; and then the Furnace is rais'd about a Foot higher, to cover or cloſe the *Retort:* Then is there fitted to this a *Dome* or Cover with its Chimney, which is ſet on the top of the Dome on a little Hole, which when the Chimney is not uſed, hath a Stopple to it. This Dome may be made of the ſame Paſte that portable Furnaces are uſually made of; which ſee under *Furnaces.*

And one may make according to his Fancy, Room, or Convenience, a Furnace of this Kind; and there is no need of keeping exactly to this Form, eſpecially as to the Dome, which in a large Reverberatory may be made with Tiles or Bricks placed over the Retorts, and plaiſtered over with a Lute made of Aſhes, melted with common Water.

Here follows the Figure of Mr. *Lemery*'s Reverberatory, which will ſerve to give an Idea of the former Deſcription.

a The Aſh-hole.
e The Fire-Place.
d The Dome or Cover.
b The Chimney.
c The Receiver.
f The Retort.



Such a Furnace as this, will alſo ſerve for many Uſes, as well as Diſtilling *per Reverberium*: as to Diſtil with the *Refrigeratory*, in *Balneo*, &c. for the Copper Body may be placed on the Bars, and the Veſſel holding the Water, Sand, Aſhes, &c. as a little Practice will ſoon teach the Young Chymiſt.

REVERSED *Talon.* See *Talon.*

REVERSION, in Law, hath a double *Acceptation*, one is, *Jus revertendi cum ſtatus poſſeſſionis defecerit*, and this is but an Intereſt in the Land, when the Poſſeſſion ſhall fall.

Secondly, When the Poſſeſſion and Eſtate which was parted with for a Time, ceaſeth, and is determined in the Perſons of the Alienees, Aſſignees, Grantees, or their Heirs, or effectually returns to the Donor, his Heirs or Aſſigns whence it was derived.

The Difference between a *Reverſion*, and a *Remainder*, is, that a *Remainder* is general, and may remain to any Man, but to him that granteth or conveyeth the Land, &c. for Term of Life only, or otherwiſe. A *Reverſion* is to himſelf, from whom the Conveyance of the Land, &c. proceeded, and is commonly perpetual, as to his Heirs alſo. And yet ſometimes *Reverſion* is confounded with *Remainder.*

REVIEW, *A Bill of Review in Chancery*, is where a Cauſe hath been heard, and the Decree ſigned and enrolled; and ſome Error in Law appears upon the Decree made, which Bill cannot be exhibited, but by Licenſe of the Court.

REVIVE, when any mix'd Body is reſtored again to its Natural Form and Condition, from out of the Diſguiſes it was in, by being mixed with ſome other Body, they ſay it is *Revived.*

Thus when Mercury is diſtilled from Cinnabar, they call it Mercury revived from Cinnabar: becauſe the Mercury was made into Cinnabar only for ſafety and convenience of its being carried from Place to Place. See *Mercury.*

Bill of REVIVER, is where a Bill hath been exhibited in *Chancery*, againſt one who anſwers, and before the Cauſe is heard, or if heard, before the Decree enrolled, either Party dies: In this caſe a *Bill of Reviver* muſt be brought, that the former Proceedings may ſtand revived, and the Cauſe be finally determined.

REVIVING, in Law, ſignifies a renewing of Rents and Actions after they be extinguiſhed.

REVOLUTION, in Aſtronomy, is the Circulation of any Celeſtial Body, till it return to the ſame Point in which it was when it firſt began to move. But,

REVOLUTION, or as ſome call it, The *Reſtitution* of the *Anomaly*, is the Return of a Planet to any one Point of its Eccentricks, after it hath parted from it.

REVULSORIA, *V. S.* is whereby the Blood that guſhes upon one part, is diverted a contrary way, by opening of a Vein in a remote and convenient place. This our Surgeons call frequently Bleeding for a *Revulſion*.

RHABDOLOGY, is the Art of computing or numbering by thoſe Rods, commonly called *Neper's Bones*; which ſee.

RHACHITIS, is according to ſome, the Spinal Marrow; (which ſee in its proper place:) Alſo a Diſeaſe common amongſt the *Engliſh*, which is an unequal Nouriſhment of the Body, accompanied with Looſeneſs of Parts, Softneſs, Weakneſs, Faintneſs, Drowſineſs, a great ſwelling Head, with Leanneſs below the Head; with Protuberances about the Joints, crookedneſs of Bones, ſtraitneſs of the Breaſt, ſwelling of the *Abdomen*, ſtretching of the *Hypochondres*, a Cough, &c. The *Engliſh* call it the Rickets: But becauſe the occaſion of it often lies in the Spinal Marrow, the Famous *Glyſſon* calls it appoſitely enough *Rhachitis*. *Blanchard.*

RHAGADES, the *Latins* ſay *Sciſſuræ*, *Fiſſuræ*, *Rimæ*, Chinks, Clefts, which as they happen in other parts of the Body, Hands, Feet, Lips, the entrance of the Womb; ſo they may happen in the Fundament, in the Extremity of the Gut *Rectum*, and in the Sphincter, or Muſcle which cloſes the Fundament. *Rhagades* in the Fundament are certain oblong little Ulcers, without ſwelling, like thoſe which are ſometimes occaſioned in the Hands by great Cold. Some are ſuperficial, others deep: Some are not hard nor callous, others are: Some are moiſt, and ſend forth Matter, others dry and cancrous. *Blanchard.*

RHEGMA, is a breaking forth or burſting of any part, as of a Bone, the inner Rind of the Belly, the Eye, &c.

RHEUMATISM, is a wandring Pain in the Body, often accompanied with a ſmall Fever, Swelling, Inflammation, &c. *Blanchard.*

RHEXIS, the ſame with *Rhegma*.

RHINENCHYTES, is a little Syringe to inject Medicines into the Noſtrils.

RHOMBE *Solid*, is two equal and right Cones joined together at their Baſes.

RHOMBOIDES, ſo called from its Figure, is a pair of Muſcles of the Scapula, proceeding from the two lowermoſt Vertebres of the Neck, and from the four upper Spinal Proceſſes of the Vertebres of the Back: By and by they deſcend obliquely, and being fleſhy at the beginning and end, go as far as the Baſis of the Shoulder-blade, which they move backward and obliquely upward: It adheres ſtrongly to its Subjacent Muſcle the *Serratus Superior Poſticus*.

RHOMBOIDES, a Figure in Geometry. See *Quadrilateral* Figures.

RHOMBUS. See *Quadrilateral Figures*.

RHUMBS. See *Rumbs*.

RHYOS, a Diſeaſe of the Eyes, cauſed by a conſuming or diminiſhing of the Caruncle, or ſmall piece of Fleſh in the great corner of the Eye, ſo that it can no longer contain its Liquor. *Blanchard.*

RHYPTICA are Scouring Medicines which cleanſe away Filth. *Blanchard.*

RHYTHMUS, is a certain Proportion of Pulſes, Time, Life, Age, &c. *Blanchard.*

RIBBON, a Term in Heraldry, ſignifying the eighth part of a Bend; it is born a little cut off from the out-lines of the Eſcutcheon, thus.

He beareth *Or*, a *Ribbon Gules*.

RIBBS of a Ship, are the Timbers of the Puttocks when the Planks are off; ſo called, becauſe they are bending like the Ribs of a Carcaſe.

Thoſe little long wooden Pieces alſo which belong to the Parrels of the Yards, and have holes in them like the Comb under the Beak-head, are called the Ribbs of the Parrels.

Ride, a Ship is ſaid to Ride, when her Anchors hold her faſt, ſo that ſhe drives not away by the force of the Wind or Tide; and a Ship is ſaid to Ride well, when ſhe is built ſo that ſhe doth not over beat her ſelf into a Head Sea, as that the Waves over-rake her, (that is over-waſh her) from Stern to Stern. They ſay alſo a Ship

RIDES a-croſs, when ſhe Rides with her Main-yards and Fore-yards hoiſted up to the Hounds; and both Yards and Arms topped alike. She is ſaid to

Ride a *Peek*, when one end of the Yard is peeked up, and the other hangs down: And this is alſo ſaid of a Ship, when in Weighing ſhe is brought directly over her Anchor. She is ſaid to

RIDE *Athwart*, when her Side is to the Tide. And to

RIDE *betwixt Wind and Tide*, when the Wind hath equal force over her one way, and the Tide another; but if the Wind hath more Power over her than the Tide, ſhe is ſaid to *Ride Wind Rode*. She is ſaid to

RIDE *Hawſeful*, when in a Streſs of Weather ſhe falls ſo deep into the Sea with her Head, that Water runs in at her *Hawſes*. She is ſaid to

RIDE *Portiſe*, when her Yards are ſtruck upon the Deck, or when they are down *Aportlaſt*.

RIDEAU, in Fortification, is a Ditch, the Earth whereof is raiſed on its Side, or a ſmall elevation of Earth, extending it ſelf in length on a Plain, which ſerves to cover a Poſt, being alſo very convenient for thoſe that would beſiege a Place at a near diſtance; and to ſecure the Workmen in their Approaches to the Fort of a Fortreſs.

RIDERS in a Ship, are great Timbers both in the Hold and alſo Aloft, which are bolted on to other Timbers to ſtrengthen them, when 'tis diſcovered a Ship is too weakly built.

RIENS *Arreare*, is a kind of Plea uſed to an Action of Debt upon *Arrearages* of Account, whereby the Defendant does alledge, There is *nothing in Arrear*.

RIENS *paſſe par le fait*, is the Form of an Exception taken in ſome Caſes to an Action.

RIENS *per deſcent*, is a Form of Pleading when an Heir is ſued for a Debt of his Anceſtor, and he hath no Aſſetts in his Hand, nor any Lands liable to be extended.

RIGGING of a Ship, is all her Ropes whatſoever belonging to her Maſts or Yards, or any Part about her.

A Ship is well Rigged, when all her Ropes are of their fit ſize in proportion to her Burden. She is ſaid to be over-rigged when her Ropes are too big for her; which wrongs her much in her Sailing, and is apt to make her *Heel*.

RIGHT, in Law, ſignifies not only a Right for which a *Writ of Right* lies; but alſo any Title or Claim, either by vertue of a Condition, Mortgage, or the like, for which no Action is given by Law, but only an Entry.

Thus is *Jus Proprietatis*, a Right of Propriety: *Jus Poſſeſſionis*, a Right of Poſſeſſion: And *Jus Proprietatis & Poſſeſſionis*, a Right both of Property and Poſſeſſion, and this was formerly called, *Jus duplicatum:* As if a Man be diſſeiſed of an Acre of Land, the Diſſeiſee hath *Jus Proprietatis*; the Diſſeiſor hath *Jus Poſſeſſionis*, and if the Diſſeiſee releaſe to the Diſſeiſor, he hath *Jus Proprietatis & Poſſeſſionis.*

Right-*angled*, a Figure is ſaid to be Right-angled, when its Sides are at Right-angles, or ſtand Perpendicularly one upon another: And this is ſometimes in all Angles of the Figures, as in Squares and Rect-angles: Sometimes only in part, as in Right-angled Tri-angles.

Right-*angled Tri-angle.* See *Tri-angle.*

Right-*Angles.* See *Angles.*

RIGHT-*aſcenſion*, of the Sun or Star, is that Degree of the *Equinoctial*, accounted from the beginning of *Aries*, which riſeth with it in a *Right Sphere.*

Or, it's that Degree and Minute of the Equinoctial (counted as before) which cometh to the Meridian, with the Sun or Stars, or with any Point of the Heavens. The reaſon of which referring it to the Meridian, is becauſe that is always at Right Angles to the Equinoctial; when the Horizon only is in a Right or Direct Sphere.

To find the Sun's or Star's *Right Aſcenſion*, by the *Globe.*

Bring the Sun's or Star's Place to the Meridian, and the Number of Degrees intercepted between the beginning of *Aries*, and that Degree of the Equinoctial which comes to the Meridian, is the *Right Aſcenſion*, if required in Time: Account every 15 Degrees to be an Hour, and every Degree to be 4 Minutes.

To find the Sun's Right Aſcenſion *Trigonometrically; having his* greateſt Declination *and* Diſtance *from the next* Equinoctial Point *given; ſay,*

As Radius is to the Co-ſine of the Sun's *greateſt Declination* :: So is the Tangent of his Diſtance *from the next* Equinoctial Point to the Tangent of the *Right Aſcenſion.*

Example.

Let the Sun's Diſtance from the next Equinoctial Point be 30 Degrees 00 Minutes; his greateſt Declination be 23 Degrees 30 Minutes.

Then to the Co-ſine of 23° 30′	9. 962398
Add the Tangent of 30° 00′	9. 761439
Sum leſs Radius is the Tan. of 27° 53′	19. 723837

Which is the *Right Aſcenſion* required.

The ſame may be alſo found, by having the preſent Declination, (ſuppoſe 11 Degrees 30 Minutes) and the greateſt Declination 23 Degrees 30 Minutes given.

For, *As the Tangent of the Sun's greateſt Declination, is to the Tangent of his preſent Declination :: So is the Radius to the Sine of his Right Aſcenſion.*

The Operation ſtands thus:

To the Ar. co. of the Tan. of 23° 30′	0. 361698
Add the Tangent of 11° 30′	9. 308463
Sum adding the Radius = S. 27° 53′	19. 670161

RIGHT or *Direct Sphere*, is that which has the Poles of the World in its Horizon, and the Equator in the Zenith: The Conſequences of living under ſuch a Poſition, (as thoſe who live directly under the Line are in) is that they have no Latitude, nor Elevation of the Pole. They can ſee nearly both Poles of the World; all the Stars do Riſe, Culminate, and ſet with them. And the Sun always riſes and deſcends at Right Angles to their Horizon, and makes their Days and Nights even; becauſe the Horizon biſſects the Circle of his Diurnal Revolution.

To find the Right Aſcenſion of a Planet, or Star that hath Latitude, uſe this Proportion.

As Co-ſine of the Stars Declination is to the Co-ſine of its Diſtance from the next Equinoctial Point :: So is the Co-ſine of its Latitude, to the Co-ſine of its Right Aſcenſion.

RIGHT *the Helm*, a Sea Phraſe, uſed by him that *Conds* to the Man at Helm, ordering him to keep the Helm even with the Middle of the Ship.

RIGHT *Line*, is the neareſt Diſtance between any two Points. See *Line.*

RIGHT *Muſcles* of the Head. See *Rectus Internus Major & Minor.*

RIGHT *Sailing*, is when a Voyage is perform'd on ſome one of the four *Cardinal Points.*

If a Ship ſail under the Meridian; that is, on the North or South Points, ſhe varieth not in Longitude at all; but only changeth the Latitude, and that juſt ſo much as the Number of Degrees ſhe hath run.

If a Ship ſail under the Equinoctial, upon the very Eaſt or Weſt Points, ſhe altereth not her Latitude at all, but only changeth the Longitude, and that juſt ſo much as the number of Degrees ſhe hath run. If the Ship ſail directly Eaſt or Weſt under any Parallel, ſhe there alſo altereth not her Latitude, but only the Longitude; yet not according to the Number of Degrees of a great Circle ſhe hath ſailed, as under the Equinoctial; but more

more than ſo many, according as the Parallel is remoter from the Equinoctial towards the Pole: For the leſs any Parallel is, the greater is the Difference of Longitude.

RIGHT *Sine*, the ſame with *Sine*; which ſee.

RIGOR, is a Vibration and Concuſſion of the Skin, and Muſcles of the whole Body, accompanied with Chilneſs.

RIGOROUS way of explicating Rarefaction is, as it is called by the Moderns, that which is made uſe of in the Peripatetick School; which ſee under *Rarefaction*.

RIM, in a Watch or Clock, is the Circular part of the Balance thereof.

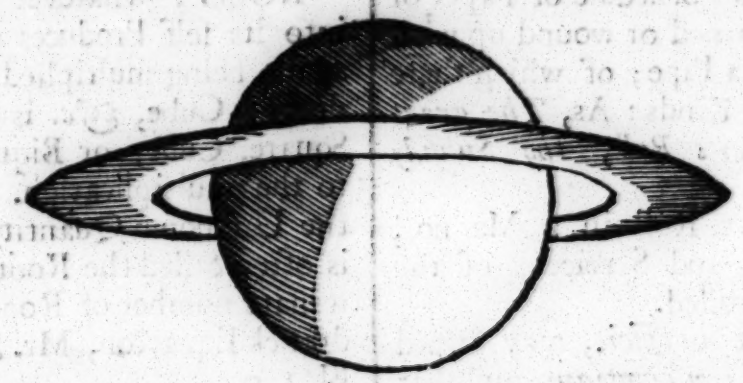
RING *Dial.* See *Univerſal Equinoctial Dial.*

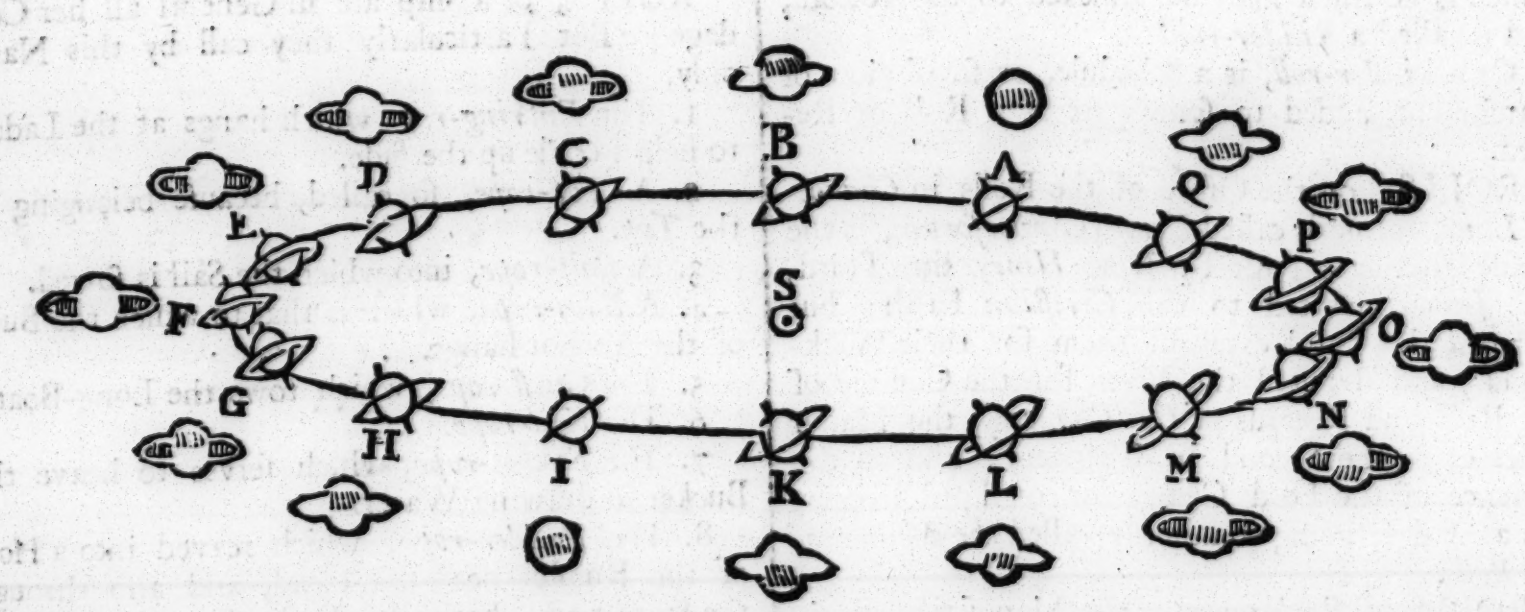
RING of *Saturn* is an Opacous Solid, Circular Arch and Plane, like the Horizon of a Globe, of Matter entirely encompaſſing round the Planet, and no where touching it; its Plane is at this Time nearly parallel to the Plane of our Earth's Equator: The Diameter of this Ring is 2 $\frac{1}{4}$ of *Saturn*'s Diameters, and the Diſtance of the Ring from the Planet, is about the breadth of the Ring it ſelf.

Galileus firſt diſcovered the Figure of *Saturn* not to be round; but that the Inequality was thus in the Form of a Ring, Mr. *Hugens* firſt found out and publiſhed in his *Syſtema Saturniana*, 1659. 'Tis this Ring, and its various Poſitions in reſpect of the Sun, (whoſe Light it reflects like the Body of *Saturn* it ſelf) and of the Eye of the Spectator, which occaſions all the various Appearances of *Saturn* with his *Anſæ* (as they call them) or with none, with broad, or narrow ones, &c.

The following Figures which I borrowed from Dr. *Gregory*'s Aſtronomy, will very well illuſtrate this Matter.

The firſt is a ſingle Figure of the Planet, when his Ring is moſt viſible: And the ſecond explains the ſeveral Phænomena of the Ring in all its Poſitions, in reſpect of the Sun at S. during the Planet's entire Revolution round the Sun. When the Planet is at A or I, the Ring is ſcarce viſible, becauſe the Sun's Rays running almoſt parallel to it, can illuminate it but very ſparingly. But when *Saturn* is at E. or N. then the Sun's Rays falling almoſt directly upon the Ring, do render it moſt of all conſpicuous.





RIOT, in Law, ſignifies the forcible doing of an unlawful thing, by three or more Perſons aſſembled together for that purpoſe.

RISING of the Sun or Star, is their appearing above the Horizon.

The *Riſing of the Sun* may be found by the Globe; thus.

Firſt rectify the Globe (which Word ſee;) then bring the Sun's Place to the Eaſt part of the Horizon; and the Hour Index will ſhew the Time either before or after Six.

The Time of the Sun's Riſing doubled, gives the Length of the Day.

The *Riſing of any Star*, may be thus found by the Globe.

Rectify your Globe and Hour Index; bring the Star to the Eaſt, and the Index will ſhew the Time of the Star's Riſing.

Riſing *Timbers* in a Ship, are the Hooks placed on her Keel; and are ſo called, becauſe as theſe riſe in Proportion, ſo her Rake and her Run riſe on her flat Floor by degrees.

The

The RISINGS in a Ship, are thoſe thick Planks which go fore and aft, on both Sides under the End of the Beams and Timbers of the Second Deck unto the third Deck, half Deck, and quarter Deck; and on them the Beams and Timbers of the Deck do bear at both ends by the Ship's ſide.

RISUS *Sardonius*, is a Contraction of each Jaw, or a Convulſive kind of Grinning, cauſed by a Contraction of the Muſcles on both ſides of the Mouth. *Blanchard.*

RIVERS and *Springs*; whence they ariſe, ſee under the Word *Vapour*.

A Road, is in any place near the Land where the Ships may Ride at Anchor, and a Ship riding there is called a Roader.

ROB. See *Apochyliſma*.

ROBBINS in a Ship, are thoſe ſmall Lines which make the Sail faſt to the Yards, being reeved into Evlet-holes in the Sail under the Head-rope, for that purpoſe. The Word is, *Make faſt the Robbins*: For at Sea they don't ſay *tie*, but *make faſt*.

ROD, a Meaſure of Length containing by Statute juſt 16 ½ Feet *Engliſh*. See *Pole*. This muſt carefully be diſtinguiſhed from *Rood*, which is a Square Meaſure containing the fourth part of an Acre.

ROLL, in Law, ſignifies a Schedule of Paper or Parchment, which may be turned or wound up with the Hand to the Faſhion of a Pipe; of which there are in the Exchequer ſeveral Kinds: As, *The great Wardrobe Roll*, *the Cofferer's Roll*, *the Subſidy Roll*, &c.

Roll *of Court*, the Court Roll in a Mannor, wherein the Names, Rents, and Services, of the Tenants were copied and enrolled.

RIDDER-*roll*; the Court *ex officio*, may award a *Certiorari ad informandam conſcientiam*; and that which is certified ſhall be annexed to the Record, and is called a *Ridder-roll*.

Or a *Ridder-roll*, is a Schedule, or ſmall piece of Parchment, added to ſome part of a Roll or Record.

ROLLS, or the Office of the Rolls in *Chancery-Lane*, formerly called *Domus Converſorum*, is the Houſe that was built by King *Henry* the Third, for *Jews* converted to the *Chriſtian* Faith; but *Edward* the Third expulſed them for their Wickedneſs, and deputed the Place for the Cuſtody of the Rolls and Records of the *Chancery*, the Maſter whereof is the Second in Chancery, and in the Abſence of the Lord Chancellor or Lord Keeper, ſits as Judge, being commonly called *the Maſter of the Rolls*.

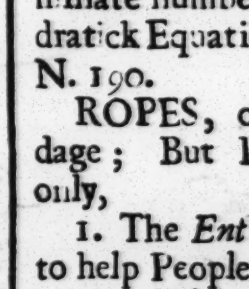
ROLLS *of Parliament*, the Manuſcript Regiſters or Rolls of the Proceedings of our old Parliaments. For before the uſe of Printing, and till the Reign of *Henry* the Seventh, our Statutes were all engroſs'd in Parchment, and (by vertue of the King's Writ to that purpoſe) proclaimed openly in every County.

In theſe Rolls we have a great many deciſions of difficult Points in Law, which were frequently in former times referred to the Determination of this Supreme Court, by the Inferior ones of both Benches, &c.

ROMAN *Indiction*. See *Indiction*.

ROMAN *Order of Architecture*, is the ſame with the *Compoſite*. 'Twas invented by the *Romans* in the Time of *Auguſtus*, and ſet above all the others, to ſhew (ſay ſome) that the *Romans* were Lords over all other Nations: 'Tis made made up of the *Ionick*, and *Corinthian Orders*, and is more Ornamental than either.

ROMPEE, in Heraldry, they call a Chevron ſo, when it is born of this Figure.



He beareth *a Chevron Rompee, between three Mullets, Or, by the Name of Sault.*

RONDEL, in Fortification, is a Round Tower ſometimes erected at the Foot of the Baſtions.

ROOD, a Square Meaſure containing juſt a Quarter of an Acre of Land: Some confound this Meaſure with a *Rod*, which is the Length of 16 ½ Feet; and others with a Yard Land, or the *Quartona Terræ*, but both very erroneouſly.

A *Rood* is ſometimes called a *Farthendele*.

ROOF-*trees*, or *Ruff-trees*, are the Timbers in a Ship, which go from the *Half-Deck* to the *Fore-Caſtle*: They ſerve to bear up the Gratings, and are ſupported by *Stanchions*. Alſo that Piece of Timber which on Occaſion is laid over the *Half-Deck* to bear up Nettings, Sails, or Pieces of Canvaſs, is called a *Roof-tree*.

ROOT, whatever Quantity being multiplied into its ſelf Produces a Square, and that Square again being multiplied by that firſt Quantity Produces a Cube, &c. is called a *Root*, as either the Square, Cube, or Biquadrate *Root*, &c. according to the multiplication. See *Square*, *Cube*, &c. Alſo the Unknown Quantity in an Algebraick Equation is often called the Root. And what are the Determinate number of Roots in any Cubick, or Biquadratick Equation, Mr. *Halley* ſhews in *Philoſ. Tranſ.* N. 190.

ROPES, of a Ship are in General all her Cordage; But Particularly they call by this Name only,

1. The *Entring-rope* which hangs at the Ladder to help People up the Side.

2. A *Top-rope*, ſo called, becauſe belonging to the *Top*.

3. A *Bolt-rope*, into which the Sail is ſowed.

4. A *Buoy-rope*, which is that to which the Buoy of the Anchor hangs.

5. The *Gueſt rope*, which tows the Long-Boat.

6. The *Keel-rope*.

7. The *Bucket-rope*, which ſerves to heave the Bucket in drawing Water.

8. The *Rudder-rope*, which reaved into a Hole of the Rudder near the Head, and alſo through the Stern-poſt, both the Ends thereof are ſpliced together, ſerving to ſave the Rudder, if by any Accident it ſhould be beaten off.

Alſo the *Preventer-rope*, which is a ſmall Rope, ſeized croſs over the Ties, cloſe at the Ram-head; ſo that if any one part of the Tie ſhould be broke, yet the Remainder ſhould not run through the Ram-head, to endanger the Yard.

There is alſo a Rope called a *Breaſt-rope*, which Laſhes the Parrels to the Maſts.

And another called the *Guy-rope*, which is reeved through a Block, faſtned by a Strop, to the Head of the Fore-maſt, and having its end faſtened to the Strop of the Winding Tackle, to bowſe it forwards, that it may plumb directly over the Hatch Way.

And there is also a *Boat-rope*, by which the Boat hangs, or is fastened a Stern of the Ship.

ROPE *yarn*, is the Yarn of any Rope untwisted: 'Tis commonly made of Cable Ends which are Worn out, which are called Junks of the Cables: The Use of it is to serve small Ropes, to make Sinnet Matts, *&c.* also to make Knettles, which are 2 of these Rope Yarns, untwisted, together: Also it helps to make Caburns, *i. e.* Lines to bind Cables withal; and to fasten the Sails to the Yard Arms, *&c.*

RORIFERUS *Ductus*, the same that *Ductus Chyliferus*.

ROS, in the Account of the Ancients, was the First Moisture that falls from the Extremities of the Vessels, and is dispersed upon the Substance of the Members. *Ros*, says *Galen*, is a Third sort of Moisture whereby the Parts of our Body are nourished, and is contained in all the Parts of an Animal, like a certain Dew sprinkled upon them. *Blanchard.*

ROS *Vitrioli*, according to *Ang. Sala*, is the first Phlegm or Water that is distilled from Vitriol in *Balneo Mariæ*.

ROSA, the same that *Erysipelas*.

ROSIMES, of Vegetables how made. See *Resine*.

ROSTRIFORMIS *Processus*. See *Coracoides*.

ROSTRUM, in Chymistry, is the Nose of an Alembick.

ROTA *Aristotelica*, is the Consideration of a Wheel moving along a Plain, till it hath made one entire revolution: For then will its Centre have described a Line equal to that of the Circumference of the Wheel, and so will all lesser Concentrical Circles. See *an Explication of this* in *Boyle* against *Linus*.

ROTATOR *Femoris Extrorsum*. See *Obturator Externus*.

ROTATOR *Major & Minor*, are two *Apophyses* in the upper Part of the Thigh-Bone, called *Trichanteres*, in which the Tendons of many Muscles are terminated.

ROTULA, the same that *Mola genu*.

ROTULÆ, See *Tabellæ*.

ROTUNDUS, *(Sc. Musculus)* is a Muscle of the Radius, serving to turn the Palm of the Hand downwards.

ROUND, is a Military Term, signifying a Walk or Turn, which an Officer attended with a Few Soldiers, takes in a Garrison or Fortifi'd Place during the Night, to observe whether the Centries do their Duty, or not.

ROUND-*house*, is the uppermost Room or Cabbin on the Stern of the Ship where the Master lies.

ROUND-*in*, or *Round-aft*, a Term at Sea belonging to the Main and Fore-sail: When the Wind largeth, they say, *Let rise the Main-tacks, or the Fore-tacks! Hale aft the Fore-sheet to the Cat-head; and the Main-sheet to the Cubbridge-head!* And when these Sheets are thus haled down they keep them from flying up with the *Passarado-rope*. This Work is called, *rounding in, or rounding aft* the Sail.

ROWLE in a Ship, is a round piece of Wood or Iron, wherein the Whip goes, being made to turn about, that it may carry over the Whip the easier from side to side.

ROWSE *in the Cable, or Rowse in the Hawser*, is a Word of Command at Sea, when a Cable or Hawser lies too slack in the Water, and they would have it be made more *taught*; lest on the turning of the Tide, the Cable should happen to be foul of the Anchor.

ROYAL *Assent*, is that *Assent* which the King gives to a thing formerly done by others, to the Election of a Bishop by Dean and Chapter; which given, then he sends a Special Writ for the taking of *Fealty*.

And also to a Bill passed in both Houses of Parliament; which *Assent*, in Parliament, being once given, the Bill is endorsed with these Words, *Le Roy le veult*, i. e. *It pleases the King*: But if he refuses to agree to it, then thus; *Le Roy S' aviser a*, i. e. *The King will Advise*.

ROYAL *Fort*. See *Fort*.

ROYAL *Parapet*, or, *Parapet of the Rampire*, in Fortification, is a Bank about three Fathoms broad, and six Foot high, placed upon the Brink of the *Rampire*, towards the Country, to cover those who defend the *Rampire*.

RUBIGO, or *Mildew*, is a Disease happening to *Plants*, caused by a *Dewy Moisture* which falling upon them, and continuing there for want of sufficient Heat of the Sun to draw it up, doth by it's Sharpness, or Acrimony, scorch and corrupt the Inmost Substance of the *Plant*.

RUBRICA. See *Impetigo*.

RUCTATION, or Belching, is a depraved Motion of the Stomach, occasioned by an Effervescence there, whereby Vapours and Flatulent Matter are sent out at the Mouth *Blanchard*.

RUDDER of a Ship, is a Piece of Timber hung on the Stern-posts by 4 or 5 Iron Hooks (called *Pintles*) and is as it were the Bridle of a Ship; because by it she is turned about at the Pleasure of him that stands at the Helm. A Narrow Rudder is best for a Ship's sailing, provided she can feel it; that is, be guided and turned by such a Rudder. For a Broad Rudder will hold much Water, when the Helm is put over to any side: But yet if a Ship have a *Fat Quarter*, so that the Water cannot come quick and strong to her Rudder, she will require a Broad Rudder. The aftermost Part of the Rudder is called, the *Rake of the Rudder*.

RUDDER-*irons*, are the Cheeks of that Iron, whereof the Pintle is part, which is fastnened and nailed down about the Rake of the Rudder.

RUDDER-*rope*. *Vide Rope*.

RUGITUS, is an Effervescence of Chyle and Excrements in the Blood, whereby Wind and several other Motions are excited in the Guts, and rowl up and down the Excrements, when there's no easie Vent upwards or downwards. *Blanchard*.

RULE *of Falshood*. See *Position*.

RULE *of Three*, or the *Rule of Proportion*; or as it is called, from its excellent Use, *The Golden Rule*, is that which teaches to find a Fourth Number, which shall have the same Proportion to one of the three Numbers given, as the others have to one another.

This *Rule of Three* is, 1. *Direct*. 2. *Indirect*. 3. *Double-Rule Direct*. 4. *Double-Rule Indirect*.

Rule of Three Direct finds a fourth Number in such Proportion to the Third, as the second is to the first; or, as the first is to the second, so is the third to the fourth: Thus.

1 : 2 :: 3 : 6

This Rule requires (and is to be known thus: That if the ſecond Term be greater or leſs than the firſt, the fourth Term ſhall be likewiſe greater or leſſer than the third.

Or in the Queſtion, if more require more, or leſs require leſs, then uſe this *Rule Direct*, and Multiply the ſecond and third Terms together, and divide the Product by the firſt Term, the Quotient gives the fourth Term required.

Note, That the firſt and third Terms, and the ſecond and fourth, are of the ſame Denomination: As if the firſt be of Money, Weights, or Meaſures, &c. ſo ſhall the third; and ſo as the ſecond, the fourth.

Example.

If 4 *Yards coſt* 8 s. *What will* 6 *Yards coſt?*

Anſwer, 12.

y. s. y. s.
For 4 : 8 :: 6 : 12.

Here (according to the Rule $8 \times 6 = 48$, which divided by 4, gives 12 required.

Obſerve, That the Term which makes the Queſtion, is to be ſet in the third place, and that which is of like Name with it, ſet in the firſt place, and the Numbers remaining ſet in the ſecond, of whoſe Nature the Number ſought muſt always be.

In this Rule, if you Multiply the ſecond and third Terms together, the Product ſhall be equal to the Product of the firſt Term multiplied by the fourth; which may very well ſerve for a Proof, if required.

RULE *of Three Indirect*, or the *Backward Rule*, is known by being contrary to the *Direct*; for whereas the former required, that more ſhall have more, and leſs leſs; as if 4 Yards coſt 2 *s.* 8 Yards will coſt more than 2 *s.* becauſe it is double to 4 Yards, and ſo muſt the Anſwer be double to 2 *s.* that is 4 *s.*

But in this Rule, more will require leſs, and leſs more; as, if 4 Horſes in 6 Days eat 10 Buſhels of Oats, 8 Horſes will eat 10 Buſhels in a fewer quantity of Days, *viz.* in 3. Here 10 Buſhels being common is omitted, and the Queſtion ſtands thus:

4 : 6 :: 8 : 3

Here the third Term contains the firſt, as often as the ſecond doth the fourth: Therefore the Product of the firſt and ſecond divided by the third, gives the fourth,

As $\frac{4 \times 6}{8} = 3$, that $\frac{24}{8} = 3$ the fourth Term required.

The *Double Rule of Three*, both *Direct* and *Indirect*, may be compriſed in one Rule, with two Operations only.

1. Obſerving, That the given Terms are always five, whereof three are Conditional and Antecedent, or Suppoſitious, the other two demand the Queſtion, and are Conſequents anſwering ſome of the former Antecedents; inſomuch, that with the Anſwer there will be as many Conſequents as Antecedents, which muſt match one another in the ſame Denomination exactly.

2. For the right placing of the Queſtion and Terms, the three Terms of the Conditional part are duly to be regarded: Let that which is the Principal Cauſe of Loſs or Gain, Increaſe or Decreaſe, Action or Paſſion be put in the firſt place; and that which betokeneth the ſpace of Time, Diſtance of Place, &c. be put in a ſecond Place; and the remaining part in the third. The Conditional part thus ſtated, the other two Terms wherein the Demand lies, muſt be placed ſo under the former Terms, that they may correſpond one with another.

RULE I.

Then, If the *Blank* or Place ſought, fall under the third Term, Multiply the three laſt Terms for a Dividend, and the two firſt for a Diviſor, and the Quotient gives the ſixth Term required.

RULE II.

But, If the *Blank* fall under the firſt or ſecond Terms, Multiply the firſt, ſecond, and fifth Terms for a Dividend, and the third and fourth for a Diviſor, the Quotient gives the Anſwer.

Example 1.

If 12 *Rods of Ditching be done by* 2 *Men in* 6 *Days, how many Rods ſhall be wrought by* 8 *Men in* 24 *Days?*

Anſwer, 194.

State your Numbers according to the former Direction, they'll ſtand thus; the Blank under the third place.

Men.	Days.	Rods.
2	6	12
8	24	

Therefore (by the firſt Rule) $12 \times 8 \times 24 = 2304$ for the Dividend, and $2 \times 6 = 12$ for the Diviſor; the Quotient 194 gives the Anſwer.

Example 2.

If 2 *Men work* 12 *Rods in* 6 *Days, how many Men will work* 192 *Rods in* 24 *Days?*

Anſwer, 8.

Your Terms being rightly placed, the Blank will fall under the firſt Term thus.

Men:	Days.	Rods.
2	6	12
	24	192

Here

Here 2 x 6 x 192 = 2304 is the Dividend, and 12 x 24 = 288 is the Divisor, and the Quotient 8 is the Answer.

RUMB, or *Course of a Ship*, is the Angle which she makes in her Sailing with the Meridian of the Place where she is.

Complement of the Rhumb, is the Angle made with any Parallel to the Equator by the Line of the Ship's run.

RUMB, in Navigation, is one Point of the Compass, or 11 ¼ *Degrees*, viz. the $\frac{1}{32}$ part of the Circumference of the *Horizon* or *Compass Card*, which is the Representative of the *Horizon*.

RUMB-*Line*, is a Line described by the Ship's Motion on the Surface of the Sea, Steered by the Compass, making the same or equal Angles with every *Meridian*.

There *Rumbs* are *Helispherical* or *Spiral* Lines, proceeding from the Point where we stand, winding about the Globe of the Earth till they come to the Pole, where at last they lose themselves.

But in the *Plain* and *Mercator's* Charts, they are represented by strait Lines. Their Use is to shew the bearing of any two Places one from another; that is, upon what Point of the Compass any Shore or Land lies from another.

RUMINANT *Animals*, are such as chew the Cud.

RUMINATION, is the Action of chewing the Cud in some Adimals. *J. Con. Peyerus* hath Written a Tract, *De Ruminantibus & de Ruminatione*, Printed at *Basil*, in 4*to*. In which he takes Notice, That some Animals do really and truly chew the Cud; such as Oxen, Sheep, Deer, Goats of all Kinds, Camels, Hares, and Squirrels; which therefore generally have 3 Stomachs, the *Paunch*, the *Feck*, and the *Read*. But those which seem only to imitate that Motion, he calls *Ruminantia Spuria*; such as the Mole, Cricket, Bee, Beetle, Crab, Lobster, Mullet, and several Birds. And these he affirms to have all of them their Stomachs composed of Muscular Fibres, by means of which, they do as it were grind and work their Meat up and down something like *Ruminating Creatures*. He defines.

Rumination to be a Natural Motion of the Stomach, Mouth, and other Parts, which relieve one another in this Action; by which means, the Meat eaten hastily at first, is conveyed back to the Mouth again, there Chewed, and then Swallowed down a second time, to the great Advantage of the Animal.

RUN of a Ship, is so much of her Hull as is always under Water, growing thinner and lanker by degrees from the *Floor Timbers* to the Stern Post. This is also called her *Way afterward on*; and they say a Ship hath a *good Run* when 'tis long, and that the Water passes cleverly to her Rudder, her *Tuck* not lying too low, which is of great Importance to her Sailing; for if the Water don't come strongly to her Rudder, by reason of her being Built too broad below, she can never *Steer well*; and a Ship that can't *Steer well*, can't keep a good Wind, and will have no fresh way through the Sea, but will be still falling to Lee-ward, and therefore can never be a good Sailor. Nevertheless a Ship with a large and *good Run*, will lose much Stowage, because she is narrow below.

RUNDLES, or *Roundels*, the same as Balls or Bullets, which see. 'Tis a Word used in Heraldry.

RUNG-*Heads*, which are made a little bending, to direct the *Sweep* or *Mold* of the *Futtocks* and Naval Timbers; for here the Lines which make the Compass and Bearing of a Ship, do begin.

RUNGS, the same with the Floor or Ground-Timbers, being the Timbers in a Ship which constitute her Floor, and are bolted to the Keel, whose ends are *Rung-heads*.

RUNNER, is a Rope belonging to the *Garnet*, and to the two Bolt-tackles, *viz.* That before which comes in the aftermost Shrouds of the Fore-Mast, and that abast which comes in the foremost Shrouds of the Main-Mast.

This *Runner* is reeved in a single Block which is seized to the end of a Pendant, and has at the one end a Hook to hitch into any thing, and at the other end a double Block, into which is reeved the fall of the *Tackle* or the *Garnet*, by which means it doth Purchase more than the *Tackle* or *Garnet* can do alone. The Word is *Overhale the Runner*; that is, bring down that end which has the Hook to it, that it may be hitched into the Sling, &c.

RAYS, is a too plentiful and preternatural faling of Tears.

SABLE; the Heralds Word for a Black Colour in the Arms of Gentlemen; but in those of the Nobility, they call it *Diamond*, and in the Coats of Soveraign Princes, 'tis called *Saturn*.

'Tis expressed in engraving by strokes drawn perpendicularly a-cross each other.

SACCHARUM *Saturni*. See Salt of *Saturn*.

SACULI *Medicinales*, are when several Simples, according to the Nature of the Disease, are compounded and beaten together, and tied up in a little Bag, to be applied to the Part affected. This Bag is to be sewed or quilted down in several places, that the Ingredients run not altogether in a Lump. *Blanchard*.

SACCULUS *Chyliferus* or *Roriferus*, is what we usually call the *Receptaculum Chyli*, or the common Receptacle of the Chyle; and sometimes *Receptaculum Pecquettianum*, from *Pecquet*, who first found out both it and the *Ductus Thoracicus* (whose beginning it is) in the Year, 1651. I mean he was the first that assigned the true use unto them, but both were observed in Horses by *Bartholomæus Eustacius*, above 130 Years ago, as appears in a Book he writ, 1564. *pag.* 301. of the *Vena sine pari*, wherein he has these Words. (as cited by Dr. *Wharton*)

From this notable left Trunk of the Throat, (viz. *the* Subclavian Vein) *there springs a great Branch, which besides that it has a Semi-circular Door,* (or Valve) *in its Origin, is moreover white, and full of watry Humour; and not far from its rise it is divided into two, that after a little space, unite again into one, which sending forth no Branches, descends by the left side of the* Vertebræ; *and having passed thro the Midriff, runs down the middle of the Loins: Where becoming larger, and folding about the great Artery, it has an obscure ending, which I have not as yet well discovered.*

Here we have a clear *Description of them*, only that it is the beginning which he takes for the end: And contrarily, it is called the *common* Receptacle, because it receives both the *Chyle* and *Lympha* promiscuously, tho' some call it the Receptacle of the *Chyle*, in particular, but without reason; for it might as well be called, *Receptaculum Lymphæ*, as *Chyli*; for that the *Lympha* passes not only with the *Chyle*, but after this is all distributed, the *Lympha* still continues to glide into it, and to ascend by the *Ductus Chyliferus Thoracicus*, which might as well be called *Lymphaticus* for the same reason.

It is seated under the Celiack Artery, and Emulgent Veins, about the middle Distance between the Kidneys and *Capsulæ atrabilariæ*, upon the *Vertebræ* of the Loins, but for the most part, rather toward the left side.

Pecquet and *Casp. Bartholin* say, 'Tis seated betwixt the Tendon (or Appendices) of the *Diaphragma*; by the Motion whereof, it is pressed and milked, as it were, and its Contents propelled. It is of a Membranous, but thicker Substance in Men than in Brutes, but not so capacious, seldom being so large as to admit one's Fingers end. Out of it there springs a Duct that presently ascends up into the *Thorax* (behind the descending Trunk of the *Arteria magna*) where it begins to be called, *Ductus Thoracicus*; but according to *Sylvius* it might more fitly be called *Spinalis*, seeing it runs along the inside of the *Spina Dorsi*.

This Duct having past the *Abdomen* and the *Midriff*, marches farther upward under the great Artery, till about the fifth or sixth *Vertebra* of the *Thorax*, where it turns a little aside from under it to the left Hand; and so underneath the Intercostal Arteries and Veins, and the Gland *Thymus*, it ascends to the left Subclavian Vein, into whose lower side it opens, just there where the left Jugular Veins enters into it on the upper side, so that their Mouths face one another. But it opens not into this Vein with any large Orifice, but by six or seven little ones, which are all cover'd in the Cavity of the *Subclavia* with one broad Valve, looking towards the Cava from the Shoulder, whereby there is granted to the *Chyle* and *Lympha* a free Passage out of the *Ductus Chyliferus* into the *Subclavia*, but their return (or of Blood with them) out of the Vein into the Duct, is prevented.

This Duct ending thus in the Subclavian Vein, the *Chyle* that it conveys into it, passes with the Blood (returning by the Cava) into the right Ventricle of the Heart, where we will leave it to supply the Defect of the depauperated Blood; having only observed, that this Duct has many Semilunar Valves that hinder the ascending *Chyle* and *Lympha* from gliding back again; which Valves are manifest by this, that the *Chyle* contained in the Duct may easily by the Finger be pressed upwards, but by no means downwards; or if one make a hole in it, the Liquor tending from beneath upwards, will flow out at it; but that which is above it, is so stopt by the Valves, that it cannot be made to descend by it.

SACCULUS *Cordis*. See *Pericardium*.

SACCUS, is with some Writers the Gut called *Rectum*.

SACER *Ignis*. See *Herpes Exedens*.

SACER *Morbus*. See *Epilepsia*.

SACER (*Musculus*) which may be also called *Transversalis Lumborum*. It lies under the Tendinous part of the *Longissimus Dorsi*; it ariseth fleshy not only from the *Os Sacrum*, but also from all the transverse Processes of all the *Vertebræ* of the Loins, and is inserted to their Superior Spines. We have sometimes observed, (saith Mr. *Cowper*) a *Spinalis Lumborum*, like the *Spinalis Colli*, which arising from the Superior Spines of the *Os Sacrum*, and marching with direct fleshy Fibres, is so inserted to the Superior Spines of the *Vertebræ* of the Loins: The *Transversalis Lumborum* lying under it, helps to move the whole Spine, or *Vertebræ* of the Neck, Back and Loins, obliquely backwards, as in looking behind us, &c.

SACCER. See *Saker*.

SACKS *of Earth*, used in Fortification, are made of course Cloath, the largest of them being about a Cubick-foot wide, and the lesser some-

what

what more than half a Foot. They are ſerviceable upon ſeveral occaſions, more eſpecially for making Retrenchments in haſte, to place on Parapets, or the Head of the Breaches, &c. or to repair them when beaten down. They are of good uſe alſo when the Ground is rocky, and affords not Earth to carry on Approaches, becauſe they can be eaſily brought on and carried off: The ſame Bags on occaſion, are uſed to carry Powder in; of which they hold out about 50 Pound a piece.

SACRAMENTO *recipiendo, quod vidua Regis ſe, non maritabit ſine licentia Regis*, is a Writ or Commiſſion to one, for taking of an Oath of the King's Widow, that ſhe may not Marry without the King's Licence.

SACRE. See *Saker*.

SACRILEGIUM, Sacrilege, or an Alienation to Lay-men, and to profane or common purpoſes, of what was given to Religious Perſons, and to Pious Uſes. Our honeſt Fore-fathers were very tender of incurring the Guilt and Scandal of this Crime. And therefore when the Order of the Knights-Templers was diſſolved, their Lands, &c. were all given to the Knights Hoſpitallers of *Jeruſalem*, for this ſacred Reaſon: *Ne in plus uſus erogata contra donatorum voluntatem in alios uſus diſtraherentur.*

SACROLUMBALIS, is a Muſcle of the *Thorax*, which with the *Dorſi Longiſſimus*, have their Origination in Common: Externally they are Tendinous as they ſpring from the Poſterior part of the Spine of the *Os Illium*, and Superior Spine of the *Sacrum*, and all the Spines of the *Vertebræ* of the Loins: Internally it ariſes fleſhy, not only from thoſe parts, but from the Tranſverſe Proceſſes of the laſt named *Vertebræ*; whence with direct Fibres aſcending before it marches over the laſt Rib, it's divided into 2 fleſhy Bodies; the outermoſt of which is called *Sacrolumbus*, whoſe Fibres aſcend directly, and make ſo many thin Tendons as there are Ribs to whom they are inſerted, which are joined with ſo many Acceſſory Muſcles, ariſing from each Rib, and united with them, before their Inſertions, as they paſs over the Superior: And this Order or multiformed Diſpoſition of it, is continued the whole length of the *Thorax*, to the third, fourth, fifth and ſixth *Vertebra* of the Neck; which ſuperior part is by *Diemerbroeck* made a diſtinct Muſcle, and called, *Cervicalis deſcendens.*

SACRUM *Os*: The *Os Sacrum* is the broadeſt of all the Bones of the Back, and doth ſuſtain all the other *Vertebræ*: On the inſide it is ſmooth and hollow, on the outſide convex and uneven, being of ſomething a triangular ſhape. In its upper part on each ſide it is knit firmly to the *Oſſa Ilia*, by an inverting Cartilage. It conſiſts of five or ſix Bones, plainly diſtinguiſhable in Infants, but more obſcurely in grown Perſons. Theſe Bones have the Reſemblance of (and are uſually called) *Vertebræ*; for each of them have a Body and Proceſſes, and a large hole to receive the *Spinalis Medulla*. The Bodies of theſe differ from thoſe of the other *Vertebræ* in this reſpect; that whereas in thoſe the lower part is always bigger, in theſe it is the leſs; by which means the uppermoſt is the biggeſt, and the loweſt the leaſt. Their ſmaller holes which ſerve for the ingreſs and egreſs of the Veſſels, differ alſo from thoſe of the other, in that they are not in their ſides, but before and behind; of which thoſe before are much the larger. As for their Proceſſes, the Oblique can hardly be diſcerned, except in the firſt. The Tranſverſe are pretty long, but ſo united, that all ſeem but one. The hinder, or Spines, are like thoſe of the Loins, but leſs, and ſtill the lower the leſſer; inſomuch that the loweſt hath no Proceſs, but only a round Protuberance.

SAFFRON *of Gold*. See *Aurum Fulminans*.

SAFFRON *of Steel*, or *Mars*, See *Crocus Martis*.

SAGITTA, a *Conſtellation* in the Northern Hemiſphere, conſiſting of 8 Stars.

SAGITTA, in Botany, ſignifies the upper part of any ſmall Twig, Cyon, or Graft of a Tree.

SAGITTA, in Mathematicks, is the ſame as the *Verſed Sine* of any Ark, and is ſo called by ſome Writers, becauſe 'tis like a Dart or Arrow ſtanding on the Chord of the Ark. See *Verſed Sine*.

SAGITTALIS *Sutura*, or *Veruculata*, is that Suture of the Scull, which begins at the *Coronal* Suture, and ends in the *Lambdoidal* Suture.

SAGITTARIUS, is the Ninth, in the Order of the 12 Signs of the *Zodiack*.

To SAIGNER *a Moat*, is to drain the Water by Subterraneous Conveyances, to the end that Hurdles laden with Earth, or a Bridge of Bulruſhes, may be afterward laid upon the Mud that remains, and the Paſſage thereby conſolidated.

SAIL: Every Yard in a Ship hath its proper Sail to it, and it takes its Name from the Yard: As the *Main-ſail*, is that which belongs to the *Main-yard*: The *Fore-top Sail*, is that which belongs to the *Fore-top-maſt Yard*, &c. *Head Sails*, are ſuch as belong to the *Fore-maſt* and *Boltſprit*: Theſe are uſed to keep a Ship from the Wind, and to flat her. *After Sails*, as the *Main-maſt* and *Miſſen Sails* do keep a Ship to the Wind.

Few Ships can ſteer on a quarter Wind with one Sail, but require a *Head Sail* and an *After Sail* both, one to countermand the other: Tho' ſome Ships can Steer with their *Main-top Sail* only.

The *Miſſen Sail* is cut by the Leech twice as deep as the Maſt is long, from the Hounds to the Deck: And the *Sprit-Sail* is $\frac{3}{4}$ of the Depth of the *Fore-Sail*.

SAILING. See *Plain*, and *Mercator's Sailing*.

SAKER, a ſort of Cannon, is either *Extraordinary*, *Ordinary*, or *leaſt Size*.

SAKER *Extraordinary*, is 4 Inches Diameter at the Bore, 1800 Pound Weight, 10 Foot long, its Load 5 Pounds, Shot 3 Inches $\frac{1}{4}$ Diameter, and ſomething more than 7 Pound $\frac{1}{4}$ Weight; its level Range is 163 Paces.

SAKER *Ordinary*, is a ſize leſſer, 3 Inches and $\frac{3}{4}$ Bore, 9 Foot long, 1500 weight, its Charge 4 Pounds of Powder, Bullets Diameter 3 Inches $\frac{1}{2}$, Weight 6 Pounds; level Range 160 Paces.

SAKER *the leaſt Size*, is 3 Inches $\frac{1}{2}$ Diameter at the Bore 1400 Pound weight, 8 Foot long, its Load near 3 Pound $\frac{1}{2}$, Shot 4 Pound $\frac{3}{4}$ weight, and 3 Inches $\frac{1}{4}$ Diameter.

SALAMANDERS *Blood*, is a fooliſh Term that the Chymiſts give to the red Vapours, which in Diſtillation of Spirit of *Nitre*, towards the latter end, do fill the Receiver with red Clouds; they are the moſt fix'd and ſtrongeſt part of the Spirit; and nothing but *Nitre* yields a red Vapour in Diſtillation.

SAL *Armoniack*, is either *Natural*, which is found in ſome Parts of *Africa*, near the Line; or *Artificial*, which is made thus.

Five parts of Urine, one of Sea Salt, or *Sal Gemmæ*, and half an one of Chimney Soot are boiled toge-

together into a Mass, which Mass, being after this put into a subliming Pots, over a gradual Fire, it sublimes into the Form of that Salt, which is the common *Sal Armoniack*. It is purified by Dissolution in Water, Evaporation, &c. As other Salts.

Equal Parts of this Salt, and common Salt decrepitated, are mingled, and then the Armoniack is sublimed from the Mass, which is called, *Flowers of Sal Armoniack*. If instead of Sea Salt, you should use Filings of Steel, the Flowers would be yellow, and they are a little more penetrating than the former.

SAL *Circulatus Paracelsi*, the same with the Alkahest.

SAL *Polychrestum*, is a Preparation of Salt-petre made by burning equal Parts of it with Sulphur in a Crucible, whereby 'tis deprived of its Volatile Parts.

They give it this Name from the *Greek* πολύχρηστος, as being good for many Uses. Tho' 'tis indeed no very good Medicine, and unless it be very white, ought not to be used.

They give it as a Purge, from half a Dram to six Drams; but there are so many other good Purgative Medicines, that there is no need of using this.

SAL *Prunellæ*, is only purified Salt-petre, having some of its most Volatile Parts separated from it, by burning upon it when melted in a Crucible over the Fire, about a 30th part of its weight of Flour of Brimstone. 'Tis given to cool and provoke Urine in Fevers and Quinsies; but Salt-petre purified three or four Times, is certainly a much better Medicine; for this burning of Sulphur upon it, carries off a good part of the fine and volatile Parts, and instead of opening it, renders it more fix'd.

They often adulterate *Sal Prunellæ* with Alum, but you may distinguish it by its over whiteness, and glittering too much. This is sometimes called, *Lapis Prunellæ* and *Chrystal Mineral*.

SAL *Volatile Oleosum*, or an *Aromatick Volatile Salt* is made, by putting to every Ounce of Volatile Salt of *Sal Armoniack* distilled with Salt of Tartar, and dulcified with Spirit of Wine, about a Dram and an half of some *Aromatick Oil or Essence*, drawn from one or more noble odoriferous Vegetables; as Cinnamon, Cloves, Rosemary, Balm, &c. and after the Spirit and Oil are well stirred and incorporated together, the Volatile Salt and Spirit is drawn off in a Cucurbit.

Some mingle all together, *viz.* the *Sal Armoniack*, *Sal Tartari*, Spirit of Wine, and the Powder of Cinnamon, Cloves, &c. at first, and then distill off the Volatile Salt and Spirit all at once; but the former is the best way.

The *Sal Volatile Oleseum*, is a well known and noble Medicine; 'twas first invented by *Silvius de la Boe*: 'Tis a great Cephalick and Cordial, and is much beyond any of the Volatil Parts that are not Aromatized.

SALIANT *Angle*, a Term in Fortification. See *Angle*.

SALIENT, the Term in Heraldry for a Lion in a leaping Posture, and standing so that his right Fore-foot is in the Dexter chief Point, and his hinder left Foot in the Sinister base Point of the Escutcheon, by which 'tis distinguished from *Rampant*.

SALIQUE *Law*, *De terra* Salica *nulla portio Hæreditatis mulieri veniat, sed ad virilem Sexum tota terræ hæreditas perveniat*, &c. was an ancient Law made by *Pharamond* King of the *Franks*; part of which seems to have been borrowed by our *Henry* the First, in compiling his Laws, as *cap.* 89. *Qui hoc fecerit secundum Legem* Salicam *moriatur*.

SALIVA, or Spittle, is a Liquor separated by proper Ducts (which they call the *Ductus Salivales*) from the Glands of the Mouth, as the *Parotides*, the *Glandulæ Nuckianæ*, the *Maxillares*, the *Sublinguales*.

'Tis probable that the Origin of the *Saliva*, is from the Arterious Blood; for as the Arteries pour Nutritious Blood into all other parts, so they do into the Glands also; part of which they convert into the own Nourishment, part is returned by the Veins in the circulation, and part (*viz.* of what is serous) they separate, and bestowing a subacid quality thereupon, make *Saliva* (or Spittle) of it.

To the Composition whereof (if not for the Separation of it) some think a Nervous Juice is contributed, the rather because larger and more numerous Twigs of Nerves are communicated to the Glands, than to more other parts, which yet have a more exquisite sense than these.

But in refutation of this Opinion, the abovementioned Dr. *Nuck* alledges this Experiment.

That if the Nerve that runs to any Gland, be either hard tied or cut in sunder, yet the Secretion of the *Saliva* will not thereupon cease, but will only proceed more slowly; which slowness may be attributed not to the want of any constitutive Principle of the *Saliva*, so much as to the want of that Motion in the Gland (that to be sure depends as well upon the Nerves as upon the Pulsation of the Artery) which is necessary for the quicker dispatch of the *Saliva*, through or out of the Gland.

The manner of the Secretion of the *Saliva*, is like that of the Liquor of all other Glands, and proceeds from the Conformity of the Particles of the Liquor to the Pores in the Gland, or the Mouths of the Excretory Vessel.

After its Separation, its Motion into and along the Salival Ducts is much farthered by the Muscular Motion of each part respectively.

Now the *Saliva* is not to be reputed a meer Excrement, for it is believed by all Modern Anatomists, that it serves for the farthering of the Fermentation of Meats in the Stomach, if it be not the main Ferment of it.

That it has a fermentative Quality *Diemerbroeck* proves by this Experiment: That if a piece of white Bread be chewed and moisten'd with much Spittle, and then be mixed with Wheat-paste kneeded with warm Water, it will make it ferment.

Dr. *Nuck* thinks it an Universal Ferment for Meats and Drinks, partaking of Divers Qualities (or Particles) but of none in any excessive Degree. That it is Acid he demonstrates by this familiar Observation.

"That if when Milk is a boiling, one take a "Spoonful to taste of, and then presently whilst it "is moist with the *Saliva*, put it into the Milk a-"gain (still a boiling) the Milk will break as if "some Acid Liquor were mixed with it.

That it is endued with a Volatile Salt, he thinks is evident from its curing the Itch, Tetters, &c. That Oleous Particles are mixed with the acid, he supposes must be concluded from its killing Quicksilver: And whereas it usually becomes frothy in the Mouth, upon its being agitated by the Motion of

of the Muſcles of the Tongue, and thoſe which move the lower Jaw, and that he thinks proceeds from its being endued with a Lixivial Salt and Spiritous Oleous and acid Particles, (while the Volatile Spirit vaniſhes.)

SALIVATION, is an Evacuation of Spittle by Salivating Medicines, of which ſort principally are Mercurial Preparations.

SALLY, in the Art of War, is the Term for the iſſuing out of the Beſieged from their Works, and falling upon the Beſiegers to cut them off, and to deſtroy their Works.

SALT, the firſt of the three Hypoſtatical, but the third of the five Chymical Principles: Its two Eſſential Properties ſeem to be, *Diſſolubility in Water*, and *a pretty Pungent Sapor*, being an active incombuſtible Subſtance; they ſay it gives all Bodies their Conſiſtence, and preſerves them from Corruption, and occaſions all the Variety of Taſts.

There are three Kinds of Salts: *Fix'd Volatile*, and *Eſſential*.

The *Fix'd Salt* is thus drawn: The Matter is firſt calcined, and then the Aſhes are boiled in a good deal of Water, that the Salt may be the better diſſolved: After this the Solution is filtrated, and all the Moiſture evaporated, and then the Salt remains in a dry form at the bottom of the Veſſel. This *Fix'd Salt* ſo drawn, is called a *Lixivious Salt*, becauſe a kind of *Lixivium*, or Lye, was made of the Aſhes of the Body calcined.

Volatile Salt, is that which is drawn from the Bodies or Parts (chiefly) of Animals, and from ſome fermented, or rather purrified parts of Vegetables: It riſes quick and eaſily, and is the moſt Volatile of any Bodies ſo called.

The *Eſſential Salt* is drawn from the Juice of Plants by Chryſtallization: How, ſee *Eſſential Salt*.

Mr. *Boyle* reckons three other Kinds of Salts, viz. *Acid*, *Urinous*, and *Lixiviate*: See thoſe Words. And he diſcovers whether any Liquor contains an Acid Salt, or no, by dropping ſome of it on Syrup of Violets, for then it will turn it *red*; but if it turn it *green*, it is either of an *Urinous* or *Lixiviate* Nature: To diſtinguiſh which, he drops ſome of it into a Solution of Sublimate made in common Water; then if a white or milky colour be produced, he concludes it to belong to the Tribe of *Urinous Salts*; but if it produce a yellow or orange colour, he judges it to be of a Lixiviate Nature.

SALT *Common*, its Spirit how drawn, ſee *Spirit of Salt*.

Mr. *Boyle* proves this Principle producible by Art, as well as other. See *Sceptical Chymiſt, Part ult. p.* 1.

SALT *of* Saturn, *Saccharum Saturni*, or Sugar of Lead, is the Body of that Metal opened and reduced to the Form of a Salt by diſtilled Vinegar.

Thus any of the Calxes of Lead, as ſuppoſe *Ceruſe*, is powdered, and diſtilled Vinegar is poured upon it to four Fingers height above the Matter, an Ebullition will follow, but without ſenſible heat it muſt be digeſted in a Sand-heat, two or three Days, and ſtirred often: Then pour off the Liquor by Inclination, and digeſt more diſtilled Vinegar with the *Ceruſe*, and more after that till you have diſſolved about half the Matter, mix all the Impregnations together in an Earthen or Glaſs Veſſel; evaporate the Matter in a Sand-heat, till a ſmall Skin or *Pellicle*, begin to ariſe upon the Surface, after which, place the Veſſel in a cool place, there will appear white Chryſtals: Take them out, and evaporate again as before, and ſet the Veſſel to cool to gain the reſt of the Salt: Continue this till you have gotten all; then dry the Chryſtals in the Sun, and keep them in a Glaſs. 'Tis chiefly uſed outwardly for Diſeaſes of the Skin; but ſometimes 'tis given inwardly, from two to four Grains at a Doſe in Quinſies, *&c.*

SALT *of Steel*. See *Vitriol of Mars*.

SALT *of Sulphur*, a Preparation in Chymiſtry, improperly ſo called, ſince it is only a *Sal Polychreſtum* impregnated with Spirit of Sulphur, and then reduced to an Acid Salt by Evaporation of all the Moiſture. Some ſay this is a great Febrifuge.

SALT *of Tartar*, is made either by powdering what remains in the Retort after the Diſtillation of Tartar; or elſe by calcining bruiſed Tartar wraped up in a Paper, till it turn white. Either of theſe muſt have a great deal of hot Water poured upon them to make a *Lixivium*, then the Liquor is filtrated and evaporated in a Sand-heat, till the Fix'd Salt remain at the bottom of the Veſſel. This is the Alkali, or Fix'd Salt of Tartar. If it be expoſed to the Air a few Days in an open Veſſel in a Cellar, or ſome ſuch moiſt place, it will melt or run into a Liquor; and this the Chymiſts call Oyl of Tartar *per Deliquum*.

SALTIER, the Name of one of the Ordinaries in Heraldry, of the Form of St. *Andrew*'s Croſs.

They tell you, that anciently 'twas the Figure of an Engine, which being ſtuck full of Pins, was uſed in the Scaling of the Walls of a Beſieged Place.

Pearl a *Saltier Ruby*, the Coat of my Lord *Macklesfield*.

The *Saltier* is often counterchanged with the Field, and ſometimes quarterly quartered, *&c.*

SALVA *guardia*, is a Security given by the King to a Stranger, fearing the Violence of ſome of his Subjects, for ſeeking his Right by Courſe of Law.

SALVATELLA, is that Vein which from the Veins of the Arm is terminated in the little Finger.

SANATIVE *Waters*, are the Mineral Waters of any kind, ſuch as the *Chalibiate* ones of *Tunbridge*, the *Vitriolick* ones of *Epſom*, &c.

SANDARACHA, is by ſome Chymiſts the Term for red Arſenick; 'tis called alſo *Realgal*.

SANGUIFICATION, is the turning of the Chyle into Blood; which is performed in all the parts of the Body, and not as the Ancients imagined in ſome particular parts, as the Heart, Liver, *&c.*

SANGUINE, the Heralds term for the Colour uſually called *Murry*, being made of Lake, with a little *Spaniſh* Brown; 'tis repreſented in Engraving by Hatches like *Purpure*: 'Tis moſtly uſed in the Coats of Knights of the Bath. When 'tis born by Nobles, 'tis call'd *Sardonyx*; and in the Coats of Soveraign Princes they call it *Dragon's Tail*.

SANIES, is a thick and bloody *Pus* or Matter, iſſuing out of a Wound or Sore.

SAPHÆNA, is the Vein of the Leg, or Crural Vein. it goes down under the Skin of the Thigh and Leg, accompanied with a Nerve which loſes it ſelf at the inner Ankle; it turns towards the upper part of the Foot, where it gives ſeveral Branches, of which ſome go to the great Toe.

SAPHA

SAPHATUM, is a dry Scurf in the Head. See *Achor. Blanchard.*

SAPONEA, is a Lambative made of Almonds. *Blanchard.*

SAPORIFICK *Particles*, are ſuch as by their Action on the Tongue occaſion that Senſation which we call Taſte or Sapor. The manner of which, ſee in *Taſte*.

SAPOROUS, are ſuch Bodies as are capable of yielding ſome kind of Taſte when touch'd with our Tongue; but thoſe that afford no Taſte, are called *Inſipid.*

SAPPE, in Fortification, formerly ſignified the undermining, or deep digging with Pick-axe and Shovel at the Foot of a Work to overthrow it without Gun-powder: Now it is uſed to ſignifie a deep Trench carried far into the Ground, and deſcending by Steps from top to bottom; ſo that it covers the Men ſideways; and to ſave them from danger on the top, they uſe to lay a-croſs it Madriers, that is, thick Planks; or Clugs, that is, Branches of Trees cloſe bound together, and then they throw Earth over all, to ſecure them from Fire. When a Covert-way is well defended by Musketiers, the Beſiegers muſt make their way down into it by *Sappe*.

SARCOCELE, is a kind of Rupture, which conſiſts in a fleſhy Excreſcence of the Teſticles. *Blanchard.*

SARCOLPIPLOCELE, a fleſhly Rupture, or Protuberancy of the *Omentum*, either about the Navel, or in the Cods.

SARCOMA, is a fleſhy Excreſcence in the Noſtrils, and chiefly in the loweſt part of the Noſe, where it is fleſhy, without any ſhape, but like the proud Fleſh of an Ulcer. *Blanchard.*

SARCOMPHALUM, is a fleſhy Excreſcence of the Navel. *Blanchard.*

SARCOTICKS, are thoſe Medicines which fill up Wounds with Fleſh, ſuch as by their moderate Heats, and cleanſing Qualities keep Wounds and Ulcers free from Filth, and preſerve the Natural Temper of the Parts, ſo that the Aliment eaſily ſupplies the Solution of the Parts. *Blanchard.*

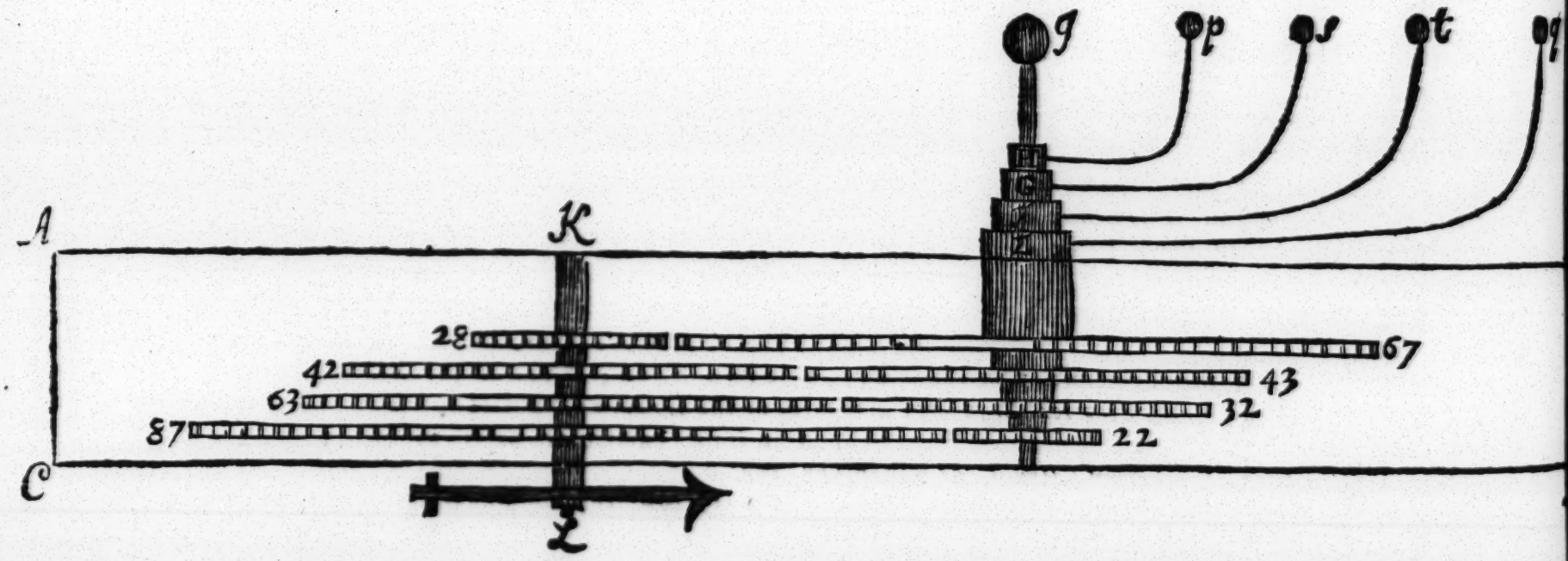
SARDONIAN, or *Sardonick Laughter*, is an Involuntary Laughter, or rather a Convulſive Diſtortion of the Muſcles of the Mouth, in which the Patient appears to Laugh.

SARPEDO. See *Lichen.*

SARRASIN, in Fortification, is a kind of Portcullice, otherwiſe called a *Herſe*, which is hung with a Cord over the Gate of a Town, or Fortreſs, and let fall in caſe of a Surprize.

SARTORIUS, a Muſcle of the Leg, which receives this Denomination from the Uſe Taylors make of it, in bringing one Leg and Thigh over the other, to ſit croſs-leg'd. It is alſo called *Longiſſimus Femoris*, it exceeding the reſt of the Muſcles of that Part in length; and *Faſcialis* from its paſſing over the Muſcles of the Thigh and Leg like a Swathe. It ariſeth ſharp and fleſhy from the forepart of the Spine of the *Os Ilium*, cloſe by the *Membranoſus*, and deſcending obliquely inwards above the *Muſculus Rectus*, and *Vaſtus Internus*, and over part of the *Tibiceps*, of an equal breadth or Thickneſs, meets with the *Gracialis* below the middle of the Thigh internally, and deſcending with it becomes Tendinous in its Paſſage over the Internal and Inferior Head of the Thigh-bone, (under a ſtrict Incloſure of the *Faſcia Lata*) and is inſerted four Fingers breadth below the ſuperior part of the *Tibia* internally: Its Uſe is declared above.

SATELLITE *Inſtrument* of Mr. *Romer*, Mathematician to the *French* King, as its Deſcription was ſent in a Letter to Mr. *Flamſtead*, *A. D.* 1679. and ſince publiſhed in the *Artificial Clock-maker*, in the Figure annexed.



A B and *C D*, repreſent the Upper and Lower Plates of the Inſtrument.

K L, is an Axis or Spindle on which 4 Wheels are fixed, and which turn round with it, and with the Hand *L*: once in 7 Days.

E F G H, are Sockets or hollow Arbors of 4 Wheels running concentrically, or one within another.

The hollow Arbor H, carrieth round the *Firſt Satellite p*, and belongeth to the Wheel or Pinion 22, which is driven by the fixed Wheel 87.

The hollow Arbor G, carrieth round the *Second Satellite s*, and belongeth to the Wheel 32, which is driven by the Wheel 63.

And the like of the Arbors F and E.

Within all theſe hollow Arbors is another fixed one included; on the top of which, is a Ball.

(♃) repreſenting the Planet *Jupiter*; round which the *Satellites* move, repreſented by the little Balls *p s t q*.

This

This *Satellite Inſtrument* may be added to a Watch, by cauſing the great Wheel, or Dial-Wheel, to drive round the Arbor *KL*, once in 7 Days.

And this Inſtrument may be of good uſe both at Sea and Land, to aſſiſt in finding the Longitude by *Jupiter*'s *Satellities*; partly by giving notice when an approaching Eclipſe is, that we may be ready with a Teleſcope to obſerve it; and partly when any Eclipſe happeneth, to ſhew which *Satellite* it is that is Eclipſed, which is difficult to be ſeen in the Heavens; and partly to ſupply the place of Tables, or Calculations of the *Satellite Eclipſes*, which it may do for a little while, tho' it muſt not be long truſted to.

SATELLITES, by Aſtronomers, are taken for thoſe Planets who are continually, as it were, waiting upon, or revolving about other Planets; as the *Moon* may be called the *Satellite* of the *Earth*; and the reſt of the Planets, *Satellites* of the *Sun*. But the Word is chiefly uſed for the new Diſcovered ſmall *Planets*, which make their Revolution about *Saturn* and *Jupiter*.

SATELLITES *of Jupiter*, are four ſmaller Moons or Planets moving round about the Body of *Jupiter*, as the Moon doth round our Earth. They were firſt diſcovered by *Gallilæus*, by the help of the Teleſcope.

The Diſtances of theſe Satellites, *from the Body of* Jupiter, *are as follows; from the Obſervations of*

	1	2	3	4	
Caſſini	5.	8.	13.	23.	Semi-diameters of *Jupiter*.
Borellus	5. $\frac{2}{4}$	8. $\frac{2}{4}$	14.	24. $\frac{2}{3}$	
Mr. *Townley* by the Micrometer	5. 51	8. 78	13. 47	24. 72	
Mr. *Flamſtead* by the Micrometer	5. 31	8. 85	13. 98	24. 23	
Mr *Flamſtead* by Eclipſes of *Satell.*	5. 578	8. 876	14. 159	24. 903	
From the Periodical Times	5. 578	8. 878	14. 168	24. 968	

The Periodical Times are: Of the

	Days.	Hours.	Min.	
Firſt	1	18	28	$\frac{3}{5}$
Second	3	13	17	$\frac{2}{10}$
Third	7	3	59	$\frac{3}{5}$
Fourth	16	18	5	$\frac{1}{5}$

Vid. Newton's *Princip.* pag. 403.

Mr. *Flamſtead* in *Philoſoph. Tranſact.* N. 154. ſays, That when *Jupiter* is in a Quartile of the Sun, the Diſtance of the firſt *Satellite* from his next Limb when it falls into his Shadow, and is Eclipſed, is one *Semi-diameter*, of *Jupiter*; of the ſecond, two, or a *whole Diameter* nearly; of the third, three; of the fourth, five of his *Semi-diameters*, or ſomething better, when the Parrallax of the Orb is greateſt. But theſe Quantities diminiſh gradually as he approaches the Conjunction or Oppoſition of the Sun ſomewhat nearly, but not exactly in the Proportion of Sines.

SATELLITES of *Saturn*. *Anno.* 1684, in the Month of *March*, Mr. *Caſſini*, by the help of excellent *Object Glaſſes*, of 70, 90, 100, 136, 155, and of 220 Feet, diſcovered the two innermoſt; (that is, the firſt and ſecond) *Satellites* of *Saturn*.

The *Firſt Satellite* he obſerved to be never diſtant from *Saturn*'s *Ring*, above $\frac{2}{3}$ of the apparent length of the ſame Ring: And it was found to make one Revolution about *Saturn*, in 1 Day, 21 Hours, and 19 Minutes; making two Conjunctions with *Saturn*, in leſs than two Days; one in the upper part of his Orb, and the other in the lower part. It is diſtant from the Centre of *Saturn* 4 $\frac{3}{5}$ of *Saturn*'s Semi-diameters.

The *Second Satellite* of *Saturn*, was obſerved but $\frac{1}{4}$ of the length of his Ring diſtant therefrom, making his Revolution about him in two Days, 17 Hours, and 43 Minutes. This is diſtant from the Centre of *Saturn*, 5 $\frac{3}{5}$ *Semi-diameters* of that Planet.

From a great number of choice Obſervations be concluded, That the Proportion of the Digreſſion of the *Second* to that of the *Firſt*, counting both from the Centre of *Saturn*, is as 22 to 17.

And the time wherein the *Second Satellite* makes its Revolution, is to the time wherein the firſt makes its, as 24 $\frac{3}{4}$ to 17.

The *Third* is diſtant from *Saturn*, 8 of his *Semi-diameters*, and revolves round him in almoſt 4 $\frac{3}{5}$ Days.

The *Fourth*, or *Hugenian Satellite*, as 'tis called, becauſe diſcovered firſt by Mr. *Hugens*, revolves round *Saturn*, in about 16 Days, and is diſtant from his Centre about 18 *Semi-diameters* of *Saturn*.

The *Fifth Satellite* of *Saturn*, is diſtant from his Centre 54 *Semi-diameters* of *Saturn*; and revolves round him in 79 $\frac{1}{3}$ Days. The greateſt diſtance between this *Satellite*, and the precedent, made Mr. *Hugens* ſuſpect there may be a Sixth between theſe two; or elſe that this Fifth may have other *Satellites* moving round him.

Mr. *Halley*, in *Philoſoph. Tranſact.* N. 145. gives a Correction of the Theory of the Motion of the *Hugenian*, or *Fourth Satellite* of *Saturn*, and makes the *True Time of its Period* to be 15 Days, 22 Hours, 41 Minutes, 6 Seconds; its *Diurnal Motion*, to be 22 Degrees, 34 Minutes, 38 Seconds, 18 Thirds. And the Diſtance of this *Satellite* from the Centre of *Saturn*, to be about 4 *Diameters* of the *Ring*, or 9 of the *Globe*; and the place where it moves, to differ little or nothing from that of the *Ring*; that is to ſay, interſecting the Orb of *Saturn* with an Angle 23 ½ Degrees, ſo as to be nearly Parallel to the *Earths Equator*.

The Periodical Times of the Satellites *of* Saturn, *according to Mr.* Caſſini, *are of the*

	Days.	Hours.	Minutes.
Firſt	1	21	19
Second	2	17	43
Third	4	12	27
Fourth	15	23	15
Fifth	79	22	00

SATURN: The Proportion of the Body of *Saturn* to our Earth is about 30 to 1.

The Periodical Time of *Saturn*'s Revolution about the Sun, is in the ſpace of 30 Years or 10950 Days.

The Semi-diameter of *Saturn*'s Orbit, is almoſt ten times as big as that of the *Magnus Orbis*, and therefore is of Engliſh Miles 946969690.

According to Mr. *Caſſini*, *Saturn*'s greateſt Diſtance from the Earth is 244330, his mean Diſtance 210000, and his leaſt Diſtance 175670 Semi-diameters of the Earth.

Mr. *Hugens* found the Inclination of the Ring of *Saturn* to the Ecliptick, to be an Angle of 31 Degrees.

Mr. *Azout* aſſerts, That the remote Diſtance of *Saturn* from the *Sun* doth not hinder, but that there is Light enough to ſee clear there, and more than in our *Earth* in Cloudy Weather.

In an Obſervation which *Caſſini* made *June* 19 1692, of a preciſe Conjuction between a Fixt Star, and one of *Saturn*'s Satellities, he ſaith, That with his 39 Foot Glaſs, he could plainly ſee the Shadow of *Saturn*'s Globe to be in part oval upon the hinder part of his Ring. The Diameter of *Saturn* at the time of this Obſervation, appeared to be 45 Seconds.

The Diameter of *Saturn* to that of his Ring is as 4 to 9.

And the Diameter of the Ring ſeen from the Sun, would be but 50″. and therefore the Diameter of *Saturn* ſeen from thence would be but 11″. as Mr. *Flamſtead* found by meaſuring it. But Mr. *Newton* thinks it ought rather to be accounted but as 10″. or 9″. becauſe he ſuppoſes the Globe of *Saturn* to be a little dilated by the unequal Refrangibility of Light.

Capt. *Halley*, in his Preface to the Catalogue of the Southern Stars, ſays, He found *Saturn* to move ſlower than the Aſtronomical Tables repreſent him.

The Diſtance of *Saturn* from the Sun, is about 10 times as great as that of our Earth from him; and therefore that Planet will not have above the 100th part of the Influence of the Sun which we have; and conſequently cannot be Habitable by ſuch Creatures as live on our Globe, unleſs there be ſome unknown way of communicating Heat to him.

Dr. *Gregory*, in his Aſtronomy, makes the Semi-diameter of the Ring of *Saturn* to that of the Planet, as 2 ¼ to 1. and the Interſtice between the Planet and the Ring, is the Breadth of the Ring.

How the Ring of *Saturn* will appear in all parts of the Orbit of the Planet, to an Eye placed at the Sun, or at the Earth, the ſame Learned Aſtronomer ſhews in his *Aſtron. Phy. & Geometr.* Lib. IV. Prop. 69, 70.

If an Eye were placed in *Saturn*, the Diameter of the Sun would appear 10 times leſs than it doth to us almoſt; and conſequently, his Disk, Light and Heat will be there 90 times leſs. *Saturn*'s Year is almoſt 30 of ours, but the length of his Day is yet uncertain, becauſe the time of his Revolution round his Axis is not yet known: But Mr. *Hugens* judges they are not longer than the Days in *Jupiter*. That great Aſtronomer ſuppoſeth the Axis of *Saturn* to be perpendicular to the Plane of his Ring, and of the Orbites of the Satellites: If ſo, then there will be the ſame Poſition of the Equator and Poles, (as to the Fixt Stars) as there is in our Earth: The ſame Pole Star and the Fixt Stars will appear to Riſe and Set after the ſame manner, in the ſame Latitudes. There is a vaſt Inequality in the Length of the Day in ſeveral parts of this Planet; and as great a diverſity of Summer and Winter; which depends on the Quantity of the Inclination of the Plane of the Equator, to the Plane of the Orbit of *Saturn* round the Sun; which *Hugens* makes to be 31 Degr. which is almoſt ⅓ more than in our Earth; where yet the differences and variety of Seaſons and Weather are very ſenſible. For in *Saturn*, in the Latitude of 50 Degr. the longeſt Day will have no Night at all, and the longeſt Night will have no Day. And the two Frigid Zones will be each of them 62 gr. broad, at leaſt 10 times as large as the whole Surface of our Earth. The Eye thus placed, will be able to diſcern none of the Planets but *Jupiter*, which will appear always to accompany the Sun, and never to be from him above 37 gr. The Parallax of the Sun in *Saturn*, is but 9″, and therefore Inſenſible; but the Parallaxes of all his Moons or Satellites, are very conſiderable, and therefore their Diſtances from him will be eaſily computable.

But what an Eye placed in *Saturn* would moſt admire, is the Ring of that Planet; the only thing of that nature that is diſcovered in any of the Planets. *Tho. Kepler* in his *Epitome Aſtron. Copernic.* Lib. 4. p. 586, and after him Capt. *Halley* in his Enquiry into the Cauſes of Variation of the Needles Variation, *Phil. Tranſ.* N. 195, do ſuppoſe our Earth may be compoſed of ſeveral Cruſts or Shells one within another, and concentrical to each other. And if ſo, then 'tis poſſible the Ring of *Saturn* may be the Fragment or remaining Ruins of his formerly exterior Shell, the reſt of which is broken and fallen down upon the Body of the Planet. And if *Saturn* ever had ſuch a Shell round it, its Diameter would then have appeared as big to an Eye at the Sun, as that of *Jupiter* doth now, when ſeen from thence.

Since the outward Margin of the Ring is diſtant from *Saturn* 2 ¼ of *Saturn*'s Semi-diameter, this cannot be ſeen at the diſtance of 64 Degr. from *Saturn*'s Equator (in whoſe Plane the Ring is placed.) Therefore a Spectator placed in a Latitude higher than that, can never ſee the Ring at all; ſo that there

there is a Zone of almoſt 53° broad towards either Pole, to whom this famous Ring can never appear. And as the Spectator ſhall move nearer the Pole, firſt one, then the ſecond Satellite, next the third and fourth; and when he is come within one Degree of the Pole, even the fifth Satellite cannot be ſeen, unleſs by Refraction; and in the Winter-time, neither Sun, Moon, nor any Planet, will be there viſible, unleſs perhaps a Comet.

If the Eye be ſuppoſed to be placed in the Equator of *Saturn*, or in the Zone nearly adjoining, it can never ſee thoſe Stars that are in or very near the Equator, nor any one of the Satellites; becauſe the Ring will always hide them; and then at the Equinoxes it cannot ſee the Sun; and if it were any where elſe placed, it could not then ſee the Ring; becauſe neither of its Faces will then appear illuminated by the Sun.

The breadth of this Ring 'tis hard to determine from our Earth, becauſe its Thickneſs is ſo ſmall: But Mr. *Hugens* makes it to be *about ſix hundred German Miles.*

For one half of *Saturn*'s Year, (*viz.* 15 Years of ours) only one Face of the Ring will be enlightned by the Sun: Whence the Inhabitants which may be ſuppoſed to live in that Hemiſphere, to which this Face of the Ring is turned, or to whom it is Summer, will ſee that part of the Ring which is above their Horizon, ſhining faintly by Day, (as our Moon doth when the Sun is above our Horizon) but brighter and ſtronger by Night, as our Moon doth in the Sun's abſence: And after Sun-ſet, the Eaſtern part of this enlightened Arch will fall within the Shadow of *Saturn*; which Shade will aſcend as Night comes on, and at Midnight will be at the higheſt; and then will deſcend again towards the Weſtern part of the Ring, according as the Sun comes more and more to the Eaſtward.

This enlightened Ark will always ſhew how to deſcribe a Meridian Line; for a Plane perpendicular to the Horizon, and paſſing thorough the Vertex of the Ark, will be in the true Meridian.

To an Eye placed any where without, and at leſs than 52° diſtance from the Equator, this enlightened Ark of the Ring will appear Concave as well as Convex, like a kind of Furnace or Vault, riſing above the Horizon: But to an Eye or more than 52′, and leſs than 64 Degrees diſtant from the Equator, the hollow or concave Part will not be viſible; but there will appear a britiſh Body ariſing as it were out of the Ground, and contiguous to the Horizon.

For the other half of *Saturn*'s Year, while the Sun declines towards the depreſſed Pole, or during the 15 Years Winter, the Ring will not be viſible, as having not that Face Illuminated which is obverted to the Spectator's Eye; but however will render it ſelf ſenſible, by covering from the Sight, ſuch Stars and Parts of the Heavens as are oppoſite to it, or apparently behind it. The ſhade of the Ring alſo will be extended more and more towards the nearer Pole; ſo that to an Eye placed any where within the aforeſaid ſpace, the Sun, when he attains ſuch a certain Declination, will appear to be covered or eclipſed juſt at Noon, and then ſtrait to emerge out of the Shadow. The next Day, the like Phænomenon will happen, but the Eclipſe will begin ſooner, and will be over later: And theſe Meridian Eclipſes will daily encreaſe in their duration, until the middle of Winter; and then they will decreaſe again gradually, till at laſt they will come to nothing again; *viz.* When the Sun returning from the Tropick, hath the ſame Declination as he had when theſe Meridional Eclipſes began.

And this will happen, if any Eye be placed in any Latitude greater than 25 or 26 Degrees; but if in a Latitude leſs than this, when the Meridian Darkneſs is of the greateſt duration, the Sun will ſuddenly appear juſt in the Meridian, and then ſtraitway will be Eclipſed again. The next Day, there will appear the like ſort of Light, but it will laſt longer; and this Meridian Light will grow ſtill longer and longer in duration, till Midwinter, and then (like the Darkneſs above-mentioned) it will be continually decreaſing, until it quite diſappear.

And from hence 'tis plain, that there is the greateſt difference between Summer and Winter in the Globe of *Saturn*, of all the other Planets; and this both on the account of the long duration of each, and the great declination of the Sun from the Equator; and alſo, by reaſon of theſe Meridional Darkneſſes in the Winter, ariſing from the Rings Eclipſing the Sun. *Gregor. Aſtr. Phy. & Geom. Lib.* 6. *Prop.* 6. *p.* 480.

SAUSAGE, is a long piece of Cloth, the ſides whereof are ſewed in form of a Gut, as large as to contain a Tennis Ball. It is dipt in Pitch or Tar, and filled with Powder, on purpoſe to ſerve as a Train to ſet Fire to Mines, Fougades, or Bomb-Cheſts. Two of theſe *Sauſages* are commonly applied to every Mine, to the end that if one ſhould fail, the other may take effect.

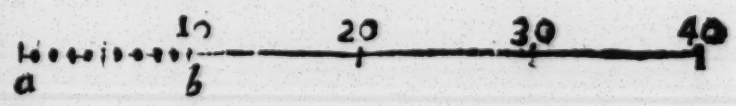
SAUCISSONS, are a ſort of Faggots made of great Boughs of Trees bound together in the middle and at both ends. Their uſe is much the ſame with the Bavings or ſmall Faggots, *viz.* to conſolidate the Way for Carriages, to make Traverſes or Parapets in Ditches full of Water, *&c.*

SAVER *default*, in Law, is Word for Word to excuſe a *Default* in Court, comes afterwards and alledges a good Cauſe why he did it, as Impriſonment at the ſame time, or ſuch like.

SCALADOE, is the mounting of the Wall of a Fortify'd Town or Caſtle, with Scaling Ladders.

SCALE, in Mathematicks, ſignifies any Meaſures or Numbers which are commonly uſed; or the degrees of any Ark of a Circle, or of ſuch Right Lines as are divided from thence; ſuch as *Sines, Tangents, Chords, Secants,* &c. drawn or plotted down upon a Ruler, for ready Uſe and Practice in Geometrical or other Mathematical Operations. The ſeveral kinds of which follow, as

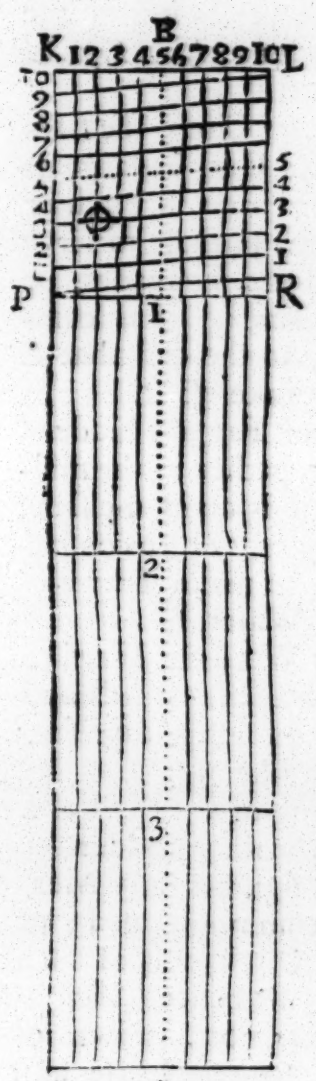
1. *Scales of Equal Parts*; of which that commonly called, *a Plane Scale*, is made by drawing any Right Line, as *a z* on *Paper, Paſtboard,* &c. Then with a Pair of Dividing Compaſſes run along 10 ſmall Diviſions from *a* to *b*; and then ſetting off the whole Diviſion *a b*, as often as you pleaſe, toward the Right-hand, as you ſee



For then may each of theſe great Diviſions repreſent 10 Miles, as in a Scale of Miles in a Map; and conſequently each of the ſmaller Diviſions one Mile: Or the diſtance *a b* may be an Inch, and

the leſſer Diviſions will be 10th parts of Inches: Or the larger Diviſions may be Leagues at Sea, *&c.* Or, in a word, this Scale may well enough repreſent any Meaſures or Numbers whatſoever, whoſe Parts are equal one to another. But this is more accurately indeed done by a

Diagonal Scale, which the larger Diviſions of are commonly of an *Inch*, or of *half an Inch*; and are made upon eleven Lines, ſo as to include ten equal Spaces (as in the Figure B) which are all cut at right Angles to the Tranſverſe Lines P R. Then P K being divided into 20 equal Parts, as alſo R L; and from the Points of Diviſion upon the Line P K, to thoſe on the Line R L, are 10 Diagonals drawn; the 1ſt beginning at P, and ending at the 1ſt Diviſion above R. The ſecond beginning at the 1ſt Diviſion above P, and ending at the 2d above R, *&c.* In ſhort, they are all drawn from one Diviſion leſs from P, to one Diviſion more from R.

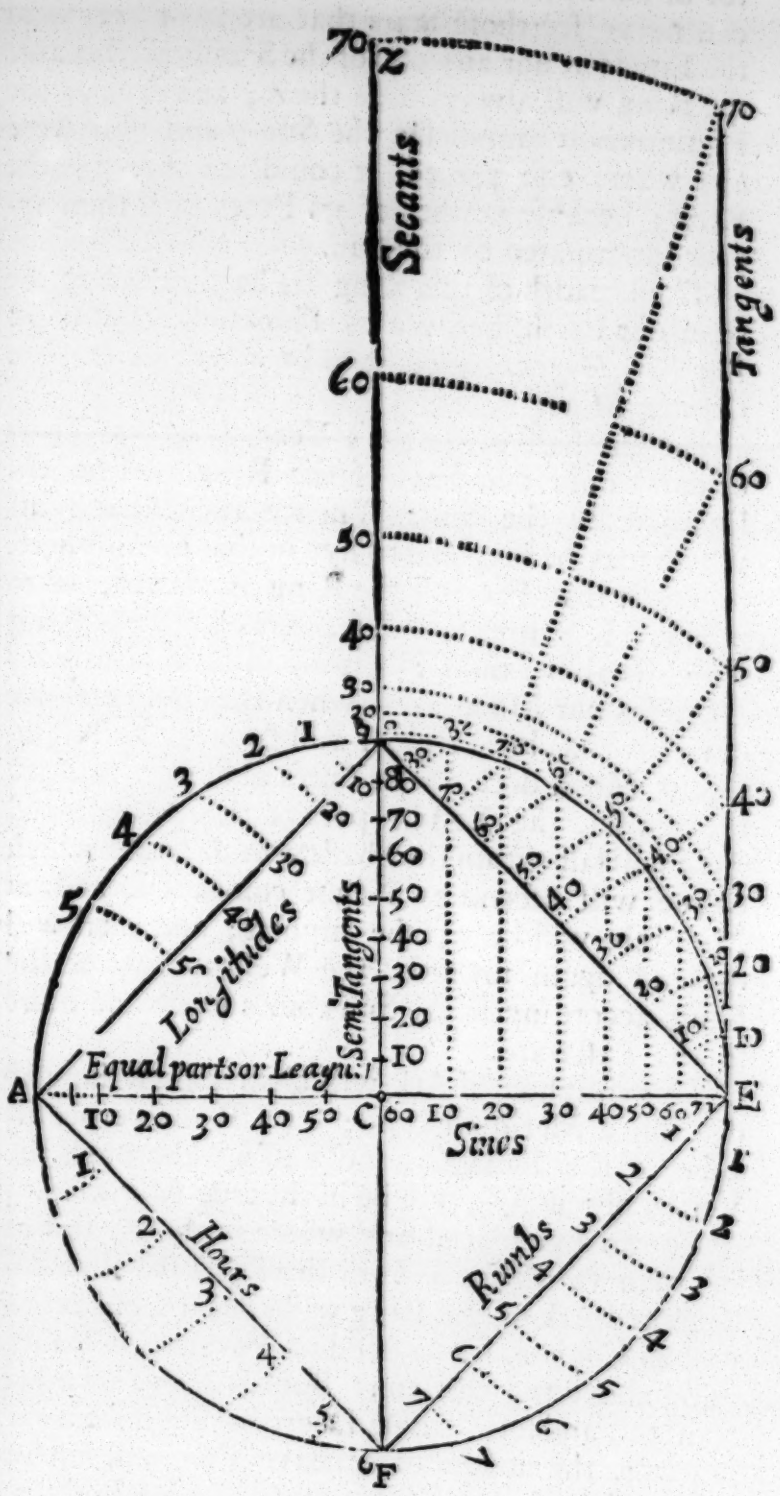


So that every *Diagonal*, by that time it hath paſſed from the firſt Line to the eleventh, is a whole 10th part of an Inch farther diſtant from the Line P R, than at the Point upon the firſt Line whence it was drawn. And every one of theſe *Diagonals* is divided into 10 equal Parts by the Parallel-line drawn along the Scale, and numbred on the Top from 1 to 9. Whereby 'tis evident, that the Interſection of any of theſe Parallel Lines numbred at the Top, with any *Diagonal*, is farther diſtant from the Line P R than the Interſection of the Line next before it, with the ſame *Diagonal*, by $\frac{1}{10}$ of $\frac{1}{10}$, that is, by $\frac{1}{100}$. Therefore you may by the *Diagonal Scale*, take the 100 part of an Inch, or of half an Inch, very exactly.

The Uſe of theſe *Scales*, viz. of *Equal Parts*, or the *Diagonal*, is chiefly, *To lay down any Meaſure taken; or a Line being laid down, to find how much of the Meaſure that Line containeth.*

The way to do both which, is to reckon the Unities from P towards R; the Tens, from P towards K; and the Hundreds, from 1, to 2, 3, 4, *&c.* of the great Diviſions. Thus, for 432, count two of the Parallel Lines downward, and then run your Eye forward to the Right-hand, till you come to the 3d *Diagonal*, as at *o*; then the Compaſſes on the Line, extended from *o* to 4, will repreſent 432.

The Plain SCALE, (for Sea Uſes) has alſo ſet thereon, the *Scale of Chords, Natural Signs, Tangents, Semi-tangents, Seconds, Rhumbs, Hours, Leagues*, and *Longitudes*; with the *Diagonal Scale* on the back-ſide, and ſome others, according as there is room. The way of deducing or graduating all which from the equal Diviſions, or Degrees of the Circumference of a Circle, is, as in the following Scheme.



Having deſcribed the Circle A F E 90, and quartered it with two Diameters A E, F 90 at Right Angles.

1. Divide the Ark E 90 into 9 equal Parts, and tranſfer the Diviſions to the Right Line E 90, and that will be a *Line of Chords*.

2. Then Perpendicular to the Radius C E, erect the Tangent E 70; then a Ruler laid over C, and the equal Diviſions of the Ark E 90, gives E 70, the *Tangent Line* truly divided.

3. If thro' the Diviſions, 10, 20, 30, *&c.* on the Ark E 90, then you draw Parallels to C 90, it will divide CE, ſo as to make it a *Line of Sines*.

4. Setting

4. Setting one Foot of the Compaſs in C, extend the other to the ſeveral Diviſions on the Tangent Line E 70, and deſcribe the Arches 10, 10; 20, 20; 30, 30; &c. and the Line Z 90, will be a true *Line of Secants.*

5. A Ruler from A, to the ſeveral Diviſions of the Ark E 90, divides the Line C 90, into a *Line of Semi-tangents.*

6. Divide the Ark E F, into eight equal Parts, and ſetting one Foot in E, transfer the Diviſions of the Ark 1, 2, 3, &c. to the Right Line E F, and it ſhall be the *Line of Rhumbs.*

7. Divide F A, into ſix equal Parts, and ſetting one Foot in A, transfer them to the Strait Line FA, and that will be a *Line of Hours.*

8. Divide the Radius AC, into ſix equal Parts, and thro' each Diviſion draw Lines Parallel to C 90; thoſe Lines will Divide the Quadrant A 90, into ſix unequal Parts, and thoſe transfer'd into the *Chord* A 90, makes the *Line of Longitudes.*

9. And the equal Diviſions on the Radius A C, being ſubdivided, is the *Line of Leagues*, or *Line of equal Parts.*

SCALE *of the Gamut*, or *Muſical Scale*, is a kind of *Diagram*, conſiſting of certain Lines and Spaces drawn to ſhew the ſeveral Degrees, whereby a Natural or Artificial Voice or ſound may either aſcend or deſcend.

The Name thereof is taken from the *Greek* Letter *Gamma*, which *Guido Aretinus*, who reduced the *Greek* Scale into this Form, plac'd at the bottom, to ſignifie from whence it was derived; ſo that ever ſince, this Scale or *Gamut*, hath been taken for the Ground-work or firſt Foundation of all Muſick, both Vocal and Inſtrumental.

But there were three different Scales in uſe among the Ancients, which had their Denominations from the three ſeveral ſorts of Muſick, *viz.* The *Diatonical*, *Chromatical*, and *Enharmonical.* Which ſee.

SCALENI, are three Muſcles of the Thorax, ſo called from their Figure, having three unequal Sides.

1. *Scalenus Primus*, which ariſes fleſhly from the Fore-part of the ſecond, third, and fourth Tranſverſe Proceſſes of the *Vertebræ* of the Neck; and deſcending obliquely forwards, becomes Tendinous at its Inſertion to the firſt Rib: The Axillary Nerves paſs between this and the following Muſcles. Its Uſe is to draw the Superior Rib, together with the reſt, upwards in Inſpiration.

2. *Scalenus Secundus*, this ſprings fleſhly from the ſecond, third, fourth, and fifth Tranſverſe Proceſſes of the *Vertebræ* of the Neck, laterally, (like the former) in its deſcent, it becomes thin and tendinous, marching over the firſt Rib to its Inſertion in the ſecond, and ſometimes to the third.

3. *Scalenus Tertius*, this has its beginning near the former, from the ſame Tranſverſe Proceſſes of the *Vertebræ* of the Neck; as alſo from the fifth and ſixth of thoſe Proceſſes, and is ſoon Inſerted to the firſt Rib.

SCALENOUS *Triangles.* See *Triangles.*

SCALPRUM; a Surgeon's Raſping and Scraping Iron, with which he ſcrapes rotten Bones.

SCAMILLI *Impares*, in Architecture, are certain Blocks or *Zocco*'s which ſerve to elevate the reſt of the Members of any Column or Statue, which was placed before the Horizon, (*i. e.*) beneath the Projectures of the *Stylobata Cornices*, and, other *Saillies*; and will eaſily be conceived by conſidering the Pedeſtals of Statutes, which do well repreſent them.

SCAMNUM *Hippocratis*, *Hippocrates*'s Bench, is an Inſtrument of ſix Ells long: 'Tis uſed in ſetting of Bones.

SCANDALUM *Magnatum*, in Law, is the ſpecial Name of a Wrong done to any high Perſonage of the Land, as Prelates, Dukes, Earls, Barons, and other Nobles; as alſo of the Chancellor, Treaſurer, Clerk of the Privy-Seal, Steward of the Houſe, Juſtice of the Bench or other, and other great Officers of the Realm, by falſe News or Meſſages, whereby Debates and Diſcords betwixt them and the Commons, or any Scandal to their Perſons might ariſe; and hath given Name to a Writ granted to recover Damage thereupon.

SCAPHA *ſeu Linter*, is the Inner Rim of the Ear.

SCAPHOIDES, is the third *Os Tarſi* in the Foot; 'tis joined to the Ancle-Bone, and the three hinder Bones. 'Tis called alſo *Os Naviculare*, from ſome reſemblance it has to a Boat.

SCAPULA, the Shoulder-blade, a broad triangular Bone, with 3 Proceſſes; 'tis very thin in the middle, but grows thicker about the Proceſſes.

SCAPULARIS, *Externa* and *Interna*, are two little Veins ſo called, of which the former ariſes from the Muſcles covering the *Scapulæ*; and the latter, from the Muſcles which poſſeſs the cavity of the *Scapulæ.*

SCAPUS, is the term in Botany for the ſtrait Stalk or *Shaft* of a Plant, ſtanding upright like a Pillar or Column.

SCARFED, in the Sea-Carpenters Language, is the ſame as *Pieced*, or faſtened or joined in: Thus they ſay the Stem of a Ship is *Scarfed* into her Keel; and they imploy by it, That the two Pieces are ſhaped away ſlanting, ſo as to join with one another cloſe and even; which they call *Wood and Wood.*

SCARIFICATION; 'tis an Inciſion of the Skin with a Pen-knife or Lancet. This is done either with or without Cupping-Glaſſes; without Cupping Glaſſes, if there be any Mortification or Gangrene, becauſe the ſeparation is by no means to be haſtened; with Cupping Glaſſes, if there be a neceſſity to take away Blood.

SCARP, in Fortification, is the Foot of the Rampart-Wall, or the ſloaping of the Wall from the bottom of the Work, to the Cordon on the ſide of the Moat.

SCARPE, a term in Heraldry, probably derived from the French *Eſcharpe*, ſignifying the Scarfe which Military Commanders wear for Ornament. It is born ſomething like a *Battoon Sinister*, but is broader than it, and is continued out to the Edges of the Field; whereas the Bottom is cut off at each end.

He beareth Argent a Scarpe Azure.

SCELOTYRBE, is a wandring Pain in the Legs, proceeding chiefly from the Scurvy. Hence the Water proper for this Diſtemper, is called *Aqua Scelotyrbitis*. *Blanchard.*

SCENOGRAPHY, in *Perſpectives*, the *Scenographick* appearance of any Figure, Body, or Building, is that Side that declines from, or makes Angles with that ſtrait Line imagined to paſs through the two outward convex Points of the Eyes, generally called by Workmen, the *Return* of a foreright Side; and differs from the *Orthographick* Appearance in this, That the latter repreſents the Side of a Body or Building as it is ſeen, when the Plain of the Glaſs ſtands parallel to that Side: But *Scenography* repreſents it as it ſeems through a Glaſs, not parallel to that Side.

In Architecture and Fortification, *Scenography* is the manner of delineating the ſeveral parts of a Building or Fortreſs, as they are repreſented in Perſpective.

SCEPTICK, is the term for a Perſon who maintains there is nothing Certain, and no real Knowledge at all to be had; but that a Man ought to Doubt of, and Disbelieve every thing.

SCHEME, is the Repreſentation of any Geometrical or Aſtronomical Figure or Problem, by Lines ſenſibly to the Eye; and theſe are otherwiſe called *Diagrams*.

SCETICA *febris*, is oppoſed to the Hectick Fever, becauſe it is ſeated moſtly in the Blood, and is eaſily cured; but the Hectick Fever is fixed in the very Habit of the Body, and not to be remov'd without great difficulty. *Blanchard.*

SCHIRRUS, and *Schirroma*, is a hard, livid Swelling, that reſiſts the touch, and is without Pain. *Blanchard.*

SCHOLIUM, is a remark made leiſurely, and as it were by the by, on that Propoſition, Subject or Diſcourſe before advanced, treated of, or delivered.

SCIATICA, the Gout in or about the Hip-Bone.

SCIENCE, is Knowledge founded upon, or acquir'd by clear, certain, and ſelf-evident Principles.

SCIOGRAPHY, is the Art of *Shadows* or *Dyaling*: Alſo in Architecture, this Word is ſometimes taken for the Draught of a Building cut in its Length or Breadth, to ſhew the Inſide of it; as alſo the Thickneſs of the Walls, Vaults, Floors, Timber-works, *&c.*

SCIOPTRICKS. See *Obſcura Camera.*

SCIOTHERICUM *Teleſcopium*, is an Horizontal Dyal, with a Teleſcope adapted for obſerving the true Time both by Day and Night, to regulate and adjuſt Pendulum Clocks, Watches, and other Time-keepers; Invented by the Ingenious Mr. *Molyneux*, who hath publiſhed a Book with this Title, which contains an Accurate Deſcription of this Inſtrument, and all its Uſes and Applications.

SCIRE *facias*, is a Writ Judicial, moſt commonly to call a Man to ſhew cauſe to the Court whence it Iſſues, why Execution of a Judgment paſſed, ſhould not be made out. This Writ is not granted until a Year and a Day be elapſed after a Judgment given. *Scire facias*, upon a Fine, lies not but within the ſame time after the Fine levied, otherwiſe it is the ſame with the Writ of *Habere facias ſeiſinam*.

SCLEROPHTHALMY, it is hard bleareduneſs of the Eyes, accompanied with Pain; a ſlow motion of the Eyes, with redneſs and dryneſs. *Blanchard.*

SCLEROTICA, or hardening Medicines, are ſuch as unite the Parts more firmly amongſt themſelves; and that either by diſſipating the thin and ſoft Parts, or elſe ſometimes by retaining them; the firſt by hardning the Matter into a *Schirrus* by too hot Medicines; the latter is done when the Part affected acquires a Hardneſs, by cooling and aſtringent Medicines, ſuch are *Sengreen*, *Nightſhade*, *Purſlane*, and *Water-Lentils*. Therefore theſe *Sclerotick* Medicines are either Healing, or elſe Cooling and Aſtringent. *Blanchard.*

SCLEROTICA *Tunica*. See *Cornea.*

SCOLIASIS, is a diſtortion of the Back-Bone to one or t'other ſide.

SCLOOPOMACHÆRION, is a Chirurgeon's Knife, with which Wounds of the *Thorax* are widened; 'tis uſed alſo in opening larger Swellings; as alſo in opening the *Abdomen*.

SCONCES, are ſmall *Forts* built for Defence of ſome Paſs, River, or other Place.

Sometimes they are made regular of four, five, or ſix Baſtions; others of ſmaller Dimenſions fit for Paſſes, or Rivers, and likewiſe for the Field, which are.

1. *Triangles with half Baſtions*, which may be all of equal Sides, or they may be ſomething unequal. However it be, divide the Sides of the Triangle into two equal Parts, one of theſe three Parts will ſet off the *Capitals*, and the *Gorges*, and the *Flanks* being at Right-Angles with the Sides, make half of the *Gorge*.

2. *Square with half Baſtions*, whoſe Sides may be betwixt 100 and 200 Feet; and let one third of the Side ſet off the *Capital* and the Gorges; but the Flank (which raiſe at Right-Angles to the Side) muſt be but one half of the Gorge or *Capital*, that is on the ſixth part of the ſide of the Square.

3. *Square with half Baſtions and Tong*.

4. *Long Squares*.

5. *Star Redoubt of four Points*.

6. *Star Redoubt of five or ſix Points*.

7. *Plain Redoubts*, which are either ſmall or great: The ſmall are fit for Court of Guards in the Trenches, and may be a Square of 20 Foot to 30. The middle ſorts of *Redoubts* may have their Sides from 30 to 50 Feet; the Great ones from 60 to 80 Feet ſquare.

The Profile (that is, the Thickneſs and Height of the Breſt-works) to be ſet on theſe ſeveral Works, and the Ditches, are alterable and uncertain; for ſometimes they are uſed in Approaches, and then the Wideneſs of the Breſt-work at the Bottom may be 7 or 8 Foot, Inward Height 6, and Outward 5 Foot; the Ditch may be 8 or 10 Feet, and ſometimes 12; and for the Sloaps to be wrought according to the nature of the Earth; ſometimes they may be made 14 or 20 Feet Wide at the Bottom, and the Height of 7, 8, or 9 Feet, and

and to have two or three Aſcents to riſe to the *Parapet*; the Ditch may be 16 or 24 Feet Wide, and 5 or 6 Deep; and ſometimes they may come near the ſmalleſt ſort of Ramparts, and have a Breſt-work Cannon Proof, with a Ditch of 50 or 60 Feet Wide, and are thus made to ſet upon Paſſes or Rivers to endure.

SCOPER-*Holes*, in a Ship are Holes made through the Sides, cloſe to the Deck, to carry off the Water that comes from the Pump, or any other way. Theſe Holes in the loweſt Deck, and in the *Manniger*, have round Leathers nail'd over them, to keep the Sea-water from coming up into the Ship, which are called *Scoper Leathers*; and the ſhort Nails with broad Heads, which faſten theſe Leathers down, are called *Scoper-Nails*.

SCORBUTUS, the Scurvy, is a Diſeaſe that is Epidemical to the *Hollanders*. The ſymptoms of it are generally livid Spots on the Hands and Feet, weakneſs of the Legs, ſtinking Breath, looſeneſs of the Teeth, bleeding of the Gums, Convulſions, Pains, running Gout, Cholick, *&c. Blanchard*.

SCORE, in Muſick, is the Original Draught of the whole Compoſition, wherein the ſeveral Parts, *viz.* Treble, ſecond Treble, Baſe, *&c.* are diſtinctly ſcored or marked.

SCORPIO, is the 8th Sign of the *Zodiack*, being uſually marked thus (♏).

SCOT. a Part or Portion, according to *Raſtall*, is a certain Cuſtom, or common Tallage made to the Uſe of the Sheriff, or his Bailiffs; but now ſignifies a cuſtomary Contribution laid upon all Subjects, according to their Ability; for whoever are Aſſeſſed to any Contribution, are generally ſaid to pay *Scot* and *Lot*.

SCOTIA, a term in Architecture, the ſame with *Trochile*; which ſee.

SCOTIA, is Architecture, in a certain Member hollowed in form of a Demi-channel, which is placed berween the *Tours* and the *Aſtragal* in the Baſes of Pillars; as alſo ſometimes under the *Larmier* or *Drip*, in the Cornice of the *Dorick* Order.

SCOTOMY, Dizzineſs or Swimming of the Head, is when the Animal Spirits are ſo whirl'd about, that the external Objects ſeem to run round. *Blanchard*.

SCROBICULUS *Cordis*, or *Anticardium*, the *Heart Pit*, formerly called *Cardia*, the Pit of the Breaſt, or as 'tis uſually called the Stomach.

SCROPHULA, art preternatural hard Glandules, or preternatural Swellings of the Glandules of the Neck and Ears; they are contained in a proper Tunick. *Blanchard*.

SCROTUM, is that Rag which contains the Teſticles of the Male: It conſiſts of a Skin, a fleſhy Panniculus, and the two Tunics; of which, the outermoſt is called *Elytroids* or *Vaginalis*; the innermoſt Tunic is called *Albuginea*. In the middle of it is a Line extended in the length, which divides the right part from the left, which they call the *Septum*. For its more eaſie Diſtention or Contraction, 'tis generally ſuppoſed to be void of Fat. See more under the Word *Teſtes* and Teſticuli.

SCROTUM *Cordis*, ſo ſome are pleaſed to call the *Pericardium*; which ſee.

SCROWLES, or *Volutes*, a term in Architecture. See *Valuta*.

SCURVY. See *Scorbutus*.

SCUTIFORME *Os*. See *Mola Genu*.

SCUTIFORMIS *Cartilago*. See *Enſiformis*.

SCUTTLES in a Ship, are ſquare Holes, big enough to let in the Body of a Man cut in the Deck, to let People down on occaſion into any Room below. They are generally before the Main-Maſt, before the Knight in the Fore-Caſtle: In the Gun-Room to go down to the Stern Sheets: In the Round-Houſe to go down into the Captain's Cabbin, when forced by the Enemy in a Fight aloft. There are alſo ſome ſmaller Scuttles, which have Gratings over them; and all of them have covers to them, that Men may not tumble in at Night, when 'tis dark.

Alſo, thoſe little Windows and long Holes which are cut out in Cabbins to let in Light, are called *Scuttles*.

SCUTUM. See *Mola Genu*.

SCYPHOS, is the *Infundibulum* in the Brain; likewiſe thoſe Paſſages which convey the Spittle from the *Os Cribriforme* to the Pallat, are ſo called by ſome Writers. *Blanchard*.

SEA-*Gate*, when two Ships are aboard one another, by means of a Wave or Billow: The Seamen ſay, They lie aboard one another in a *Sea-Gate*.

SEA-*Quadrant*. See *Back-ſtaff*.

SEA-*York*, when the Sea is ſo rough, that they cannot govern the Helm with their Hands, then the Seamen ſeize two Blocks to the end of the Helm, one on each ſide, and then reeving two ſmall Ropes through them, which they call Falls, and which are faſtned to the ſides of the Ship, by having ſome Men at each Tackle, they govern the Helm according to Direction. This they call a Yoke to ſteer by. Sometimes they make a Yoke, by taking a double turn about the end of the Helm by a ſingle Rope, the ends being laid to the Ship-ſides; and by this means they guide the Helm; but this is not ſo good a Yoke as the other.

SEAMS of a Ship, are Places where her Planks meet and joyn together. There is alſo a kind of peculiar Seam in the ſowing of Sails, which they call a *Monks Seam*; which ſee.

SECANT, is the Right Line drawn from the Centre of a Circle cutting it, and meeting with the Tangent without. See under *Trigonometry*.

SECOND, is the Sixtieth part of a *Minute*.

SECOND *Deliverance*, is a Writ that lies for him, who after a return of Cattle Replevied; Adjudged to him that diſtrained them, by reaſon of a default in the Party that Replevied, for the Replevying of the ſame Cattle again, upon Security put in for the re-delivery of them in caſe the Diſtreſs be Juſtified.

SECONDARY *Circles*, in reference to the Ecliptick, or *Circles of Longitude* of the Stars, are ſuch as paſſing through the Poles of the Ecliptick, are at Right Angles to the Ecliptick (as the Meridian and Hour Circles are to the Equinoctial.) By the help of theſe (Infinitely many Circles, all Points in the Heavens are referred) to the Ecliptick: That is, Any Star, Plane, or other *Phænomenon*, is underſtood to be in that Point of the Ecliptick which is cut by the *Secondary* Semicircle which paſſes through ſuch Star or Phænomenon. And if two Stars, *&c.* are thus referred to the ſame Point of the Ecliptick, they are ſaid to be in *Conjunction*; if in oppoſite Points, they are ſaid to be in *Oppoſition*: If they are referred to two Points at a *Quadrants diſtance*, they are ſaid to be in a *Quartile Aſpect*;

Aſpect; if the Points differ a *ſixth* part of the Ecliptick, the Stars are ſaid to be in a *Sextile Aſpect*, &c.

And in general, all Circles which Interſect one of the ſix greater Circles of the Sphere at Right Angles, may be called *Secondary Circles*; as the Azimuths or Vertical Circles in reſpect of the Horizon, *&c.*

SECONDARY *Planets*, are ſuch as move round others, whom they reſpect as the Centre of their Motion; tho' they move alſo along with the Primary Planets in the Annual Orbit round the Sun. And theſe are otherwiſe called the *Satellites*: Such is the Moon to the Earth; and *Jupiter* hath four moving round him; as *Saturn*, according to *Caſſini*, hath five; *Mars*, *Venus*, and *Mercury*, have no Secondary Planets moving round them, that have been yet diſcovered.

The Learned Dr. *Gregory* in his *Aſtronomia Geom. & Phyſica*, Lib. IV. ſhews and proves at large, That tho' the Motion of the *Primary* Planets be ſufficiently ſimple and uniform, as being compounded only of a projectile Motion forward in a right Line, which is a Tangent to the Orbit, and a Gravitation towards the Sun at the Centre; and alſo being at ſuch vaſt diſtances from each other, that the effects of their mutual Gravitation towards one another are inſenſible; yet is the matter far otherwiſe in reference to the *Secondary* Planets. For every one of theſe (altho' it chiefly gravitate toward its reſpective Primary one, as towards its Centre) at equal diſtances from the Sun, is attracted towards him with equal accelerated Gravity, as the Primary one is towards him; but at a greater diſtance with *leſs*, at a nearer diſtance with *greater*. From which double Tendancy towards the Sun, and towards its own *Primary* Planet, the motion of the *Satellites* or *Secondary* Planets comes to be mightily compounded and affected with many Inequalities. As for Inſtance, he Proves,

1. That the Satellite ſhall be continually *accelerated* in its Motion from the time of its Quadrature with the Sun, to the next following Conjunction or Oppoſition, but that contrariwiſe, from the Syzygys to the Quadratures, it ſhall be *retarded*, and therefore will not always move Swifter in or near the Syzygys, and Slower near the Quadratures. From whence will follow,

2. That the Orbits of theſe Secondary Planets will be of a Figure more circular in the Quadratures, than in the Syzygys, where the ſwiftneſs of the Motion will make the Figure of the Orbit more Rectilinear. And therefore the Satellite will run farther from its Primary Planet in the Quadratures, than at the Syzygys; ſo that the Orbit will be a little Eliptical, having the Primary Planet for its Centre; and the longer Diameter will coincide with the Line of the Quadratures, and the ſhorter with that of the Syzygys.

And theſe irregularities will ariſe, if the Sun's power of perterbing the motion of the Satillite be excluded; and the Orbit be concentrick with that of the Primary Planet. For, if the Orbit be eccentrical, it may happen that the Satellite ſhall be farther off from the Primary one in the Syzygys, and ſo move ſlower, than it ſhall do at the Quadratures.

And when this is the caſe, that the Satellite's Orbit, is not a Circle concentrick to the Primary Orbit, but an Elipſis in one of whoſe Focus's the Primary Planet is placed; then the motion of the Satellite will be ſo diſturbed by the Sun, that as it runs into its Orbit, the *Apſes* of the Orbit ſhall be moved ſometimes in *Conſequentia*, and ſometimes in *Antecedentia* (whereas he proves before, that the *Nodes* and *Apſes* of the Primary Planets are at reſt.)

3. When the Plane of the Satellite's Orbit, is inclined to the Plane of the Primary Orbit, the Line of the Nodes of the Secondary Orbit will be moved in *Antecedentia*, with an angular motion, and an unequal Velocity; for it will recede moſt ſwiftly when the Nodes are in Quadrature to the Sun; after which, it will move ſlower; and at the time of the Nodes being in the Syzygys, it will be perfectly at reſt.

4. The Inclination alſo of the Plane of the Secondary Orbit to the Primary one, will be continually varying, and will be *greateſt* when the Nodes are in the Syzygys with the Sun; and *leſs* (*cæteris paribus*) when they are in the Quadratures; and from the time of the Nodes being in the Syzygys to the Quadratures, it will be always decreaſing; and from the time of their being in the Quadratures to the Syzygys, continually encreaſing.

And he proves, that all theſe Irregularities, whether in any excentrick or concentrick Orbit, will always be ſomething greater when the Satellites is in *Conjunction* with the Sun, that when he is in *Oppoſition* to him.

After this, he proceeds to ſhew, what Errors or Irregularities in the motion of theſe Secondary Planets will be produced by the Sun, ſuppoſing the Primary Planet to move in an excentrick Orbit round the Sun. Of which, Sect. IV. of the ſaid Book IV.

SECRETION, is the ſeparation of one Fluid from another in the Body of an Animal or Vegetable, by the means of Glands or ſomething analogous to them.

Dr. *Havers* in his *Oſteologia*, explains *Glandular Secretion*, by obſerving, firſt, That all Motion in its proper Tendency is direct, (which is exactly right) and that the Glands which are ſeated on the ſides of the Arteries all over the Body, are ſo placed, as to favour the motion of any Particles that ſtrike againſt them in a Right Line, more than the Veins; and having Pores adapted to the Figure of the Particles which they ſeparate, the Particles endeavour in their motion to get into thoſe Glandules; and being there received, are ſeparated and diſtinguiſhed from the reſt of the maſs of Blood, and ſo aſſume the form of that Liquor which we find ſeperated by every Gland. And that the Glands are ſo ſituated as to favour the motion of a Particle in a Right Line more than the Veins, he ſaith, is apparent from Obſervation of the gradual conſtruction of the Arterial Channel. See *Vol.* II.

SECTA *ad Curiam*, is a Writ that lies againſt him who refuſes to perform Suit either to the *County* or *Court-Baron*.

SECTA *facienda per illam quæ habet æniciam partem*, is a Writ to compel the Heir that hath the Elder's part of the Co-heirs to perform Service for all the Co-parceners.

SECTA *unica tantum facienda pro pluribus hæreditatibus*, is a Writ that lies for that Heir that is diſtrained by the Lord to more Suits than one, in reſpect of the Land of divers Heirs deſcended unto him.

SECTIO *Cæsaria*. See *Hysteratomotocia*.

SECTION *Conick*, is the Figure made by the ſolidity of a Cone's being ſuppoſed to be cut by a Plane.

If the *Section* be made by the *Axis*, or through the Vertex, the Figure ariſing is a Triangle. If by a Plane, Parallel to the *Baſe* of the Corner, or *ſubcontrarily* poſited, the Figure produced is a *Circle*.

If the *Section* be made Parallel to one ſide of the Cone, the Figure produced is a *Parabola*: If thro' both ſides of the Cone, 'tis an *Ellipſis*; and if thro' one ſide of the Cone, thro' the Baſe, and not Parallel to the other ſide of the Cone, 'tis an *Hyperbola*.

Archimedes, *Euclid* and other ancient Mathematicians, called that only a *Conick Section*, when the Plane cutting the Cone was *at right Angles to the ſide of the Cone*; and according as the Angle made by the ſides of the Cone meeting in the Vertex, as it was a *right*, *obtuſe*, or *acute* one, they called it the Section of *Right-angled*, *Obtuſe-angled*, or *Acute-angled Cone*. By which Words they underſtood what we now call the *Parabola*, the *Hyperbola*, and the *Ellipſis*: Which three Sections, (as alſo the Circle) *Apolonius Pergæus* (juſtly called *Magnus Geometra*) found out to be producible in any Cone, according to the four ways of cutting it, as above-mentioned.

SECTION, in Mathematicks, ſignifies the cutting of one *Plane* by another, or a *Solid* by a *Plane*.

The *common Section* of two Planes is always a right Line, being the Line ſuppoſed to be drawn on one Plane by the Section of the other, or by its Entrance into it.

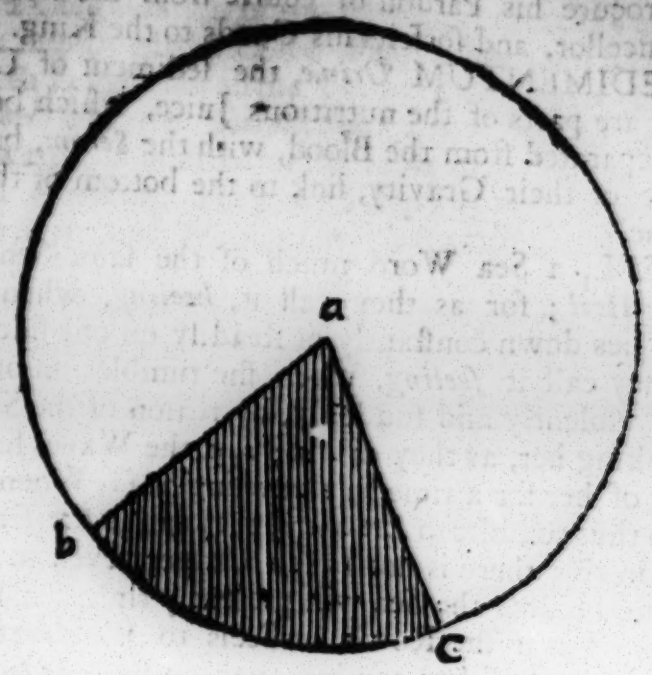
SECTION *of a Building*, in Architecture, is underſtood of the Perfile or Delineation of its Heights and Depths raiſed on the Plane; as if the Fabrick were cut aſunder to diſcover the Inſide.

SECTIS *non faciendis*, is a Writ that lies for a Woman, who, for her Dower, ought not to perform Suit of Court.

SECTOR, is an Inſtrument made of Wood, Ivory, Braſs, *&c.* with a Joint, and ſometimes a piece to turn out to make a true Square, with Lines of Sines, Tangents, Secants, Equal Parts. Rumbs, Polygons, Hours, Latitudes, Metals, Solids, *&c.* and is generally uſeful in all the Practical Parts of the Mathematicks, and particularly contrived for *Navigation*, *Surveying*, *Aſtronomy*, *Dyaling*, *Projection of the Sphere*, &c. By *Gunter*, *Foſter*, *Collins*, and others. There are likewiſe *Sectors* for *Fortification* and *Gunnery*, by Sir *Jonas Moor*.

The great Advantage of the Sector above any other Rule or Plain-ſcale, is that all its Lines can be accommodated to any Radius; which is done by taking off all Diviſions Parallelwiſe, and not Lengthwiſe. The ground of which Practice is this, That Parallels to the Baſs of any Plain Triangle, bear the ſame Proportion to it :: as the Parts of the Legs above the Parallel do to the whole Legs.

SECTOR of a Circle, is a mixt Triangle comprehended between the Radius and an Ark of the Circle.



As here,

The Sector *a b c*, made by the Legs *a b* and *a c*, and the Ark *b c*.

To find the ſuperficial Content of any *Sector*, ſee *Area*, N. 9.

SECUNDA *ſuperoneratione paſturæ*, is a Writ that lies where Admeaſurement of *Paſture* hath been made; and he that firſt ſurcharged the Common, doth again ſurcharge it, notwithſtanding the Admeaſurement.

SECUNDANS, in Mathematicks, is an infinite ſeries of Numbers, beginning from Nothing, proceeding as the ſquares of Numbers in Arithmetical Proportion.

As for Inſtance,

0, 2, 4, 9, 16, 25, 36, 49, 64, *&c.*

SECONDARY; that Officer who is the ſecond, or next to the chief Officer; as the *Secondaries* of the Fine Office; the *Secondaries* of the Compters, who is next to the Sheriff of *London* in each of the two Compters; *Secondary* of the Office of the Privy-Seal; *Secondaries* of the Pipe, two; *Secondary* to the Remembrancers, which are two Officers in the Exchequer.

SECUNDINE, the Secunding or After-Birth, are the three Membranes, *Chorion*, *Alantois*, and *Amnion*, which with the *Placenta*, are excluded after the Birth.

SECURITATE *pacis*, is a Writ that lies for one who is threatned Death or Danger, againſt him that ſo threatneth, and is taken out of the *Chancery*, and directed to the Sheriff.

SECURITATEM *inveniendi quod ſe non divertat ad partes exteras ſine licentia Regis*, is a Writ that lies for the King againſt any of his Subjects, to ſtay them from going out of his Kingdom: The ground of which is, That every Man is bound to ſerve and defend the Common-wealth, as the King ſhall think meet.

SE *defendendo*, is a Plea for him that is charged with the Death of another, ſaying, he was neceſſitated to do that which he did in his *own defence*; the other ſo Aſſaulting him, That if he had not done as he did, he muſt have been in hazard of his own Life; But this Danger ought to be ſo great, that it ſeems inevitable; and tho' he juſtifie it to be done in his own Defence, yet he is driven

to procure his Pardon of course from the Lord-Chancellor, and forfeits his Goods to the King.

SEDIMENTUM *Urinæ*, the sediment of Urine, are parts of the nutritious Juice, which being separated from the Blood, with the *Serum*, because of their Gravity, sink to the bottom of the Urine.

SEEL, a Sea Word much of the same Sense with *Heel*; for as they call it, *heeling*, when a Ship lies down constantly or steadily on one side; so they call it *seeling*, when she tumbles on one side violently and suddenly, by reason of the Sea forsaking her, as they call it; *i. e.* the Waves leaving of her for a time in a rowling Sea: When a Ship thus tumbles to *Lee-ward*, they call it *Lee-seel*; and in this there is not much danger, even in a Storm, because the Sea will presently right her up again; but if she Rowls or Seels to Windward, there is fear of her coming over too short or suddenly, and so by having the Sea break right into her, be either foundred, or else have some of her upper Works carried away.

SEGMENT *of a Circle*, is a Figure contain'd between a Chord and an Ark of the same Circle.

To find the Superficial Content of any Segment of a Circle, see *Area*, N. 10.

SEGMENT *of a Sphere*, is a part of it cut off by a Plane; and therefore the Base of such a Segment must always be a Circle, and its Superficies a part of the Surface of the Sphere.

Its solid Content is found by multiplying the Surface of the whole Sphere, by the Altitude of the Segment, and then dividing the Project by the Diameter of the Sphere, and to the Quotient, adding the *Area* of the Bass of the Segment.

Or if it is less than an *Hemisphere* thus:

Take the Altitude of the Segment from the Radius of the Sphere, and by the Difference multiply the Area of the Base of the Segment; and Substract this Product from that which will arise from multiplying the Semi-Axis of the Sphere into the Convex surface of the Segment; then divide the Remainder by 3, and the Quotient is the Solidity sought.

This latter Method supposes the Axis of the Sphere to be given; if not, it may be found thus.

Let the Altitude of the Segment be called a, and its Semi-diameter s.

Then will

$a . s :: s . \frac{s\,s}{a}$; add $\frac{s\,s}{a}$ to a, and that shall give the Axis sought. 13. *è* 6. *Euclid.*

SEGMOIDALES, or *Semilunaries*, are Valves of the *Arteria Pulmonaria*, and are so called, because they resemble a Half-moon, or Segment of a Circle; their substance is Membranous: When they separate, they give passage to the Blood, from the Ventricle into the Artery; but they shut the Passage, and are thrust together by the Blood, if it endeavours to return.

SEGREIANT, the Heralds Word for *Griffins*, when drawn in a leaping or saliant Posture.

SEJANT, (*i. e.* sitting) the Term is used in Heraldry for a Lyon, or other Beast, when it is drawn in an Escutcheon sitting like a Cat, with his Forefeet strait.

SEISIN, from the *French Seisine*, *possessio*. So *primier Seisin*, is the first possession; and *to Seise*, is to take possession.

Seisin, according to the common Law, is twofold; *Seisin in fact*, and *Seisin in Law*.

Seisin in Fact, is when a Corporal Possession is taken.

Seisin in Law, when something is done which the Law accounteth a *Seisin*, as an Inrolment: And this *Seisin in Law*, is as much as a Right to Lands and Tenements, tho' the Owner be by Wrong disseised of them: And he who hath had an Hours Possession quietly taken, hath *Seisin de droit & de claime*, whereof no Man may disseise him by his own force or subtilty, but must be driven to his Action; and 'tis called by *Coke*, *Seisin in Law*, or *Actual Seisin*.

The *Civilians* call the one *Civilem Possessionem*, the other *Naturalem*.

SESINA *habenda, quia Rex habuit annum, diem & vastum*, is a Writ that lies for Delivery of *Seisin* to the Lord of his Lands or Tenements, after the King, in the Right of his Prerogative, hath had the Years, Day, and Waste.

SEIZING, or *Seasing*, in the Sea Language, is the same as *Fastening*, (*viz.*) of two Ropes together with some Rope-yarn, *&c.* Also the fastening of a Block at the end of a Pendant or Tackle, Garnet, *&c.* is called *Seizing*.

The *Boats seasing*, is a Rope by which a Ring, or little Chain is made fast in the Foreship of the Boat, whereby, in a Harbour, the Boat is fastened to the Ship's side.

SELLA *Equina, seu Turcica*, or *Sphænoides*, a part of the Brain, is compounded of four Processes of the Bone *Sphænoides*, or the Wedge-like Bone; it contains the *Pituitarian* Glandule; and in Brutes, the *Rete Mirabile*.

SEMEIOSIS. See *Diagnosis*.

SEMEIOTICA, is that part of Physick, or the Art of Medicine, which treats of the Signs of Health and Sickness; assisting the Physician to make probable Guesses and Conjectures of the Constitution and State of his Patient.

SEMETS, according to Dr. *Grew*, are the Apices of the Attire of a Plant. See *Apices*.

SEMI-BREVE, a Term in Musick. See *Notes* and *Time*.

SEMI-CIRCLE, is the Figure contained between the Diameter of a Circle, and half the Circumference.

Also an Instrument for *Surveying*, made of Brass, and divided into 180 Degrees, being half the *Theodolite*.

SEMI-COLON, is a Stop, or Point in a Sentence, between a *Comma* and a *Colon*, and mark'd thus (;) and expresses a Pause greater than the former, and less than the latter.

SEMI-CUBICAL *Paroboloid*, is a Curve whose Ordinates are in *Subtriplicate of the Duplicate* proportion of the Diameter: That is, the Cubes of the Ordinates are as the Squares of the Diameters.

In this *Paraboloid*, the Segments of the Curve, cut by Ordinates (at equal Distances) are as the Ordinates in a *Parabola*; and therefore their Squares increased by Equals in Arithmetical Progression; and consequently that Curve to a Right Line, as the Trunk of a *Parabola* to a *Parabola*.

SEMI-

SEMI-CUPIUM, is a Bath, in which the Patient is only up to the Navel in Water.

SEMI-DIAMETER, or *Radius*, is that Line that is drawn from the Center to the Circumference of a Circle.

SEMI-DIAMETER, in Fortification, is twofold, *viz.* the Greater and Leſſer: The former being a Line compoſed of the Capital, and the Small Semi-diameter of the Polygon: And the other, a Line drawn to the Circumference from the Centre thro' the *Gorges*.

SEMI-DIAPASON, a Term in Muſick, ſignifying a Defective or Imperfect *Octave*.

SEMI-DIAPENTE, a Term in Muſick, ſignifying an *Imperfect Fifth*.

SEMI-DITONE, in Muſick, is the Leſſer Third having its Terms as ſix to five.

SEMI-LUNARES *Valvulæ*. See *Segmoidales*.

SEMI-MEMBRANOSUS, is a Muſcle of the Leg, ſo called from its being half Tendinous and Membrane-like, lying immediately under the *Seminervoſus*: It ariſeth broad and tendinous from the Protuberance of the *Os Iſchium*, and in its deſcent becomes broader; and in leſs than half its Progreſs begins to grow fleſhy, and is dilated into a large and fleſhy Belly, lying under the long round Tendon of the *Semi-nervoſus*, becoming a ſhort thick Tendon, inſerted to the ſuperior part of the upper Appendix of the *Tibia* backwards. Its Uſe is to help to bend the *Tibia*.

SEMINAL *Leaves*: much the greateſt part of all Seeds which are ſown in the Earth, come up, or ſhoot forth at firſt with too little, plain, ſoft, and undivided Leaves; which becauſe they are uſually very different from the Leaves of the ſucceeding Plant in Magnitude, Figure, Surface, and Poſition, are called very properly by this Name *Seminal Leaves*: As the little embrionated Plant which lies in Minature in every Seed, is called, the *Plantula Seminalis*.

SEMI-NERVOSUS, *ſeu Semi-tendinoſus*, a Muſcle of the Thigh, which is ſo called from its being half Tendinous, and Nerve-like. It ariſeth partly Tendinous and partly Fleſhy from the External part of the Protuberance of the *Os Iſchium*, and preſently being dilated to a large fleſhy Belly, becomes a round Tendon in half its Progreſs, which deſcending over the fleſhy Belly of the *Semi-membranoſus*, marcheth cloſe by the *Gaſterocnemius*, on the poſterior part of the Superior Appendix of the *Tibia*; from whence it paſſes forwards to its Inſertion in the ſaid Bone immediately below the termination of the *Gracilis*: This with the *Gracilis* acting, bend the *Tibia* directly backwards. Its Tendon, together with the *Sartorius*, *Gracilis*, *Semi-membranoſus* and *Biceps*, make the inward Hamſtrings, as they are commonly called.

SEMI-QUADRATE, the ſame with *Semi-quartile*.

SEMI-QUARTILE, an Aſpect of the Planets when diſtant from each other 45 Degrees, or one Sign and a half.

SEMI-QUAVER, a Term in Muſick. See *Notes* and *Time*.

SEMI-QUINTILE, an Aſpect of the Planets, when at the Diſtance of 36 Degrees, from one another.

SEMI-SEXTILE, an Aſpect of the Planets, when diſtant from one another 30 Degrees, or 1 Sign, and is noted thus, SS.

SEMI-SPINATUS, is a Muſcle which ſeems to be a Continuation of the *Sacer*; and therefore may not improperly be called *Tranſverſalis Dorſi*; it ariſeth fleſhy from all the Tranſverſe Proceſſes of the *Vertebræ* of the *Thorax*, and marching obliquely upwards, is inſerted to the ſuperior Spines of the ſaid *Vertebræ*: Theſe with the *Quadratus Lumborum Sacer*, and *Tranſverſales Colli* acting, move the whole Spine, or *Vertebræ* of the Neck, Back, and Loins, obliquely backwards, as when we endeavour to look very much behind us: If they all act together on each ſide, they aſſiſt in erecting the Trunk of the Body.

SEMI-TENDINOSUS. *Vid. Semi-nervoſus.*

SEMI-TONE, a Term in Muſick, of which there are two ſorts, *viz.* a Greater and a Leſſer; the *Enharmonical Deiſis*, being the Difference between them.

SEMITA *Luminoſa*, is a Name given by Mr. *Childrey* in his *Britannia Baconica*, p. 183, 184. to a kind of Lucid Track in the Heavens, which a little before the Vernal Equinox, (he ſaith) may be ſeen about 6 a Clock at Night, extending from the Weſtern edge of the Horizon up towards the *Pleiades*.

After this, the *Phænomenon* was taken notice of by *Caſſini* and *Fatio*, who both evince, That this Light comes diffuſed from each ſide of the Sun: Its brightneſs is much the ſame with that of the *Via Lactea*, or the Tail of a Comet. 'Tis ſeen plaineſt with us about the beginning of *October*, and towards the end of *February*.

S. *Fatio* conjectures, That the Bodies, or rather the Congeries or Aggregate of thoſe Bodies which occaſion the Light, doth conform to the Sun like a *Lens*; and takes it to have ever been the ſame: But *Caſſini* thinks it ariſes from a vaſt Number of ſmall Planets which encompaſs the Sun, and give this Light by Reflection, eſteeming it alſo not to have exiſted long before he obſerved it: But this latter is overthrown by *Childrey*'s Obſervations, whoſe Book was Printed in 1661; and he ſaith there he had taken notice of it for many Years.

SEND, when a Ship is either at an Anchor, or under Sail, falls with her Head or Stern deep into the *Trough of the Sea* (*i. e.* into a Hollow made between two Waves or Billows) they ſay ſhe *ſends* much that way, whether it be *A-head*, or *A-ſtern*.

SENESCALLO *& Mareſchallo quod non teneant placita de libero tenemento*, &c. is a Writ directed to the Steward, or Marſhal of *England*, inhibiting them to take Cogniſance of any Action in their Court that concerns either Freehold, Debt, or Covenant.

SENSATION is the perceiving of things by our Senſes; and is the Original of moſt of the Idea's which we have, which by our Senſes are derived to our Underſtanding.

The *Carteſians* aſſert Senſation to be only a ſimple Perception, whereby the Motions of external Objects affecting the Extremities of the Nerves in the Organs of the Body, are communicated all along thoſe Nerves to the *Glandula Pinealis*, where the Soul reſiding receives her Informations, and accordingly makes Jugdments upon them.

In which, (except as to that Whim of the Soul's reſiding in the *Glandula Pinealis*) they are certainly much in the right: For Senſation is properly and ultimately made in or by the Mind, or diſcerning Faculty, which probably, from the different Mo-

tions of the internal parts of the Brain, is excited and determined to differing Perceptions; and to theſe we give differing Names, as Heat, Cold, and other Qualities.

SENSIBLE *Horizon.* See *Horizon.*

SENSIBLE *Point.* See *Point Senſible.*

SENSITIVE *Plants*, are ſuch whoſe Frame and Conſtitution is ſo nice and tender, that at the touch, or at the leaſt preſſure of ones Hand, they will contract their Leaves or Flowers, as if they really felt Pain by ſuch a Conract.

Of theſe the Botanick Writers mention many Kinds, ſome of which contract with Heat, others with Cold.

SENSORIUM *Commune*, or the Seat of the common Senſe, is that part of the Brain in which the Nerves, from the Organs of all the Senſes, are terminated, which is the beginning of the *Medulla Oblongata.*

SENSORY, the Organ or Inſtrument of Sence, as the Eye of Seeing, the Ear of Hearing, &c.

SENSUS, *Senſe*, is when the Motion impreſſed by the outward Objects upon the Fibres of the Nerves, is conveyed by the help of the Animal Spirits in the Nerves, to the common *Senſory*, or *Medulla Oblongata.*

SEPARATION, with ſome Writers of Navigation, is the ſame with what is more uſually called, the *Departure*; that is, a Ship's difference of Longitude from any place, or from another Ship. Our Seamen commonly call it *Eaſting* or *Weſting*; according as the Difference of Longitude is Eaſt or Weſt.

SEPHYROS (in ſome Authors) is a hard Inflammation of the Womb.

SEPTAN *Fevers*, intermitting Fevers that return every ſeventh Day.

SEPTANGULAR, the ſame with *Heptangular.*

SECTENTARIUS, a Conſtellation in the Northern Hemiſphere, conſiſting of 30 Stars.

SEPTENTRIONAL *Signs*, are the firſt 6 Signs of the *Zodiack*, ſo called, becauſe they decline towards the North from the Equinoctial, and are the ſame with *Boreal* Signs.

SEPTICA, *ſive Putrefacientia* are thoſe things, which by a Malignant ſharpneſs, rot and corrupt the Fleſh.

SEPTUM *Cordis*, the fleſhy part that divides the Right Ventricle of the Heart from the left.

SEPTUM *Lucidum*, is a Partition, which is diaphanous, upon the account of its thinneſs, it diſtinguiſhes the Ventricles of the Brain.

SEPTUM *Tranſverſum.* See *Diaphragma.*

SEQUATUR *ſub ſuo periculo*, is a Writ that lies where a Summons *ad Warrantiſandum* is awarded, and the Sheriff returns, That he hath nothing whereby he may be ſummoned; then goes out an *Alias* and *Pluries*; and if he come not at the *Pluries*, then goes out this Writ.

SEQUESTER, is a Term uſed in the Civil Law for renouncing, as when a Widow comes into Court, and diſclaims to have any thing to do, or to intermeddle with her Husband's Eſtate, who is Deceaſed; ſhe is ſaid to *Sequeſter.*

SEQUESTRATION, is the ſeparating of a thing in Controverſie from the Poſſeſſion of both thoſe that contend for it: And it is of two ſorts; *Voluntary*, or *Neceſſary.*

Voluntary, is that which is done by Conſent of each Party.

Neceſſary, is that which the Judge doth of his Authority, whether the Parties will or non.

It is uſed alſo for the Act of the Ordinary, diſpoſing of Goods and Chattels of one Deceaſed, whoſe Eſtate no Man will meddle with.

Alſo for the gathering of the Fruits of a Benefice void to the Uſe of the next Incumbent.

SEQUESTRO *habendo*, is a Writ Judicial, for the diſſolving a Sequeſtration of the Fruits of a Benefice made by a Biſhop at the King's Command, thereby to compel the Parſon to appear to the Suit of another: For the Parſon, upon his Appearance, may have this Writ for the Diſcharge of the Sequeſtration.

SERIES, properly ſpeaking, is an orderly Proceſs or Continuation of things one after another. 'Tis commonly in *Algebra* connected with the Word *Infinite*, and there, by *Infinite Series*, is meant certain Progreſſions, or Ranks of Quantities orderly proceeding, which make continual Approaches to, and if infinitely continued, would become equal to what is inquired after.

This Method took its Riſe from the Learned Dr. *Wallis's Arithmetick of Infinites*, and has been of late ſo purſued by ſeveral Worthy Perſons of our own Nation, eſpecially the Incomparable Sir *Iſaac Newton*, that it is now one of the greateſt Improvements of *Algebra.*

SEROSITIES, are ſerous Humours abounding in the Body.

SERPENTINE, ſo the Chymiſts (from its Figure) call that long winding Worm, which is placed in a Tub of Water in the Diſtillation of Spirits. See *Worm.*

SERPENTINE *Line*, the ſame with *Spiral*; which ſee.

SERPIGO. See *Lichen.*

SERRATUS *Major Anticus*, is a Muſcle which ariſes fleſhy from the whole *Baſis Scapulæ*, and paſſing under the *Subſcapularis*, it becomes broader and thicker, ſtill running ſomewhat forwards till it's inſerted to the eight ſuperior Ribs laterally, by ſo many diſtinct fleſhy Portions, or *Digituli*, repreſenting the Teeth of a Saw; the two, and ſometimes three inferior of which, are indented with the *Muſculus Obliquus Deſcendens* of the *Abdomen.* This like the *Serratus Minor Anticus*, dilates the *Thorax*, or moves the *Scapulæ* forwards and downwards, when its Muſcles are relax'd.

SERRATUS *Minor Anticus*, is a Muſcle, by Anatomiſts generally reckoned a Muſcle amongſt thoſe of the *Scapula*: But we are perſwaded (ſays *Cowper*) from its Poſition that it may be equally ſerviceable to the *Thorax*, in elevating thoſe Ribs it is inſerted to; It ariſes fleſhy from the Proceſſus *Coracoides Scapulæ*, and deſcends obliquely forwards, becomes broader and thinner, and is inſerted fleſhy to the bony part of the ſecond, third, fourth, and fifth Ribs. If the *Scapulæ* are elevated by their proper Muſcles, this with its Partner, are then capable of dilating the Breaſt in large Inſpirations. But if they are depreſt, it may be eaſily conceived with what Difficulty that Action muſt be performed.

SERRATUS *inferior poſticus*, is a Muſcle of the *Thorax*, much larger than Authors generally aſſign it: "In a Robuſt Man we obſerved its Conti-
"nuation, (ſays *Cowper*) not only from the Spines of
"the *Vertebra*'s of the Loins, but from all thoſe of
"the *Thorax*, as well underneath as below the for-
"mer Muſcle; its ſuperior and inferior Parts be-
"ing

" ing entirely Tendinous, its Middle growing " fleſhy near its ſerrated Termination at the Cur- " vature of the ninth, tenth, eleventh, and Extre- " mity of the twelfth Ribs. The *Ductus* of the Fi- " bres of this paſſing tranſverſe, and thoſe of the " precedent deſcending obliquely, do decuſſate " each other in Acute Angles; which *Riolan* has " well obſerved, and contrary to the Opinion of " Authors, aſſigns it with its Partner, a different " Uſe in depreſſing the *Thorax*; both performing " the Office of a Bandage in binding together and " conſtringing the Poſterior Muſcles of the Spine, " not unlike the Conſtructive Incloſures of the " Thigh and Cubit.

SERRATUS *ſuperior poſticus*, is a Muſcle of the *Thorax*; which lies immediately under the *Rhomboides*: It ariſes with a thin Tendon from two inferior Spines of the *Vertebræ* of the Neck, and three ſuperior of the *Thorax*, from thence deſcending obliquely over the *Splenius Capites*, and under parts of the *Sacrolumbalis*, and *Dorſi Longiſſimus*, it becomes fleſhy, marching over the *Scapula*, to its Inſertion at the Curvature of the ſecond, third, and fourth Ribs, by ſo many diſtinct fleſhy endings, repreſenting the Teeth of a Saw, whence its Name. This aſſiſts in elevating the Ribs or *Thorax*.

SERVE, to ſerve a Rope (in the Sea Phraſe) is to lay upon it Spun-yarn, Rope-yarn, Sinnet, a piece of Canvas, or the like, which is there rowled faſt round about the Rope, to keep it from fretting or galling in any place.

SERVIENTIBUS, are certain Writs touching Servants and their Maſters violating the Statutes made againſt their Abuſes.

SERVITUS *acquittandis*, is a Writ Judicial, that lies for one diſtrained for Services to *F.* who owes and performs to *R.* for the Acquittal of ſuch Services.

SERUM, is a watery, thin, yellowiſh, and ſaltiſh Humour, which conſiſts chiefly of Water, with a moderate quantity of Salt, and a little Sulphur: The Uſe of it is to be a Vehicle to the Blood: And this is that watery part that ſeparates from the Blood in the Veſſel, after any Perſon is let Blood. A ſmall Heat will Coagulate it.

SESAMOEIDEA *Oſſa*, are 16, 19. 20, and ſometimes more little ones, ſo called from the likeneſs they have to *Seſamum* Seeds, which are found in the Joints of the Hands and Feet.

SESQUIALTER, in Muſick. See *Time*.

SESQUIALTERAL *Proportion*, is when any Number or Quantity contains another once and an half, and the Number ſo contain'd in the Greater, is ſaid to be to it in *Subſelaquiteral Proportion*.

SESQUIQUADRATE, an Aſpect or Poſition of the Planets, when at the Diſtance of 4 Signs and an half, or 135 Degrees from each other.

SESQUIQUINTILE, an Aſpect of the Planets, when 108 Degrees Diſtant from each other.

SESQUITERTIANAL *Proportion*, is when any Number or Quantity contains another once and one third.

SESSIONS, is a ſitting of Juſtices in Court upon Commiſſion, as the *Seſſions of Oyer and Terminer*, *Quarter-ſeſſions*, otherwiſe called *General-ſeſſions*, oppoſite whereto, are *Eſpecial*, otherwiſe called *Privy-ſeſſions*, which are procured upon ſome ſpecial occaſion, for the more ſpeedy diſpatch of Juſtice.

Seſſions of Parliament, is a *Seſſions* which continues till it be prorogued or diſſolved.

SETACEUM, is when the Skin of the Neck is taken up and run through with a Needle; and the Wound afterward kept open by Briſtles, a Skean of Silk, &c. which is after moved to and fro, to give vent to the Humours that are ill diſpoſed in that Part. 'Tis alſo called *Seton* and *Setum*.

SETON, or *Setum*. See *Setaceum*.

SETT, when the Seamen obſerve on what Point of the Compaſs, the *Sun*, Land, &c. bears, they call it, *Setting* the Sun, or Land, by their Compaſs.

SETTLE *a Deck*, is the Word at Sea for taking a Deck lower than it was at firſt, which they call ſettling a Deck.

SEVERAL *taile*, is that whereby Land is given or entailed ſeverally, to two Men and their Wives, and to the Heirs of their Bodies begotten; the Donees have joint Eſtate for their two Lives, and yet they have *ſeveral* Inheritance, becauſe the Iſſue of the one ſhall have his Moiety, and the Iſſue of the other, the other Moiety.

SEVERAL *Tenancy*, is a Plea or Exception taken to a Writ that is laid againſt two as joint, which are *ſeveral*.

SEVERANCE, is the ſingling or ſevering of two, or more, that are joined in one Writ.

For Example; If two join in a Writ *de libertate probanda*, and the one afterward be Non-ſuit: Here *Severance* is permitted; ſo that notwithſtanding the Non-ſuit of the one, the other may ſeverally proceed.

There is alſo *Severance* of the Tenants in an Aſſize, when as one or two, or more Diſſeiſors appear upon the Writ, and not the other.

As alſo *Severance* in *Attaints*, and *Severance* in *Debt*, where two or more Executors are named Plaintiffs, and the one refuſes to proſecute.

Severance of Corn, is the cutting and carying it off from the Ground; and ſometimes the ſetting out the Tythe from the reſt of the Corn, is called *Severance*.

SEW, when a Ship at Low-water comes to lie on the Ground, and to lie dry, they ſay *ſhe is ſewed*; and if ſhe be not quite left dry, they ſay, ſhe *ſews* to ſuch a part.

SEXAGENARY *Tables*, were Tables contrived (formerly) of Parts proportional, where by Inſpection, you may find the Product of two *Sexagenaries* to be multiplied, or the Quotient of two that are to be divided, &c.

SEXAGESIMAL *Fractions*, or *Sexagenaries*, are ſuch as have always 60 for their Denominator: There were antiently no others uſed in Aſtronomical Operations; and they are ſtill retained in many Caſes; tho' *Decimal Arithmetick* begins to grow in Uſe now in Aſtronomical Calculations.

In theſe Fractions, (which ſome call *Aſtronomicals*) the Denominator is uſually omitted, and the Numerator only written down: Thus.

$$4^{\circ}, 59', 32'', 50''', 16''''.$$

Is to be read, 4 Degrees, 59 Minutes, 32 Seconds of a Degree, or 60th parts of a Minute, 50 Thirds, 16 Fourths, &c.

The Ancients, before the introducing of Algoriſm by the Numeral Figures now in uſe, (finding

it troubleſome to expreſs and manage Fractions of divers Denominators, eſpecially when they are to be expreſſed by great Numbers; and troubleſome alſo to expreſs and manage Integers, when they happen to be great Numbers) though fit to divide an Integer into 60 Parts, which they call'd λεπτὰ, which now we call Minutes, or Scruples; and each of theſe into 60 Parts, which they called Seconds, and (if there were yet need of greater Exactneſs) each of theſe into 60 Thirds; and each of theſe into as many Fourths; and ſo onward, as far as there was occaſion, which they called Sexageſms, or Sexageſimal parts.

And (to avoid great Numbers) a Collection of ſixty Integers they called a Sexagene; and ſixty of ſuch, a ſecond Sexagene; and ſixty of theſe a third; and ſo onward, as there was occaſion.

Thus, for $\frac{1}{4}$, the fourth part of an Integer, (be it Hour, Day, Degree, or whatever elſe) they put 15′ (that is, 15 Minutes); for $\frac{1}{8}$, they put 7′ 30″ (that is, 7 Minutes and 30 Seconds); which is exactly the ſame in Value: And for $\frac{1}{7}$, (becauſe this cannot be exactly expreſs'd in a Sexageſms) they would put 8′, (which is pretty near, but ſomewhat too little) or 9′ (which is yet nearer, but ſomewhat too much) or (if theſe be not exact enough for the preſent purpoſe) 8 34″, or 8′ 34″ 17‴; or yet more accurately, if need be, till they come to ſo much exactneſs, as that the ſmall remaining difference might ſafely be neglected.

And ſuch Sexageſms were uſed not only by *Ptolemy*, (by whom the ſeem to have been firſt introduced) and other *Greek* Writers, but by the *Arabs* alſo, (in imitation of *Ptolemy*) and are continued in Uſe with us to this Day.

So for 227015, (which is the Number of Days, whereby the *Arabic* Years of the *Hegira* begin later than our Account by the Years of our Lord) they put 1‴ 3″ 3′ 35°; that is, 1 Third Sexagene, 3 ſeconds Sexagenes, 3 firſt Sexagenes, and 35 Days. And this Account we meet with in the *Alphonſine* Tables, and (of later Times) in thoſe of *Lansbergius*.

And for the better expediting the Work of Multiplication and Diviſion in theſe Sexageſms and Sexagenes, they had a Table for that purpoſe, in ſuch form as this.

1	By	1, 2, 3, 4, &c.	makes	0 1, 0 2, 0 3, 0 4, &c.
5	by	5, 6, 7, 8, &c.	makes	0 25, 0 30, 0 35, 0 40, &c.
10	by	10, 11, 12, 13, &c.	makes	1 40, 1 50, 2 00, 2 10, &c.
11	by	11, 12, 13, 14, &c.	makes	2 1, 2 12, 2 23, 2 34, &c.
30	by	30, 31, 32, 33, &c.	makes	15 0, 15 30, 16 00, 16 30, &c.
50	by	50, 51, 52, 53, &c.	makes	41 40, 42 30, 43 20, 44 10, &c.

And ſo onwards, as far as 60 by 60, makes 60 00.

Which Tables they contracted into a ſquare or triangular Form, extending from 1 to 60; of like nature with what we call the *Pythagorical Table* for Multiplication, extending from 1 to 10.

Such a Sexagenary Table there is (or ſhould be, if not torn out) in *Blundevil's* Exerciſes, with a Deſcription, and Directions for the uſe of it; firſt publiſhed about the Year 1600, or ſooner, (for it is mentioned in the Preface to his Theories, publiſhed in the Year 1602, as having been then received with good approbation) and Re-printed a ſeventh time in the Year 1636. And the like in other Writers of Aſtronomical or Sexageſimal Fractions.

And then they had other Tables or Rules to determine the Denomination of the Product; as thus, Multiplication of

Integers into	Primes, Seconds, Thirds, Fourths, &c.	makes	Primes, Seconds, Thirds, Fourths, &c.
Primes into	Primes, Seconds, Thirds, Fourths, &c.	makes	Seconds, Thirds, Fourths, Fifths, &c.
Seconds into	Seconds, Thirds, Fourths, Fifths, &c.	makes	Fourths, Fifths, Sixths, Sevenths, &c.

The ſum of all which Particulars, are equivalent to this one General, the Exponent of the Product, (that is, of the laſt part thereof) is equal to the Exponent of both the Factors put together, as 10′ by 11″ makes 1″. 50‴; and 10′ by 12′ makes 2″ 0‴, &c. So 10″ by 10‴ makes 1‴. 40ᵛ, &c.

My meaning is, That ſuch Tables they had (expreſſed in Numeral Figures) of later times, ſince thoſe Figures were in uſe; but before, they muſt be expreſſed in ſuch a way as this, *viz.*

II° into III′, makes VI′
III′ into IV″, makes XII‴.
IV′ into III″, makes XII′.

That is, 4 Sexagenes into 3 Seconds of the Sexageſms, makes 12 of the firſt Sexageſms, becauſe $+1 \times -2 = -1$.

XVI″ into X‴, makes CLXᵛ; that is, IIˡᵛ, XLᵛ,

(Which

(Which they find for Expedition, by conſulting their Sexageſimal Table, as we do the Table of Multiplication; where finding XVI in the top, and X in the ſide, they have, in the ſquare anſwering to both, II, XL.)

XLV′ into LIV″, makes XL″, XXX‴,

Concerning this Proceſs, by Sexageſimal Multiplication, &c. and the Demonſtration of it, we have a learned and accurate Treatiſe in the *Greek*, of *Barlaam* a Monk, (*Barloamus Monachus*) under the Title of *Logiſtica*, (λογιστικὴ) whom *Voſſius* (cap. 18. *De Scientiis Mathematicis*) placeth about the Year 1350 (but miſtakes of it for a Treatiſe of Algebra): It is publiſhed by *John Chambers*, (then a Fellow of *Eaton* College) with his Latin Tranſlation, and Notes upon it, in the Year 1600, encouraged thereunto by Sir *Henry Savile*, who chanced to light on a *Greek* Manuſcript thereof abroad, and did himſelf, from thence tranſcribe it.

But this way of Multiplication and Diviſion in Sexageſimals, proves ſo perplex and troubleſom, (notwithſtanding ſuch a Table at hand) that ſince the *Indian* Figures came in uſe, whereby we may with more convenience manage great numbers) it is thought leſs troubleſome, (when there is occaſion to Multiply or Divide) to reduce all to the loweſt Denomination; and then, having performed that Work, (of Multiplication or Diviſion, or both) to reduce it back again to the ſeveral Denominations.

As for Inſtance; ſuppoſing the Luner Month of Conjunction, (from New-Moon, to New-Moon) according to the Moon's middle Motion, to be 29 D. 12 H. 44′ 3″ 10‴, *Proximè*; and I would compute how much the Moon moves from the Sun in 6 D. 5 H. 14′ 16″ 35‴. I know well that there be many Aſtronomical Tables computed to expedite ſuch Operations; (which here I do not meddle with) but without ſuch Preparatory Tables, my Work muſt ſtand thus:

if 29 D. 12 H. 44′ 3″ 10‴ (that is, 11′ 48 H. 44′ 3″ 10‴) give 360 Degrees, (that is 6′ 10 D. Sexagenes of Degrees) then 6 D. 5 H. 14′ 16″ 35‴ (that is, 2′ 29 H. 5′ 14″ 16‴ 35⁗) will give, how much?

Now, if I were to Work it by the Sexageſimal Tables of Multiplication, the Work would be ſo perplex, that I will not here repeat it; and therefore it is thought better to reduce the firſt and third Numbers to the loweſt Denomination, that is (here) to third Scruples.

D. H. ′ ″ ‴.	D. H. ′ ″ ‴
29 12 44 3 10.	6 5 14 16 35
× 24	× 24
116	144
58	+ 5
12	149 14′ 163″ 5′′
708 44′ 3″ 10‴.	×60
× 60	8940
42480	+ 14
+ 44	8954′ 16″ 35‴
42524′ 3″ 10‴.	×60
× 60	537240
2551440	+ 16
+ 3	537256″ 35‴.
2551443″ 10‴	+ 60
× 60	32235360
153086580	+ 35
+ 10	32235395‴
153086590‴	

And then the Work will ſtand thus.

If 153086590 Thirds give 360 Degrees;
Then 32235395 Thirds, give how many Degrees?

Where Multiplying the third Number by the ſecond, and dividing by the firſt, I ſhall have the Number of Degrees ſought in Integers, with the common Fraction annexed; which being reduced to Sexageſimals, will give the anſwer in Degrees, Minutes, Seconds, &c. Or I might have reduc'd the 360 Degrees into Thirds alſo, (which muſt have been done, if to theſe Degrees there had been annexed firſt, ſecond, and third Minutes) and then the Anſwer had been in *third Minutes*; and theſe to be reduced to Degrees, Minutes, &c.

Which Operation, tho' it be troubleſom enough, is yet more expedite, than by the Sexageſimal Multiplication and Diviſion, ſince the time that we have learned, (by help of the Numerical Figure) to manage great Numbers, which in *Ptolemy*'s time were not in uſe.

And in like manner, whatever other come to be ſo Multiplied.

According to this Sexageſimal Method, *Ptolemy* divides the Radius or Semi-diameter of a Circle into 60 Parts, (and conſequently, the whole Diameter into 120) and each of thoſe Parts into 60 Minutes, and each of thoſe into 60 Seconds, and ſo forward, as far as occaſion requires. And accordingly, the Arch anſwering to ſuch a Chord; (that is, the ſixth part of the Circumference, whoſe Chard Equals the Radius) into 60 Degr. and conſequently the whole Circumference into 360° and each of theſe Degrees into Minutes, Seconds &c. by a continual Sexagenary Diviſion.

And conſonant hereunto, he makes his Table of Chords of Subtenſes (in ſuch Parts, Minutes, and Seconds) anſwering the ſeveral Arches in a Circle.

Inſtead

Instead of which, the *Arabs* or *Saracens* have introduced (as more Expedient) their Table of Sines, (or half Chords of the double Arch) expressed in like manner by sexagesimal Parts.

Which they did in imitation of *Ptolemy*, than that they were necessitated so to do, having the use of Numeral Figures as we have, which *Ptolemy* and others of the Ancients had not.

But *Arzachel* therein differs thus far from *Ptolemy*, that he divides his Diameter into 300 Parts which *Ptolemy* divides but into 120, and hath therefore less need of Subdivisions.

The reason why the Ancients did thus reduce their ordinary Fractions all to one kind of Denomination, was, to avoid the trouble which would arise from the different Denomination of Fractions, which (when they had not the helps that now we have) would be very great; and therefore chose to admit of Approximations, many times, instead of accurate Equalities.

And why they chose the Number 60, rather than any other Number, was, because if they had made use of 12, or such other small Number, they would be put upon a necessity of the more Subdivisions, and a Number much greater than this they could not well manage; (there being, even in this, trouble enough) and of Numbers about this bigness, this was thought most convenient, as being most capable of exact Divisions, without being put to the necessity of Approximations or Subdivisions; admitting, for Divisors, the six first Numbers, 1, 2, 3, 4, 5, 6, (which none less than it can do) and as many more answering to them 10, 12, 15, 20, 30, 60, (that is Twelve in all there being no Number less than it, admitting of so many Divisors; nor can any, greater than it, admit of more, which is not at least twice as great; which cannot be said again of any greater Number, till we come to 360. And this is that which is made the Number of Degrees in the whole Circle.

And this Division of Integers into Sexagesms (Minutes, Seconds, Thirds, *&c.*) especially in the Parts of Arches, Angles, Time, and Motion; the *Arabs* have retained, in imitation of the *Greeks* (or *Egyptians*) and we from them, even to this Day. *Wallis*'s Algebra, Chap. VII.

SEXANGLE, in Geometry, is a Figure consisting of six Angles.

SEXTANS, is the sixth part of any thing, thus: There is an Astronomical Instrument called a *Sextant*, as being the 6th part of a Circle. This hath a graduated Limb, and is used like a Quadrant.

SEXTILE, the Position or Aspect of the Planets, when at 60 Degrees distant, or at the distance of two Signs from one another; and is marked thus,*.

SHACKLES, aboard a Ship, are those oblong Iron Rings, and bigger at one end than at the other, with which the Ports are shut fast, by thrusting the Wooden *Bar of the Port* through them. There are also a sort of Shackles to lift the Hatches up with, of the former Figure, but smaller; they are fastened at the Corners of the Hatches.

SHALLOP, is a small light Vessel with only a small Main-Mast and Fore-Mast, and Lugg-Sails, to hale up and let down on occasion: They commonly are good Sailers, especially the French *Chaboups*; and are used often as Tenders upon a Man of War.

SHAME, is an uneasiness of the Mind, upon the thought of having done something which is Indecent, or will lessen the valued Esteem which others have of us.

SHANK, or *Shank-Painter*, in a Ship, is a short Chain fastned under the Fore-Mast Shrowds, by a Bolt to the Ships-side; having at the other end a Rope fastned to it. On this Shank-Painter, the whole Weight of the Aft-part of the Anchor rests, when it lies by the Ship's-side. The Rope by which it is haled up, is made fast about a Timber-head.

SHAPOURNETT: The Heralds call a kind of Cap which is born in some Coats of Arms by this Name.

SHEER, or *Sheering*; the Sea Phrase for the going of a Ship when she is not steered steadily; then they say she *sheers* or goes *sheering*; as they do also when she goes in and out by means of the swift running of a Tide-Gate, *&c.* for then being at an Anchor, they say there is danger, lest she should *sheer home her Anchor*, or sheer a-shore.

SHEER-*Hooks*, aboard a Ship; are great Hooks of Iron sometimes used when a Ship designs to board another. They are like a Sickle, and are let into the Main-Yard-Arms and Fore-Yard-Arms in order to spoil, cut or tear the Enemy's Shrouds, Sails, or Rigging.

SHEER-*Shanks*, at Sea, is the term for a kind of Knot, by which they tye up or shorten a Runner when 'tis too long, so that they cannot hoise in the Goods by it over the Ship's-sides. This Knot can be let loose again when they please.

SHEERS, so the Seamen call two Masts Yards, or Poles set up and seized a-cross each other aloft, near the top. This *Pair of Sheers*, as they call it, is placed below on the *Chain-Wales* of the shrouds, and lashed fast to the Ship's-sides to keep them steady aloft. Their use is to set in or take out a Mast; for which end, there is fastned at the place where they cross one another, a strong double Block with a strap. They serve also to hoise in or out of Boats that have Masts, such Goods as are wanted to be taken in or out.

SHEATHING of a Ship, is casing that Part of her which is to be under Water, with something to keep the Worms from eating into her Planks. 'Tis usually done by laying Tar and Hair mixt together all over the old Plank, and then nailing on thin new Boards: But this hinders a Ship's Sailing; and therefore of late some have been sheathed with milled Lead.

'Tis very well worth trying what the Newstone Pitch will do in this case; if it will defend from the Worm, as perhaps it will, a Ship might be Paid with it cheaper than with the Crown-Pitch; and it will not crack nor scale off as that will do, but keep always soft and smooth. I have seen where it hath been on 13 Months, and yet it was very black and soft.

SHEATS in a Ship, are Ropes bent to the Clews of the Sails; serving in the Lower-sails to *Hale-aft* or *Round-off* the Clew of the Sail: But in Top-sails they serve to *Hale-home* as the Word is, or to hale the Clew of the Sale close to the Yard-Arm.

If the Main-sail Sheats are *haled-aft*, 'tis in order to make the Ship keep by a Wind; but when the Fore-sheats are *haled aft*, 'tis that the Ship may fall off from the Wind: And if she will not do it readily, they then hale the Fore-sail (by the sheat) flat in, as near the Ship's-sides as they can; and this they call *Flatting in the Fore-sail*. When they say, *Ease the Sheat*, they mean *Veer it*, or let it go out gently; but when the Word is, *Let fly the*

the Sheat, they mean, let it go all at once, and run out as faſt as it can; and then the Sail will hang looſe, and hold no Wind. In a very great Gale or Guſt of Wind, there is another Rope bent to the Clews of the *Main-ſail* and *Fore-ſail*, above the ſheat Block, to ſuccour and eaſe the *Sheat*, and this they call a *Falſe-ſheat*.

Sheats in a Ship, alſo, are thoſe Planks under Water which come along her *Run*, and are cloſed into the *ſtern Poſt*: So alſo that Part within Board in the *Run* of the Ship, is called the *Stern-ſheats*. The Seamen ſay when they would have the *ſheats* of the Main or Fore-ſail haled aft, *Tally the ſheats*.

SHEWING, in Law, is to be quit of Attachments in any Court, and before whomſoever in Plaints ſhewed, and not avow'd.

SHIFTERS, certain Men aboard a Man of War, who are employed by the Cooks to ſhift or change the Water in which the Fleſh or Fiſh is put and laid for ſome time, in order to fit it for the Kettle.

SHIVERS, ſo the Seamen call thoſe little round Wheels in which the Rope of a Pulley or Block runs. They turn with the Rope, and have pieces of Braſs in their Centres, (which they call the *Cocks*) with Holes in them, into which the Pin of the Block goes, and on which they turn. Theſe *Shivers* are uſually of Wood; but ſome are of Braſs, as thoſe in the *Heels* of the *Top-maſts*.

SHOALE, in the Sea phraſe, is the ſame as ſhallow: They ſay, 'tis *good Shoaling*, when as a Ship ſails towards the ſhoar, ſhe finds by her ſounding, it grows ſhallow by degrees, and not too ſuddenly; for then a Ship may go in ſafety.

SHORT-*Accent*, in Grammar, ſhews that the time of Pronunciation ought to be ſhort, and is marked thus (˘).

SHOT of a Cable, is the ſplicing of two Cables together, that a Ship may ride ſafe in deep Waters, and in great Roads: For a Ship, will Ride eaſier by one ſhot of a Cable, than by three ſhort Cables out a-head.

SHOT, for Ordnance, are of ſeveral ſorts, as *Round-ſhot*, which are round Bullets fitted in proportion to the Bore of the Piece.

Croſs-bar-ſhot, are round ſhot, with a long ſpike of Iron caſt in it, as if it did go through the middle of it.

Trundle-ſhot, being only a Bolt of Iron 16 or 18 Inches long, ſharp-pointed at both ends, and about a Hand's breadth from each end, having a round broad Bowl of Lead caſt upon it, according to the Bore of the Piece.

Langrel-ſhot, which runs looſe with a ſhackle to be ſhortned when it is put into the Piece; and when it flys out, it ſpreads it ſelf. At each end of the Bar it has half a Bullet, either of Lead or Iron.

Chain-ſhot, is two Bullets with a Chain betwixt them, ſome being contrived round, yet ſo that they will ſpread in flying their full Length and Breadth.

Caſe-ſhot, is any thing of ſmall Bullets, Nails, old Iron, and the like, to put into the *Caſe*, to ſhoot out of Ordnance.

SHOULDRING, in Fortification, is a Retrenchment oppoſed to the Enemies, or a Work caſt up for a Defence on one ſide, whether it be made of heaps of Earth caſt up, or of *Gabions* and *Facines*. A *ſhouldring* alſo is a ſquare *Orillon* ſometimes made in the Baſtions on the Flank near the ſhoulder, to cover the Canon of a Caſemate. Again, it is taken for a Demi-baſtion or Work conſiſting of one Face, and one Flank, which ends in a Point at the head of a *Horn-work* or *Crown-work*: Neither is it to be underſtood only of a ſmall Flank added to the ſides of the *Horn-work*, to defend them when they are too long, but alſo of the Redents which are raiſed on a ſtrait Line.

SHROWDS, are great Ropes in a Ship, which come from either ſide of all Maſts. They are faſtned below by Chains to the Ship's ſides, and aloft over the Head of the Maſt, their *Pendants*, *Fore-tackle*, and *Swifters* being firſt put under them: They are alſo *ſerved* there, to prevent their galling the Maſt. The Top-maſt-ſhrowds are faſtned to the *Puttocks* by Plaits of Iron; and by Dead-mens Eyes and Lanniers alſo as the others are. The terms are *Eaſe the ſhrowds*; that is, ſlacken them: *Set Taught the Shrowds*; that is, ſet them ſtiffer The Bolt-ſprit hath no ſhrowds.

SICUT *alias*, is a ſecond Writ ſent out, when the firſt was not executed.

SIDEMEN, or *Queſtmen*, be thoſe that are Yearly Choſen, according to the Cuſtom of every Pariſh, to Aſſiſt the Churchwardens in the Enquiry and repreſenting ſuch Offenders to the Ordinary, as are Puniſhable in the *Court Chriſtian*.

SIDERAL Year. See *Solar Year*.

SIDERATIO. See *Spacelos*.

SIEF, *Album*. See *Collyrium*.

SIEGE, is the encamping or ſitting down of an Army before a Place, in order to take it, either by Force or by Famine.

SIGMOIDE, are the *Apophyſes* of the Bones, repreſenting the Letter C of the ancient *Greeks*. Alſo the *Valves* of the great Artery that hinder the Blood from returning back to the Heart.

SIGNIFICABIT, is a Writ *de Excommunicato capiendo*, which iſſueth out of the *Chancery* upon a Certificate given by the Ordinary, of a Man that ſtands obſtinately Excommunicate, by the ſpace of forty Days, for the laying him up in Priſon without Bail or Mainpriſe, until he ſubmit himſelf to the Authority of the Church. And 'tis ſo called, becauſe the Word *Significavit* is an Emphatical Word in the Writ. There is alſo another Writ in the *Regiſter*, *Fol.* 7. directed to the Juſtices of the Bench, commanding them to ſtay any Suit depending between ſuch and ſuch, by reaſon of an Excommunication alledged againſt the Plaintiff; becauſe the ſentence of the Ordinary that did Excommunicate him, is appealed from, and the Appeal yet depends undecided.

SILIQUA, in Botany, is the Seed-veſſel, *Huſk*, *Cod*, or *Pod*, of ſuch Plants as are of the Leguminous kind.

SILLON, in Fortification, is an elevation of Earth, made in the middle of a Moat, to Fortifie it when too broad: It is otherwiſe called *Envelope*, which is the more common Name.

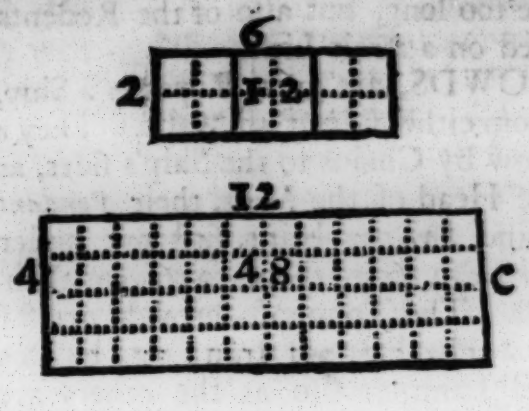
SIMILAR *Arks* of a Circle, are ſuch as are like Parts of their whole Circumference.

SIMILAR *Bodies*, in Natural Philoſophy, are called ſuch as have their Particles of the ſame Kind and Nature one with another.

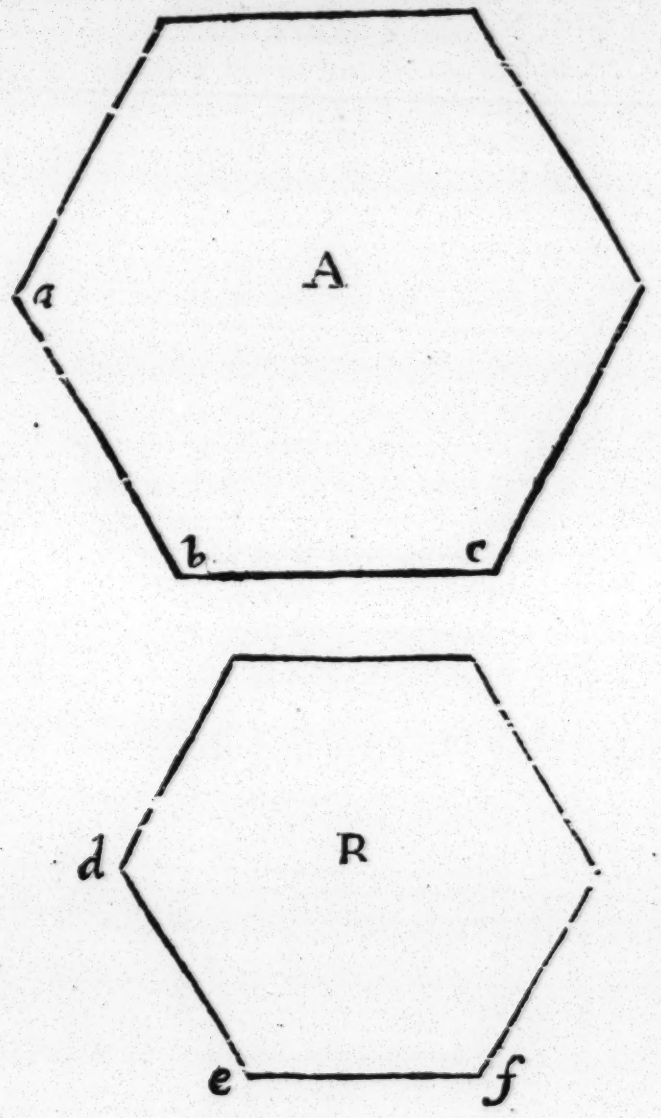
SIMILAR, or *ſimple Parts*, by Anatomiſts are called ſuch as are throughout of the ſame nature and texture, as all the Parts of the Bone are Bony, *&c.*

SIMILAR *Plane Numbers*, are thoſe *Numbers* which may be ranged into the form of *ſimilar Rectangles*;

angles; that is, into Rectangles, whoſe ſides are Proportional, ſuch are 12 and 48; for the ſides of 12 are 6 and 2 (as in Fig. B.) and the ſides of 48 are 12 and 4 (as in Fig. C.) But 6. 2 :: 12. 4, and therefore thoſe *Numbers* are *ſimilar*.

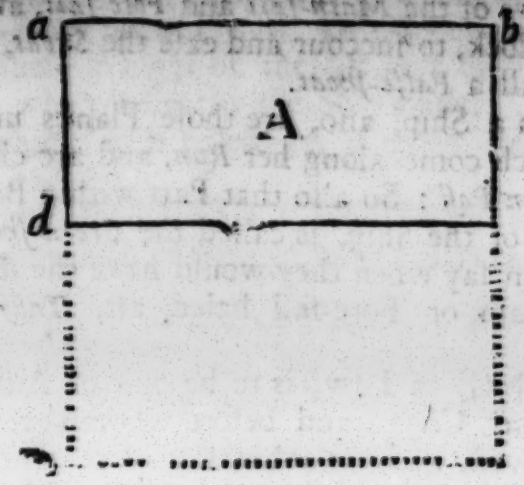


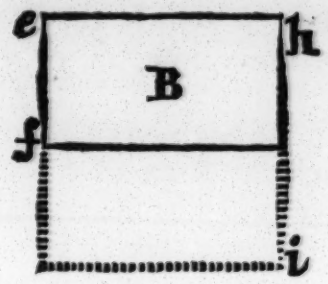
SIMILAR *Polygons*, are ſuch as have their Angles ſeverally Equal, and the ſides about thoſe Angles Proportional.



Thus, if in the Polygon A, all the Angles *a b c*, *&c.* are reſpectively equal to all thoſe *d e f*, *&c.* in the Polygon B. And that alſo *a b* hath the ſame Proportion to *b c* :: as *d e* hath to *e f*. Then thoſe two Polygons are *ſimilar*.

SIMILAR *Rectangles*, are thoſe which have their ſides about the equal Angles Proportional; that is, as *a b* : *e h* :: *a d* : *e f*.





COROLLARY I.

All *Squares* muſt be *ſimilar Rectangles*; for (ſince they have all their Sides equal, and all their Angles right) whatever Proportion the ſide *a m* hath to the ſide *b i* of the other *Rectangle*, the ſame muſt alſo the other ſide *a b* have to the ſide *e h*; becauſe they are equal to *a m*, and to *h i*.

COROLLARY II.

Hence all *ſimilar Rectangles* are to each other as the *ſquares* of their *Homologous-ſides*.

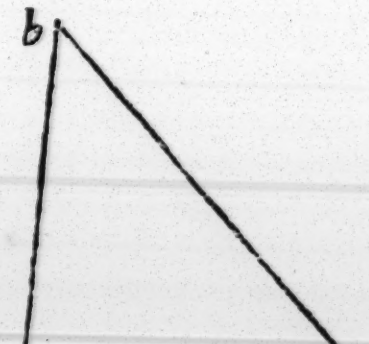
For the *Rectangle* A, is to B :: as the Square *b m* is to the Square *e i*; ſince as well *Squares* as *Rectangles* are in a duplicate Ratio to that of their ſides.

SIMILAR *Right-Lin'd Figures*, are ſuch as have equal Angles, and the ſides about thoſe equal Angles proportional.

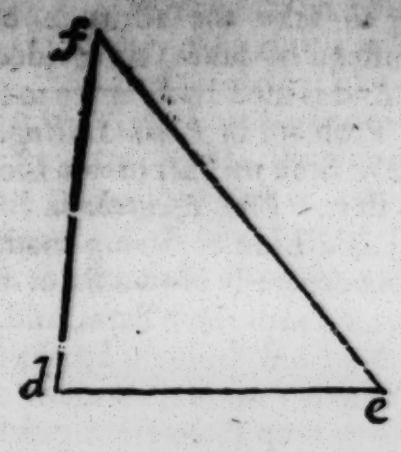
SIMILAR *Segments* of a Circle are ſuch as contain equal Angles.

SIMILAR *ſolid Numbers*, are thoſe, whoſe little Cubes may be ſo ranged as to make *ſimilar* and rectangular Parallelopipeds.

SIMILAR *Triangles*, are ſuch as have all their three Angles reſpectively equal to one another.



As



As if the Angle *a* be equal to *d*, the Angle *c* equal to *e*, and the Angle *b* equal to *f*; then is the Triangle *a b c* ſimilar or *like* to *d f e*: And then the ſides about the Equal Angles are always proportional; that is, *a b* hath the ſame Proportion to *a c* as *f d* hath to *d e*, and is thus written,

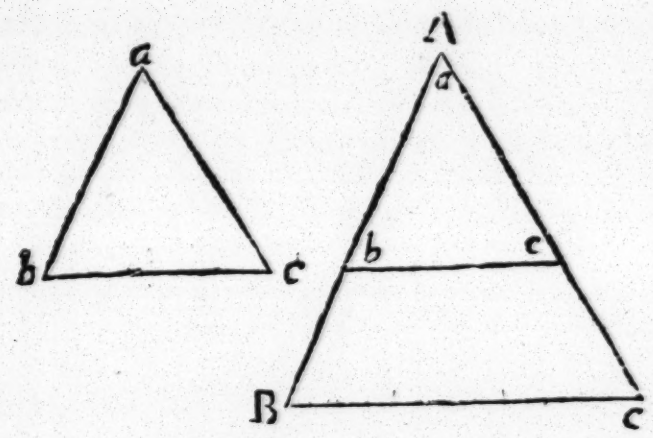
a b . a c : : f d . d e.

PROPOSITION.

All *Similar Triangles*, have the ſides about their Equal Angles Proportional.

Thus in the Figure.

I ſay, A B: *a b* : : A C : *a c* : : C B. *b c*, &c.



For ſet the leſſer Triangle into the greater, by taking A *b* = *a b*, and A *c* = *a c*, then will the Baſe *b c*, be the ſame as in the leſſer Triangle; and the whole Triangle A *b c*, will be equal to *a b c*.

And therefore the Angle A *b c*, will be equal to the Angle B, and A *c b* = C.

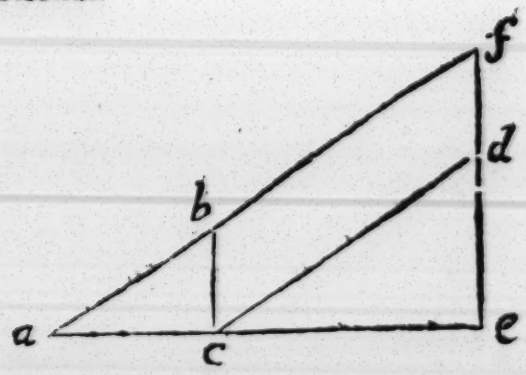
Wherefore the Line *b c*, is Parallel to B *b*: And therefore,

A *b*: A B: A *c*: A C: : *b c*: B C, &c.

Q. E. D.

Otherwiſe thus, according to *Euclid.*

Let the Triangle *a b c*, be ſimilar to *d c e*. Then I ſay, That the ſides about their Equal Angles are Proportional.



Set the Baſes of the two Triangles *a c* and *e c*, ſo together as that they may join and make one Right Line *a e*; and draw out the Lines *a b* and *e d*, till they meet together in the Point *f*.

DEMONSTRATION.

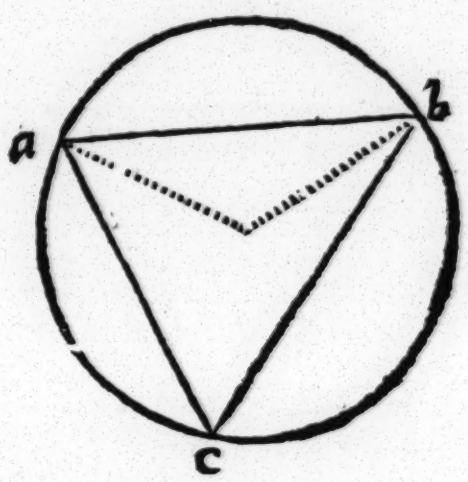
Becauſe the Angle *a* = Angle *d c e*, *a f*, is Parallel to *c d* alſo, becauſe the Angle *a c b*, is equal to the Angle *c e f*; the Lines *b c* and *f e* are Parallel. Wherefore *b c d f*, muſt be a *Parallelogram*, whoſe oppoſite ſides are equal, that *b f* = *c d*, and *b c* = *f d*.

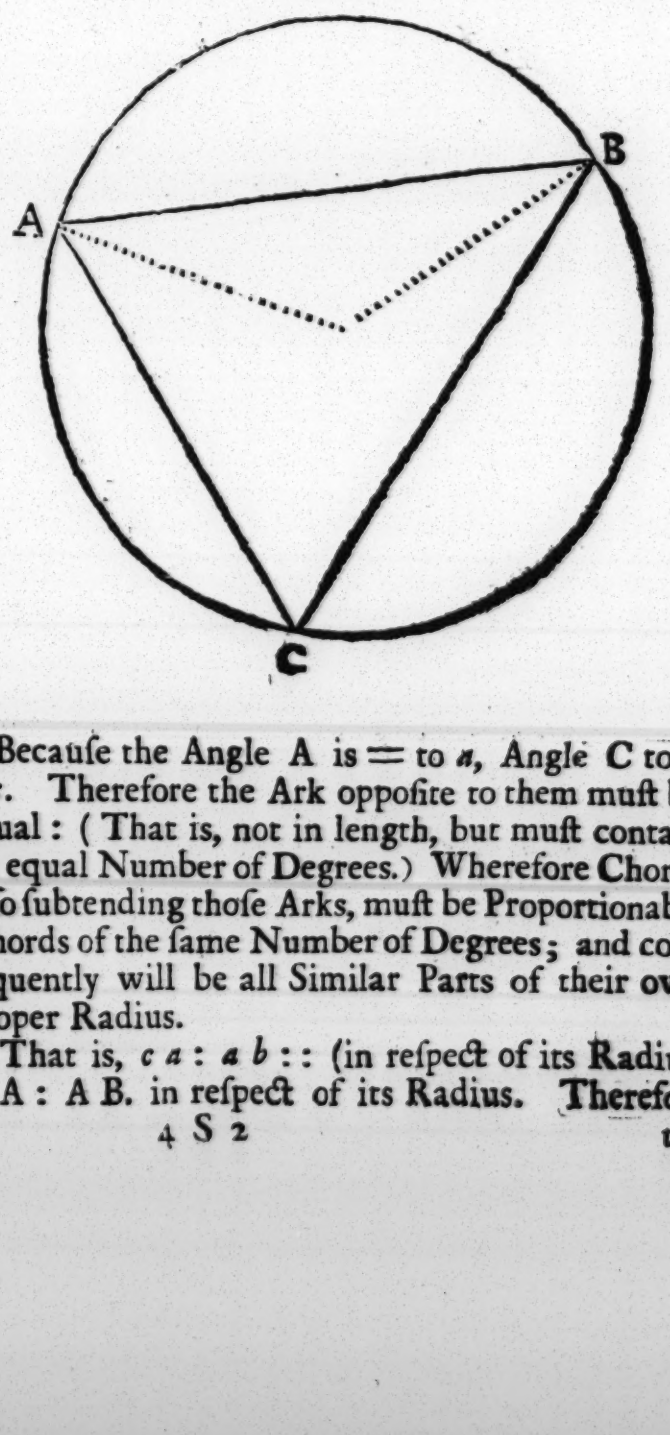
Therefore becauſe *c d* is Parallel to the Baſe *a f*, of the Triangle *f e a*; *d e* : *f d* (or *b c*) : : *e c* : *a c*.

That is, *d e* : *b c* : : *e c* : *a c*. And therefore alternately, *d e* : *c e* : : *b c* : *a c*. And ſo the ſides about *c* and *e* are proved Proportionable.

Alſo becauſe *b c* is Parallel to the Baſe *f e*, of the Triangle *a f e*. Therefore *e c* : *a c* : : *f b*, (or *c d*) : *a b*: That is, *e c* : *a c* : : *c d* : *a b*. And therefore alternately, *e c* : *c d* : : *a c* : *a b*. And ſo the ſides about the equal Angles *a*, and *d c e*, are found Proportional. The ſame may be eaſily done by the Angles *b* and *d*.

Another *Demonſtration* by *Pardie*.





Becauſe the Angle A is = to *a*, Angle C to *c*, &c. Therefore the Ark oppoſite to them muſt be equal: (That is, not in length, but muſt contain an equal Number of Degrees.) Wherefore Chords alſo ſubtending thoſe Arks, muſt be Proportionable Chords of the ſame Number of Degrees; and conſequently will be all Similar Parts of their own proper Radius.

That is, *c a* : *a b* : : (in reſpect of its Radius) C A : A B. in reſpect of its Radius. Therefore

the Sides about the equal Angles will be proportional.

Or, *bc* : *ba* : : BC : BA, *Q. E. D.*

COROLLARY I.

From hence it follows, That all *Similar Triangles* are to one another, as the Squares of their Homologous Sides. For theſe *Triangles* are the Halves of *Simila Triangles* or *Parallelograms*, which are to one another in a *Duplicate Ratio* of their Homologous Sides; Therefore the Halves muſt be as the Wholes.

COROLLARY II.

All *Similar Polygons* are to one another as the Squares of their Homologous Sides. For being made up of *Similar Triangles*; the Aggregates or Sums will be to each other, as the Parts cut, of which they were made.

SIMONY, is an unlawful Contract made to have a Man preſented to a Rectory or Vicarage: It was agreed by all the Juſtices, that if the Patron preſent any Perſon to a Benefice with Cure, for Money, that ſuch Preſentation, *&c.* is void, tho' the Preſentee were not Privy to it, and the Statute gives Preſentation to the King: But this is now repealed.

SIMPLE *Flank.* See *Flank.*

SIMPLE *Place*, a Term in Geometry. See *Place Simple.*

SIMPLE *Problem.* See *Linear Problem.*

SIMPLE *Problem*, in Mathematicks. See a *Linear One.*

SIMPLE *Quantities*, in Algebra, are ſuch as have but one Sign, whether Poſitive or Negative: Thus.

2 *a*, and — 3 *b*, are *Simple Quantities.*

But $a + b$, and $+ d - c + h$ are compound ones.

SIMPLE *Tenaille.* See *Tenaille.*

SINAPISMUS, is a Medicine applied to the Head, and is prepared of Muſtard, Wild Raddiſh, and Leven. *Blanchard.*

SINCIPUT, the Fore-part of the Head, reaching from the Fore-head to the *Coronal Suture.*

SINE, or *Right Sine*, is a right Line drawn from one end of an Arch, perpendicularly upon the Diameter drawn from the other end of that Arch; or it is half the Chord of twice the Arch. See more under the Word *Trigonometry.*

SINE *aſſenſu capitali*, is a Writ againſt him that alienates Lands without conſent of his Chapter or Covent.

SINE *Complement.* See *Complement.*

SINE *die*, in Law, when Judgment is given againſt the Plaintiff, he is ſaid to be *in miſericordia pro falſo clamore ſuo*: But when for the Defendant, then 'tis ſaid, *Eat inde ſine die.*

SINGLE, or *Simple Excentricity.* See *Eccentricity.*

SINGULTUS, or the Hickoup, is a Convulſive Motion of the Midriff, cauſed by tough and irregular Particles, forcing it to this diſordinate Motion. *Blanchard.*

SINICAL *Quadrant*, is made of Braſs or Wood, with Sines drawn from each Side interſecting one another, with an Index divided by Sines alſo, with ninety Degrees on the Limb, and two Sights to the Edge, to take the Altitude of the Sun. Sometimes inſtead of Sines, 'tis divided all into equal Parts: And is uſed by Seamen to ſolve by inſpection any Problem of *Plain Sailing.*

SINESTER Side or Part of an Eſcutcheon, is the left Side Part. *Vide Eſcutcheon.*

SINNET, is a Line or String made of Rope-yarn, conſiſting generally of two, ſix, or nine Strings, which are divided into three Parts, and are platted over one another, and then it is beaten ſmooth and flat, with a Wooden Mallet, its uſe is to *Serve* the Ropes, that is to keep them from gawling.

SI *non omnes*, is a Writ of Aſſociation, whereby, if all in Commiſſion cannot meet at the Day aſſigned, it is allowed, That two, or more of them, may finiſh the Buſineſs.

SINUS, any Cavity in or between the Veſſels of an *Animal Body*, the Anatomiſts call a *Sinus*, and ſome Philoſophical Writers call thoſe Fiſſures or Cavities which are between the ſeveral Strata or Layers of the Earth, in Mines, *&c.* by this Term *Sinus*, for *Sinus* in Mathematicks. See *Sine.*

SINUS *Meningium*, are thoſe 3 Cavities which *Galen* calls the Ventricles of the Thick Membrane. The firſt and ſecond, or the Lateral *Sinus*, are ſeated between the Brain and the *Cerebellum*, and end in the vertebral *Sinus*'s. The third begins from the *Os Cribriforme*, and ends in the middle of the former *Sinus*'s The fourth ariſes from the *Pinealis* Glandule, and ends in the middle of the lateral *Sinus*'s. The Inſertion of theſe *Sinus*'s is called *Trocular Herophili.* The *Sinus*'s, after they have paſſed through the Scull, are partly continued with the Jugular Veins, and partly deſcend through the whole length of the Spinal Marrow down to the *Os Sacrum.* The uſe of them is to ſupply the place of Veins, for they convey the Blood from the Brain and *Cerebellum*, partly into the Jugular Veins, and partly into the Vertebral *Sinus*'s. *Blanchard.* With us the Ventricles of the Brain are accounted only the three Partitions or Subdiviſions of the Forinx; and they ſerve as a Sink to drain away the excrementitious Matter of the Brain.

SINUS *Oſſium*, are thoſe Cavities of the Bones which receive the Heads of other Bones.

SIPHON, a Glaſs or metalline crooked Pipe, Tube, or Cane. See *Syphon.*

SI *Recognoſcant*, is a Writ that lies for a Creditor againſt his Debtor, for Money numbered, that hath before the Sheriff in the *County Court*, acknowledged himſelf to owe his Creditor ſuch a Sum, received of him in *pecuniis numeratis*,

SIRIUS, the *Dog-ſtar*, a bright Star of the firſt Magnitude, in the Conſtellation *Canis major*, its Longitude is 99 Degrees, 47 Minutes, Latitude 39 Degrees, 32 Minutes.

SIRONES, little Puſhes in the Palm of the Hand, and Sole of the Foot, containing certain ſmall Inſects or Worms.

SCARFED, the Sea Term, when one Piece of Timber is let and faſten'd into another. See *Scarfed.*

SKELETON, of a Man or other Animal, is when the Bones are cleaned and dry, and put together according to Art in their natural Order and Poſition.

SKUPPERS, and *Skupper-holes.* See *Scoper-holes.*

SLATCH, when any Rope or Cable hangs ſlack, the Seamen call the middle Part which hangs

hangs down, the *Slatch* of the Cable or Rope, ſo alſo after long foul Weather, if there come a ſmall Intervail of fair, they ſay, this is a *Slatch* of fair Weather.

SLEEPERS, Timbers lying before and aft in the bottom of a Ship as the Rung-heads do; the lowermoſt of them is bolted to the Rung-heads, and the uppermoſt to the *Futtocks*, in order to ſtrengthen and faſten the *Futtocks* and *Rungs*.

SLIDING *Rules*, or Scales, are Inſtruments to be uſed without Compaſſes, in Gauging, Meaſuring, &c. having their Lines fitted ſo as to anſwer Proportions by Inſpection; they are very Ingeniouſly contrived and applied by *Gunter*, *Partridge*, *Cogſhall*, *Everard*, *Hunt*, and others, who have Written particular Treatiſes about their Uſe and Application.

SLING, a Word uſed variouſly at Sea, there are *Slings* to hoiſe up Casks or any other heavy things; which are made of Ropes, ſpliced into themſelves at either end, with an Eye big enough to hold the thing to be *Slung*.

There are other *Slings* which are made longer and with a ſmall Eye at each end, one of which is put over the Breech of a Piece of Ordnance, and the other Eye comes over the end of an Iron Crow, which is put into the Mouth of the Piece, to Weigh and Hoiſe the Gun as they pleaſe.

There are alſo *Slings* for the Yards, which is done by binding them faſt to the *Croſs-tree* aloft, and to the Head of the Maſt with a ſtrong Rope or Chain, that if the Tye ſhould happen to break, or to be ſhot to pieces in a Fight, the Yard nevertheleſs may not fall down upon the Hatches.

SMELLING, is probably occaſioned by the *Effluvia* of Odorous Bodies mingling themſelves with the Air, and entring up the Noſtrils, which are covered with a very Nervous and Senſible Coat, and there inſinuating themſelves into the Proceſſes of the Olfactory Nerve, do move it variouſly according to their various and different Nature, and ſo communicate to the Brain, ſuch correſponding Motions, as enables the Soul to judge differently of the Bodies emitting ſuch *Effluvia*: And from hence when the *Effluvia* produces a grateful Senſation, we ſay its hath a ſweet Smell, but when a diſagreeable one, we ſay it ſtinks.

SMITEING-Line, in a Ship, is a ſmall Rope faſtened to the Miſſen-yard Arm, below at the Deck, and is always furled up with the Miſſen-ſail, even to the upper end of the Yard, and from thence it comes down to the Poope. Its Uſe is to looſe the Miſſen-ſail without ſtriking down the Yard, which is eaſily done, becauſe the Miſſen-ſail is furled up only with Rope-yarns; and therefore when this Rope is pulled hard, it breaks all the Rope-yarns, and ſo the Sail falls down of it ſelf: The Word of Art is, *Smite the Miſſen* (whence this Rope takes its Name;) that is, hale by this Rope that the Sail may fall down.

SNATCH *Block*, is a great Block in a Ship, with a Shiver in it, having a Notch cut thro' one of its Cheeks for the more ready receiving in of any Rope: For by this Notch, the middle part of a Rope may be reeved into this Block, without paſſing it in end-ways. This ready Block is commonly faſtened with a Strap about the Main-maſt, cloſe to the Upper Deck, and is chiefly uſed for the *Fall* of the *Winding Tackle*, which is reeved into this Block, and then brought to the Capſtan.

SNOW. The Learned Dr. *Grew*, in *Philoſophical Tranſactions*, N. 92. gives the following Account of Snow, which ſeems very exact and juſt.

1. With Mr. *Des Cartes*, and Dr. *Hook*, he obſerves, That many parts hereof are of a Regular Figure; for the moſt part being as it were ſo many little Rowels, or Stars of 6 Points; being perfect and tranſparent Ice, as any one may ſee upon a Pool, or Veſſel of Water; upon each of which 6 Points, are ſet other collateral Points, and thoſe always at the ſame Angles, as are the main Points themſelves.

2. Amongſt theſe Regular Figures, tho' many of them are large and fair; yet from theſe taking our firſt *Item*, many others, alike Regular, but far leſs, may likewiſe be diſcovered.

3. Amongſt theſe, not only Regular, but entire Parts of Snow, looking ſtill more warily, we ſhall perceive, that there are divers others indeed irregular, which yet are chiefly the broken Points, Parcels, and Fragments of the Regular ones.

4. That beſides the broken parts, there are ſome others which ſeem to have loſt their Regularity, not ſo much in being broken, as by various Winds, firſt gently Thaw'd, and then Froze into little irregular Clumpers again.

From whence the true Notion, and external Nature of *Snow*, ſeemeth to appear, *viz.* That not only ſome few parts of *Snow*, but originally, the whole Body of it, or of a Snowy Cloud, is an infinite Maſs of Icicles regularly figured; not one Particle thereof I ſay, originally, not one of ſo many Millions, being indetermined, or irregular; that is to ſay, a Cloud of Vapours being gathered into Drops, the ſaid Drops forthwith deſcend; upon which Deſcent, meeting with a ſoft freezing Wind, or at leaſt paſſing thro' a Colder Region of the Air, each drop is immediately froze into an Icicle, ſhooting it ſelf forth into ſeveral Points or *Stiriæ*, on each Hand fromward its Centre: But ſtill continuing their deſcent, and meeting with ſome ſprinkling and intermixing Gales of Warmer Air, or in their continual Motion and Waftage to and fro, touching upon each other; ſome are a little thaw'd, blunted, froſted, clumper'd, others broken, but the moſt hanked and clung in ſeveral Parcels together, which we call Flanks of *Snow*.

It being known what Snow is, we underſtand, why, though it ſeem to be ſoft, yet 'tis truly hard: becauſe true Ice, the inſeparable property whereof is to be hard; ſeeming only to be ſoft, becauſe upon the firſt touch of the Finger, upon any of its ſharp Edges or Points, they inſtantly thaw; or otherwiſe they would pierce our Fingers as ſo many Lancets.

Why again, though Snow be true Ice, and ſo hard and denſe a Body, yet very light; becauſe of the extream thinneſs of each Icicle in compariſon of its breadth. For ſo Gold, which though of all Bodies it be the moſt ponderous, yet being beaten into Leaves, rides upon the leaſt breath of Air; and ſo in all other Bodies, where there is but little Matter contained within large Dimenſions, and poſſibly in no other Caſe.

Alſo, how it is *White*, not becauſe hard; for there are many ſoft Bodies White; but becauſe conſiſting of parts, all of them ſingly tranſparent, but being mixed together appear White; as the Parts of Froth, Glaſs, Ice, and other tranſparent Bodies, whether ſoft or hard.

Thus much for the *External* Nature of *Snow*; let us next enquire into its *Eſſential* Nature.

Now to make a Judgment of this, is by conſidering, what the general Figure of *Snow* is, and comparing the ſame with ſuch Regular Figures as we ſee in divers other Bodies, in that where we ſee the like Configurations, we may believe there is the like Subject wherein, or the like Efficient *whereby* but thoſe and theſe are made.

As for the Figure of *Snow*, 'tis generally one, *viz.* that which is above deſcribed: Rarely of different ones, which may be reduced chiefly to two general Circulars and Hexagonals, either Simple or Compounded together, more rarely, either to be ſeen of more than 6 Points; but if ſo, then not of 8 or 10 but 12. Or in ſingle Shoots, as ſo many ſhort, ſlender Cylinders, like thoſe of *Nitre*. Or by one of thoſe ſhoots, as the Axle-tree, and touching upon the Centre of a Pair of pointed Icicles, joyned together as the two Wheels. Or the ſame Hexagonal Figure, and of the ſame uſual breadth; but continued in thickneſs and profundity. All theſe are rare, the firſt deſcribed being the general Figure.

As for the Configuration of other Bodies we ſhall find, that there are divers which have ſome a leſs, others a more near reſemblance thereto. *Nitre* is formed as is commonly known in long Cylindrical ſhoots, as alſo all *Lixivial Salts* for the moſt part reſembling, tho' not perfectly, the ſeveral Points of each Starry Icicle of *Snow*. *Salt of Harts-horn*, *Sal Armoniack*, and ſome other volatile Salts, beſides their main and longer ſhoots have others ſhorter Branched out from them; reſembling as thoſe the main, ſo theſe the Collateral Points of the *Snow*, but the Icicles of *Urine* are ſtill more near: For in *Salt of Harts-horn*, altho' the Collateral ſhoots ſtand at acute Angles with the main, yet not by pairs at equal height: And in *Sal Armoniack*, altho' they ſtand Diametrically oppoſite, or at equal height; yet withal at right, not acute Angles: Whereas in the Icicles of *Urine*, they ſtand at equal Heights, and at acute Angles both; in both, like thoſe of *Snow*. And it is obſervable that the Configuration of *Feathers* is likewiſe the ſame. The reaſon whereof is, becauſe Fowls having no Organs for Evacuation of Urine, the Urinous Parts of their Blood are evacuated by the Habit or Skin, where they produce and nouriſh Feathers.

From whence it ſhould ſeem, That every Drop of Rain aforeſaid, containing in it ſelf ſome Spirituous Particles, (as from the height to which they are advanced, the prolifick Vertue of Rain, and its eaſie tendency to Putrefaction, above other Water, is argued they do) and meeting with others in their Deſcent, of a Saline, and that partly Nitrous, but chiefly Urinous, or of an *acide-ſalinous* Nature; the ſaid Spirituous Parts are apprehended by them, and with thoſe the Watry; and ſo the whole Drop is fix'd, yet not into any indifferent and irregular ſhape, depriving their Spirituous parts of their Motion in an inſtant; but according to the Energy of the Spirituous, as the Pencil, and the Specifick Nature, or determinate poſſibility of the Saline Parts, as the Ruler, 'tis thus figured into a little Star.

Theſe things ſomewhat further conſidered and cleared, may add a little to that great deal of Light which the Honourable Mr. *Boyle*, hath given to the Nature of Gold, the Air, and the Bodies therein contained, in his Excellent Diſcourſes thereof.

SOC, is a Word ſignifying a Power, or Liberty of Juriſdiction; whence comes the Law *Latine* Word *Soca*, for a Seigniory enfranchiſed by the King, with liberty of holding a Court of his *Sockmen*, or *Socagars*; that is, his Tenants whoſe Tenure is hence called *Socage*.

SOCAGE, is a Tenure of Lands by, or for certain inferior Services of Husbandry to be performed to the Lord of the Fee, or is a Tenure of Lands, when a Man is infeoffed freely without any Service, Word, Relief, or Marriage, and pays to his Lord ſuch Duty as is called, *Petit Sergeanty*, &c.

There is alſo *Free*, or *Common Socage*, and *Baſe Socage*, or *Villenage*.

Other Diviſions thereof there are in Law Books: But by the Statute 12 *Car.* 2. *cap.* 24. all Tenures ſhall be adjudged, and taken to be turned into *free* and *common Socage*.

SOCMANS, or *Sokemans*, are ſuch Tenants as hold their Lands and Tenements by *Socage* Tenure.

SOLÆUS, is a Muſcle that helps to extend the Foot.

SOLAR *Comet*. See *Diſcus*.

SOLAR *Cycle*. See *Cycle of the Sun*.

SOLAR *Spots*. See *Spots of the Sun*.

SOLAR *Year*, is either *Trophical*, or *Siderial*.

Trophical Year, is that ſpace of Time, wherein the *Sun* returns again to the ſame Equinoctial, or Solſtitial Point, which is always equal to 365 Days, 5 Hours, and about 55 Minutes.

The *Siderial Year*; is the ſpace wherein the *Sun* comes back to any particular Fixed Star, which is about 365 Days, 8 Hours, and 9 Minutes,

SOLE *Tenant*, is he or ſhe that holds only in his or her own Right, without any other joined: As, if a Man and his Wife hold Land for their Lives, the Remainder to their Son; here the Man dying, the Lord ſhall not have Heriot, becauſe he dieth not *Sole-Tenant*.

SOLET & *debet*. See *Debet and Solet*.

SOLID, in Geometry, is the Third Species of Magnitude, having three Dimenſions, Length, Breadth and Thickneſs; and is frequently uſed in the ſame ſence with Body. It may be conceived to be formed by the direct Motion, or the Revolution of any Superficies, of what Nature, or Figure ſoever.

SOLID *Angle*, is an *Angle* made by the meeting of three or more Planes, and thoſe joining in a Point, like the point of a Diamond well cut.

SOLID *Baſtion*. See *Baſtion*.

SOLID *Numbers*, are thoſe which ariſe from the Multiplication of a *Plain Number*, by any other whatſoever; as 18 is a *ſolid Number* made of 6, (which is Plane) multiplied by 3; or of 9 multiplied by 2.

SOLID *Place*. See *Place ſolid*.

SOLID *Problem*, in Mathematicks, is one which can't be Geometrically ſolved, but by the Interſection of a Circle, and a Conick Section; or by the Interſection of two other Conick Sections beſides the Circle.

As, *To deſcribe an Iſoſceles Triangle on a given Right Line, whoſe Angle at the Baſe, ſhall be triple to that at the Vertex.*

This will help to Inſcribe a Regular Heptagon, in a given Circle, and may be reſolved by the Interſection of a *Parabola* and a Circle.

The following Problem alſo helps to Inſcribe a *Nonagon* in a Circle; and may be ſolved by the Interſection of a *Parabola*, and an *Hyperbola* between its *Aſymptotes: Viz.*

To deſcribe an Iſoſceles Triangle, whoſe Angle at the Baſe, ſhall be Quadruple of that at the Vertex.

And ſuch a Problem as this, hath 4 ſolutions, and no more; becauſe 2 Conick Sections can cut one another but in 4 Points.

How all ſuch Problems are conſtructed, Mr. *Halley* ſhews in *Philoſoph. Tranſact. N.* 188.

SOLIDITY (ſee *Firmneſs*) is a Quality of a Natural Body contrary to Fluidity, and appears to conſiſt in the Parts of Bodies being interwoven and intangled one with another, ſo that they cannot diffuſe themſelves ſeveral ways, as Fluid Bodies can.

SOLLICITOR, is a Man imploy'd to take care of, and follow Suits depending in Courts of Law, or Equity, formerly allowed only to Nobility, whoſe Menial Servants they were; but now too frequently uſed by others, to the damage of the People, and the increaſe of Champerty and Maintenance.

SOLSTICE, is the Time when the *Sun* entring the Tropical Points, is got furtheſt from the Equator, and before he returns back towards it, ſeems to be for ſome time at a ſtand, being moved in the ſame Parallel, and ſcarce making any other Lines than perfect Circles, ſo ſmall is its Progreſs. Theſe *Solſtices* are two:

Eſtival, or Summer *Solſtice*, when the *Sun* enters *Cancer* the 11th of *June*, making the longeſt Day, and the ſhorteſt Night.

And the *Hyemal*, or Winter *Solſtice*, on the 11th of *December*, when he enters *Capricorn*, the Nights being then at the longeſt, and Days at the ſhorteſt; that is, in Northen Regions, for under the Equator there is no Variation, but a continual Equinox; and in the Southern Parts, the Sun's Entrance into *Capricorn*, makes the longeſt Day; and into *Cancer*, the longeſt Night.

SOLSTITIAL *Colure*. See *Colure*.

SOLUBLE *Tartar*, is made by boiling in 3 Pints of Water, 8 Ounces of Cream of Tartar, and 4 Ounces of the Fix'd Salt of Tartar, for about half an Hour in an Earthen Pan unglazed; and then when 'tis cool, filtrating and evaporating it till 'tis dry: 11 Ounces and 6 Drams of Salt will remain at the Bottom. This is the *Soluble Tartar*. 'Tis accounted a very good Aperitive Medicine.

'Tis called alſo a Vegetable Salt. Sometimes the *Tincture of Mars* is added in this Preparation, and then 'tis called *Soluble Tartar Chalybeate.*

An *Emetick Tartar*, is alſo made of this Soluble Tartar, and Liver of Antimony, which works as the common one.

SOLVENDO *eſſe*, a Term in Law, ſignifying that a Man hath wherewith to pay, or is a Perſon *ſolvent*.

SOLVENT, the ſame with Diſſolvent, being any Corroſive Liquor, or *Menſtruum*, that will diſſolve Bodies.

SOLUTIO *Chymica*, is a reſolving any Body into its Chymical Principles; which are, Spirit, Salt, Sulphur, Earth and Water.

SOLUTIO *continui*, is a Diſſolution of the Unity and Continuity of the Parts: As in Wounds, Ulcers, Fractures, *&c.*

SOLUTION, in Mathematicks, is the anſwering of any Queſtion, of the Reſolution of any Problem.

SOLUTIONE *feodi Militis Parliamenti*, and *Solutione feodi Burgens Parliamenti*, are Writs whereby Knights of the Shire and Burgeſſes may recover their Allowance, if it be denied.

SOLUTIVE. See *Laxative*.

SOMMONS, See *Summons*.

SOMNIFEROUS, or Sleeping Medicines, are ſuch which conſiſting of fœtid Sulphureous Parts, diſſipate and extinguiſh the Animal Spirits, and hinder their Increaſe, whence follows Sleep. *Blanchard.*

SOPHISTICATED, the ſame with counterfeited, debaſed, or adulterated; and is uſually ſpoken of Wines, Chymical Preparations, *&c.* when they are not made good in their Kinds, thro' the Avarice of the Compoſer.

SOPHORIFEROUS. See *Somniferous.*

SORITES, is a ſort of Argument compoſed of ſeveral Propoſitions, of which the ſecond depends upon the firſt, the third upon the ſecond, and ſo forward.

SORROW, is uneaſineſs of the Mind, upon the thought of a Good loſt, which might have been enjoy'd longer; or the ſenſe of a preſent Evil.

SOUND, ſeems to be produced by the ſubtiler, and more Etherial Parts of the Air, being formed and modified into a great many ſmall Maſſes or Contextures, exactly ſimilar in Figure; which Contextures are made by the Colliſion and peculiar Motion of the Sonorous Body, and flying off from it, are diffuſed all around in the Medium, and there do affect the Organ of our Ear in one and the ſame manner.

Sound, alſo appears not to be produced in the Air, ſo much by the ſwiftneſs, as by the very frequent Repercuſſions, and reciprocal Shakings of the Sonorous Body.

Sir *Iſaac Newton* demonſtrates, (in *Prop.* 43. *Lib.* 2. of his *Principles*;) That ſounds, becauſe they ariſe from the Tremulous Motion of Bodies, are nothing elſe but the Propagation of the Pulſe of the Air. And this he ſaith, is confirmed by thoſe great Tremors that ſtrong and grave Sound excite in Bodies round about, as the Ringing of Bells, noiſe of Canon, *&c.*

And in another place he concludes, That Sounds do not conſiſt in the Motion of any Æther, or finer Air, but in the Agitation of the whole common Air; becauſe he found by Experiments, That the Motion of Sound depended on the Denſity of the whole Air.

He found by good Experiments, That *a Sound moves* 968 *Feet*, Engliſh, *in a Second of Time*, pag. 270.

Sup-

Suppoſing the Air by the Pulſe which cauſes Sound, to be in a Motion, like that of the Water when its Waves roul; he calculates the Breadth of the Pulſe, or the Diſtance between Wave and Wave, to be in the Sounds of all open Pipes, double the Length of thoſe Pipes, which he grounds on an Experiment of Father *Merſennus*, in his *Harmonicks*, that an extended String made 104 Vibrations in a Second, when it was an Uniſone with the *C ſa ut* Pipe of an Organ, whoſe Length was 4 Foot open, and 2 Foot ſtop'd, *pag.* 372.

Why the Sound ceaſes always with the Motion of the Sonorous Body; and why they reach the Ear equally ſoon, when far off, or near: He ſhews in *Prop.* 48, *Cor.* where he proves, That the Number of the Pulſes propagated, is always the very ſame with the Number of the Vibrations of the Tremulous Body, and that they are not by any means multiplied as they go from it.

The following Properties have been obſerved of Sound; in many of which, there is a near Relation between it and Light. For,

1. As Light acquaints the Eye with the different Qualities, Magnitudes, and Figures of Bodies, ſo Sound in like manner informs the Ear of many of the ſame Things, in the Sonorous Body.

2. As Light preſently vaniſhes on the Removal, or Total Eclipſe of the Radiating Body, ſo a Sound periſhes as ſoon as the Undulation of the Air ceaſes, which Motion both produces and preſerveth all Sounds.

3. The Diffuſion of Sound from the Sonorous Body is *Spherical*, like the Radiation of Light from its Centre.

4. A great Sound drowns a leſs, as a greater Light Eclipſes a leſs.

5. Too Great, Loud, or Shrill a Sound is Offenſive and Injurious to the Ear, as too great and bright a Light is to the Eye.

6. Sound alſo (like Light) moves ſenſibly from Place to Place, tho' nothing near ſo ſwift as Light. It is Reflected like Light from all hard Bodies; it is hindred and refracted, by paſſing thro' a Denſer Medium. But it differs from Light in this, that whereas Light is always propagated in Right Lines, the Motion of Sound is almoſt always *Curvilinear*.

7. Sound alſo differs much from Light in this, that it is very much weakned by Winds, and ſuch like Motions of the Air, which yet have no Effect on Light. For *Merſennus* Computes, that the Diameter of the Sphere of a ſound heard againſt the Wind is near a third Part leſs, than when coming with the Wind.

8. A very ſmall quantity of Body, ſerves to reflect the Rays of Light: as we perceive manifeſtly in ſmall pieces of Looking-glaſſes, *&c.* But there appears to be neceſſary a Body of much larger Dimenſions to Return a Sound, or to make an Eecho.

9. As to Reflection of Sounds: 'Tis obſerved, that if one ſtand near the Reflecting Body, and the Sound be not very far off, tho' an Eccho be produced, yet it cannot be heard; becauſe the Direct and Reflex Sound, enter the Ear almoſt at the ſame time: But then the Sound appears to be ſtronger than ordinary, and laſts longer: Eſpecially when the Reflexion is made from divers Bodies at once; as from Arches and Vaulted Rooms, from whence the confuſed Bomb of ſuch like Places ariſes.

And from hence probably may be deduced, the Reaſon why Concave Bodies are (*cæteris paribus*) fitteſt to produce great and clear Sounds; ſuch as Bells, *&c.* for in ſuch Bodies the Sound is very ſwiftly and very often Reflected from ſide to ſide, and from one Part of the Cavity to another, and the Bell hanging at liberty, this produces great tremblings and ſhakings of the whole Concave Body, which occaſions the Sound to continue till they ceaſe and are quiet.

10. There is one Phænomenon of Sounds that is indeed very wonderful, That all Sounds great or ſmall, with the Wind or againſt it, from the ſame Diſtance, come to the Ear at the ſame Time.

Dr. *Holder* in his Books of the Natural Grounds and Principles of Harmony; ſays, That if the tremulous Motion which cauſeth Sound, be Uniform, then it produces a Muſical Note, or Sound: But if it be Difform, then it produces a Noiſe.

The *Florentine* Academicks ſound a *Sound* to move one of their Miles (*viz.* 3000 *Braccia*, or 5925 Feet) in Five Seconds of Time: Therefore according to them, it moves 1185 Foot in one Second.

But Sir *Iſaac Newton* found it to move but 968 Foot, in a Second of Time.

Sound, in Geography, is any great Indraught of the Sea, between two Head-lands, where there is no Paſſage through.

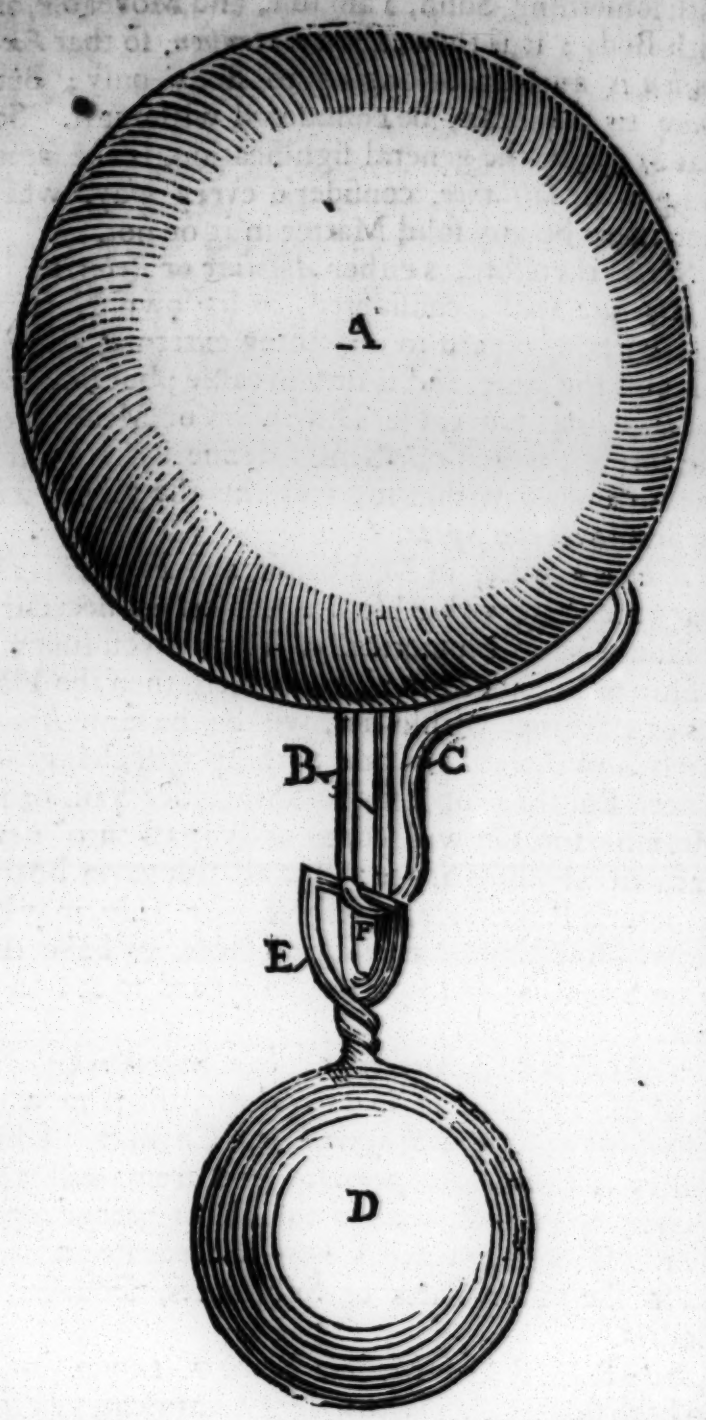
Sounding, when the Seamen try the Depth of the Water with a Line and Plummet, they call it Sounding. But their *Sounding Line*, as thy call it, is a Line different from the *Deep Sea Line*, as being bigger than it, and not much above 20 Fathom in length; and is marked at 2 Fathom, with a piece of Black Leather betwixt the Stranns; ſo alſo at 3 Fathom, and at 4; but at 5 'tis marked with a piece of White Leather, or Cloth.

This Line can be uſed when the Ship is under Sail; but the Deep Sea Line cannot be uſed well, except the Ship be brought upon the Back-ſtays, (See *Deep Sea Line.*)

To ſound the deepeſt Sea without a Line.

Take a Globe of Fir or Maple, or other light Wood, as A; let it be well ſecured by Varniſh, Pitch, or otherwiſe, from imbibing Water; take alſo a piece of Lead or Stone D, conſiderable heavier than will ſink the Globe.

Let



Let there be a long Wire-ſtaple B, in the Ball A, and a ſpringing Wire C, with a bended end F; and into the ſaid Staple, preſs in with your Fingers, the ſpringing Wire on the bended end: And on it hang the Weight D, by its Hook E; and ſo let Globe and all ſink into the Water gently, in the poſture repreſented in the ſaid Figure, to the Bottom, where the Weight D, touching firſt, is thereby ſtop'd; but the Ball being by the *Impetus* it acquired in deſcending, carried downwards, a little after the Weight is ſtopt, ſuffers the ſpringing Wire to fly back, and thereby ſets it ſelf at liberty to re-aſcend: And by obſerving the time of the Balls ſtay under Water, (which may be done by a Watch, having Minutes and Seconds; or by a good Minute-glaſs; or beſt of all by a Pendulum vibrating Seconds; which muſt be 3 Foot, 3 $\frac{1}{2}$ Inches long, *viz.* between the middle of the Bullet, and the upper end of the Thread, where it is faſtened, or held when it Vibrates. By this way, with the help of ſome Tables, you may come to know any Depth of the Sea.

Note, That care muſt be had of proportioning the Weight, and Shape of the Lead, to the Bulk, Weight, and Figure of the Globe, after ſuch a manner, as upon Experience ſhall be found moſt convenient.

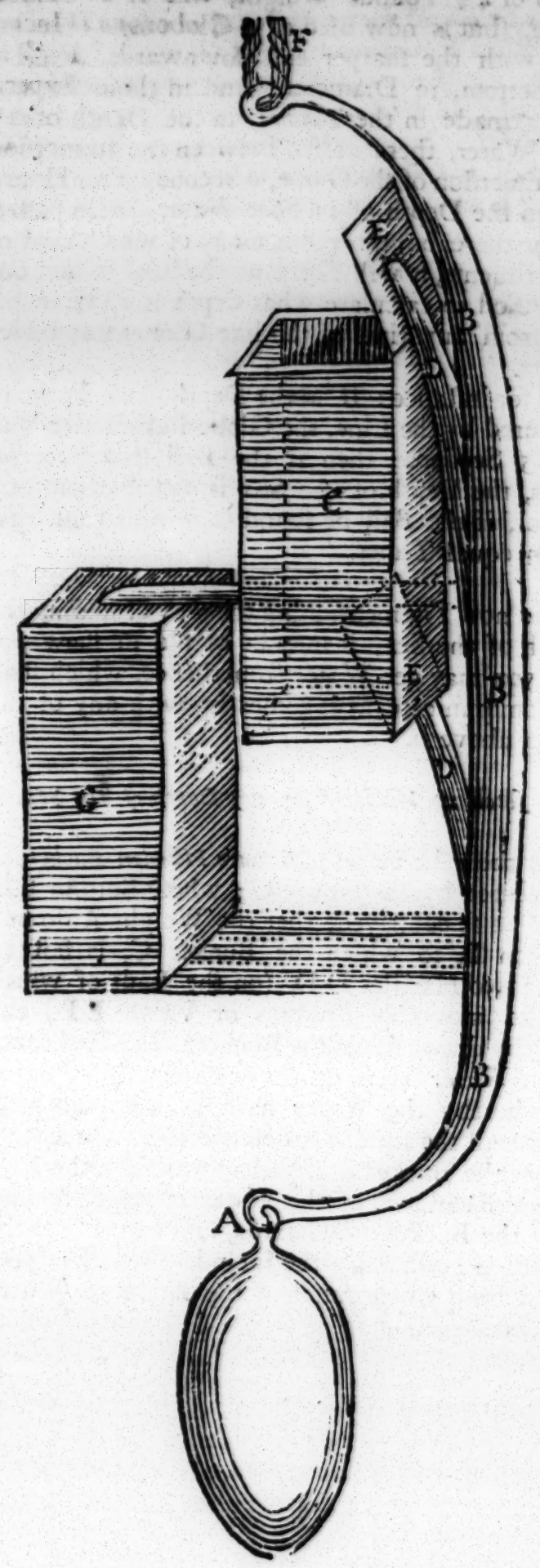
In ſome of the Trials already made with this Inſtrument, the Globe being of Maple-wood, well covered with Pitch, to hinder ſoaking in, was 5 $\frac{13}{17}$ Inches in Diameter, and weighed 2 $\frac{1}{2}$ Pounds; the Lead of 4 $\frac{1}{2}$ Pounds Weight, was of a Conical Form, (but is now uſed of a Globous) 11 Inches long with the ſharper end downwards, 1 $\frac{9}{16}$ at the Bottom, in Diameter: And in thoſe Experiments made in the *Thames*, in the Depth of 19 Foot Water, there paſſed between the Immerſion and Emerſion of the Globe, 6 Seconds of an Hour; and in the Depth of 10 Foot Water, there paſſed 3 $\frac{1}{2}$ or thereabouts: From many of which kind of Experiments, it will likely not be hard to find out a Method to calculate what depth is to be included from any time of the like Globes ſtay under Water.

As for inſtance: If in the Depth of 20 Fathom, meaſured by the Line, the Globe ſtays under Water, 15 Seconds; then if the Ball ſtay 700 Seconds, the Depth of the Sea is 933 Fathom and 2 Foot, if the Ball be found to move equal Spaces in equal Times.

And now I'm mentioning the way of finding the Depth of the Sea, it may be of uſe to ſhew you how you may get Water from thence, which ſhall not communicate as it comes up with any of the Water above it.

To fetch up Water from any Depth of the Sea.

Let there be made a *Square Wooden Bucket*, as repreſented by the Figure C; whoſe Bottom E E, are to be ſo contrived, that the Weight A do ſink the Iron B, to which the Bucket C, is faſtned by the two Handles D D, (on the Ends of which are the moveable Bottoms or Valves E E) and whereby draws down the Bucket: The Reſiſtance of the Water keeps up the Bucket in the Poſture C; whereby the Water hath a clear thorough paſſage all the time it is deſcending; whereas, as ſoon as the Bucket is pulled upwards by the Line F, the Reſiſtance of the Water to that Motion, beats the Bucket downwards, and keeps it in the Poſture G; whereby the included Water is preſerved from going out, and the Ambient Water kept from getting in.



By the Advantage of this, or the like Veſſel, the ſeveral *Degrees of Saltneſs* of Sea-water, may be known, according to its nearneſs to the Top or Bottom; or rather the Conſtitution of the Sea-water in the ſeveral Depths of ſeveral Climates.

SOUTH *Direct Dials.* See *Prime Verticals.*

SOUTHERN *Signs.* See *Auſtral Signs.*

SOWNE, is a Term uſed in the *Exchequer*; where *Eſtreates that Sowne not*, are ſuch as the Sheriff by his Induſtry cannot get, and *Eſtreates that Sowne*, are ſuch as he may gather.

SPACE, if conſidered, barely in Length, between any two Beings, is the ſame Idea that we have of *Diſtance*; but if it be conſidered in Length, Breadth and Thickneſs, it is properly called Capacity: And when conſider'd between the Extremities of Matter, which fills the Capacity of *Space*, with ſomething, Solid, Tangible, and Moveable, or with Body; it is then called *Extenſion*, ſo that *Extenſion* is an Idea belonging to Body only; but *Space* 'tis plain may be conſidered without it. So that *Space*, in the general ſignification, is the ſame thing with *Diſtance*, conſider'd every way, whether there be any ſolid Matter in it or not.

Space therefore, is either *Abſolute* or *Relative*.

Abſolute Space, conſidered, in its own Nature, and without regard to any thing external, always remains the ſame, and is immoveable; but *Relative Space*, is that moveable Dimenſion or Meaſure of the former, which our Senſes define by its Poſitions to Bodies within it; and this the vulgar uſe for immoveable *Space*.

Relative Space, in Magnitude and Figure, is always the ſame with Abſolute, but 'tis not neceſſary it ſhould be ſo Numerically. Thus if you ſuppoſe a Ship to be indeed in abſolute Reſt, then the Places of all things within her, will be the ſame Abſolutely and Relatively, and nothing will change its Place. But then ſuppoſe the Ship under Sail, or in Motion, and ſhe will continually paſs thro' new Parts of abſolute Space: But all things on Board conſider'd Relatively, in reſpect to the Ship, may be notwithſtanding in the ſame Places, or have the ſame Situation and Poſition, in regard to one another.

SPAGYRICA *Medicina.* See *Hermetick.*

SPAGYRICK, or *Spagyrical* Art, the ſame with Chymiſtry; and a *Spagyriſt*, is a Chymiſt. Chymiſtry is called the *Spagyrick* Art, from σπᾶν and ἀγαίρειν, to extract, and to collect, or gather together. Becauſe it teaches how to ſeparate and extract the purer Parts or Subſtances, from mixt Bodies.

SPARADRAPUM, in a Piece of Linen ting'd on both ſides, either with a thick Ointment, or Plaiſter, and is made this way. After you have melted your Ointment, or Plaiſter, dip your Linen in it, extend it, and keep it for uſe. *Blanchard.*

SPASMODICKS, are Medicines againſt Convulſions.

SPASMOLOGIA, is a Treatiſe of Convulſions.

SPASMUS, is any Convulſive Motion: *Cardan* makes two ſorts of Convulſive Affections, *viz. Tetanus Spaſmus*; and by the former he underſtands a conſtant Contraction, whereby the Member becomes rigid and inflexible; by the latter he underſtands ſudden Concuſſions and Motions, which ceaſe and return Alternately. *Blanchard.*

SPASMUS *Cynicus*, a ſort of Convulſions, whereby the Mouth is diſtorted on one ſide thro' the Contraction of the Muſcles.

SPECIALITY, in Law, is moſt commonly taken for a Bond, or Bill, or ſuch like Inſtrument.

SPECIES, in Metaphyſicks, or Logick, is an *Idea*, that relates to another more general one, to which it is ſubſervient, and has only under it *Individuals* and *Singulars*.

SPECIES in Algebra, are thoſe Letters, Notes, Marks, or Symbols, which repreſent the Quantities in any Equation or Demonſtration. This ſhort and advantageous way of Notation, was firſt Introduced by *Vieta*, about the Year 1590, and by it he made many diſcoveries in the Proceſs of *Algebra*, not before taken notice of.

The Reaſon why *Vieta* gave this Name of *Species*, to the Letters of the Alphabet ſubſervient to Algebra, and why he calls it *Arithmetica Speciosa*:

oſa: Seems to have been in Imitation of the *Civilians*, who call Caſes in Law, but abſtractedly between *John a-Nokes* and *John a-Stiles*, or between *A*, *B* and *C*, ſuppoſing thoſe Letters to ſtand for any Perſons indefinitely; ſuch Caſes, I ſay, they call *Species*. Wherefore ſince the Letters of the Alphabet will alſo as well repreſent Quantities, as Perſons, and that too Indefinitely one Quantity as well as another, they may properly enough be called *Species*; that is Symbols, Marks, or Characters. From whence the *Litteral Algebra* is frequently now a-days called *Specious Arithmetick*, or *Algebra* in *Species*.

SPECIES, in Medicine, are properly the Simple Ingredients in the Druggiſts, or Apothecaries Shops, out of which compound Medicines are made: But the Writers of *Pharmacy*, do uſually give this Name to ſome *Aromatick*, or *Cathartick Powders*, becauſe probably they were formerly kept ready prepared in the Shops, to form Electuaries, Tablets, Pills, &c. as ſome are ſtill.

SPECIES, *Viſibles*, are thoſe wonderfully fine ſuperficial Images of the Bodies which the Light produces, and delineates in their due Proportion and Colours in the Bottom of our Eyes. Theſe the *Ariſtotelians* would have to be Immaterial, but a 1000 Experiments prove, That tho' they are admirable ſubtile, yet they are really corporeal.

SPECIFICK is in general, whatever is peculiar to any diſtinct Species of Things, and which diſtinguiſhes them from all others of different Species. Therefore the Logicians ſay, That in every good Definition of any thing, the Specifick Difference ought always to be inſerted. Hence,

SPECIFICK *Gravity*, is the Appropriate and peculiar Gravity or Weight, which any Species of Natural Bodies have, and by which they are Plainly Diſtinguiſhable from all other Bodies of Different kinds. By ſome 'tis not improperly called *Relative Gravity*, to diſtinguiſh it from *Abſolute Gravity*, which encreaſes in Proportion to the Bigneſs of the Body weighed. Thus, if any Body weigh a Pound, one as big again will weigh two Pounds: And let the Bodies be of what Nature or Degree of Specifick Gravity ſoever, a Pound of one will be as much as a Pound of the other, Abſolutely conſidered: Thus as is commonly ſaid, a Pound of Feathers, is as heavy as a Pound of Lead. But if you conſider Lead and Feathers Relatively, the Specifick Gravity of the Former, will be much greater than that of the Latter. Or Lead, or Bulk, for Bulk will be much heavier than Feathers: And Gold heavier than Lead, &c.

'Tis of ſo great Advantage in many reſpects as will appear below to find truly the Specifick Gravities of Bodies, that many Curious Ways have been thought of, and experimented for this Purpoſe. As by forming exact Cubes of different ſubſtances, and taking their Weight accurately in Nice Scales; and by melting Metals of different Gravities, and then caſting them in Moulds of the ſame Dimenſions. But for Practice and Univerſal uſe, nothing is better than the following Method, which is to weigh any Body firſt in Air, and then in Water; which latter being conſiderably a Denſer Fluid than Air, will buoy up the Body immerſed in it in part; and will conſequently make it weigh leſs there than in the Air. And if after this you ſubſtract the Weight found in the Water, from the former in the Air; a Remainder or Difference will be found, which is the Weight of as much Water as is equal to the Bulk of the Body. As *Archimedes* hath demonſtrated Mathematically, and Mr. *Boyle* Phyſically and Experimentally, in his *Hydroſtatical Paradoxes*. So that by this means having two Bodies, one Firm, and the other Liquid, with the Weight of each part, 'tis very eaſie to find the Proportion that one hath to the other, Bulk for Bulk; by only dividing the greater by the leſſer; for the Quotient will ſhew the Specifick Gravity of the heavier Body compared with as much Water as is equal to it in Bulk. As if the Quotient be 2, 3, 6, or 19; the Body will accordingly be twice, thrice, 6, or 19 times as heavy as Common Water.

The Application of which Rule, and the great Advantages which may be made of the uſe of it. You will find in the following Problems or Experiments.

I. *To find the Specifick Gravity of ſuch Bodies as will ſink in Water, and not be diſſolved by it.*

Having ready a Pair of good ſmall Scales which will turn with the $\frac{1}{4}$ of a Grain, (or $\frac{1}{4}$ Part may do well enough) drill a ſmall Hole in the middle of one Scale, thro' which put a Horſe-hair about a Foot in length with a Knot at the upper end of it, and a Loop at the other, put as much Horſe-hair in the oppoſite Scale, as will ſerve to Equiponderate the other, and having well adjuſted your Scales: Weigh firſt the Body in the Air, carefully turn the Weight into Grains, ('twill be beſt to uſe Troy Weight) and write down the Number on a piece of Paper. Then faſten the Body to the Horſe-hair, and leiſurely immerſe it into a Veſſel of Rain; or Spring Water, and putting Weights into the oppoſite Scale, find its Weight exactly in the Water, (where it muſt ſwim about freely, and not touch the Bottom or Sides, of the Veſſel.) Turn alſo this Weight into Grains, and ſubſtract it from the former Weight in Air, and note the Remainder; by which Remainder divide the firſt found Weight in Air; and the Quotient will be the Proportion that the Body bears to Water; that is, will ſhew the Sepcifick Gravity in reſpect of Water, which is pitched on as a Standard to compare it by.

Example.

A Piece of white Marble weighed in Air 1169 Grains, and in Water 738 Grains; which ſubſtracted from the former Weight left 431 Grains; by which Remainder dividing the Weight in Air, 1169, the Quotient was $2\frac{7}{10}$, which is the Specifick Gravity of Marble, in reſpect of as much Water as is equal to it in Bulk.

N. B. If you practice this much, 'twill be beſt to hang your Scales upon a Gibbet, or ſome other Reſt, where they may hang freely; and ſo you will have both your Hands at liberty for more nicely adjuſting the Balance, and your Arm will not be weary with holding the Scale; and be ſure that the Scales play freely, and are no way tangled, and that you do not wet your Weights, nor Scales; for a little careleſsneſs may produce great Errors in ſuch Caſes: Let alſo the Body hang a while in the Water before you weigh it, and move it up and down, and gently knock it againſt the Sides of the Veſſel, to extricate it from all Bubbles of Air, that elſe ſticking to it, may buoy it up a little, and conſequently

ſequently induce you to miſtake its Weight. You ſhould alſo have a ſmall pair of Plyers, or Tongs, to take up your Grains withal, leſt you let them fall; which with your Fingers you may be apt to do, and ſo occaſion your ſelf a needleſs trouble.

'Twill be convenient alſo to make a little Net of Horſe-hair (of ſmall Maſhes) to hold round, or ſmall Bodies, that cannot conveniently be faſtened with one Hair only; be ſure always to Equipoiſe your Scales, before you begin to weigh.

The Uſes of this Experiment.

1. Since common Stone, Marble, and Rock-Chryſtal, *&c.* (See the Table of *Specifick Gravity*) are to Water, but as 2 ½ (or 5 to 2;) if you find a piece of ſtrong Matter, whoſe *Specifick Gravity* exceeds that Proportion, you may conclude, That it hath in it ſomething of a Mineral, or Metalline Nature, in proportion to its exceſs above the Weight of common Stone.

2. By this Method alſo, a Body may be examined, whether it be of a ſtony Nature, or not? So *Coral* and *Pearls*, will be diſcovered to approach rather to a Stony, than to a common Vegetable, or Animal Nature; and *Bezoar*, and the Stones found in the Bladders of Men, or other Animals, will by their great lightneſs ſhew themſelves of a very different Conſtitution from ordinary Stones.

3. By this Method, you may make an Eſtimate of the Goodneſs of ſeveral Stones, or Bodies of the ſame Kind, or Denomination: For having found the Gravity of ſuch as are Excellent, all others of leſſer Goodneſs, may eaſily be diſtinguiſhed, as they are any way diverſe from that Standard.

4. And thus alſo Genuine Stones, or Minerals, may be eaſily diſtinguiſhed from falſe ones; and counterfeit Money readily known from Sterling, tho' never ſo well waſh'd over, or gilded; for having by your own Trials, or by the help of ſuch a Table as is here annexed, gotten the Specifick Gravity of ſuch Stones, Gems, or Corns, as are True and Genuine, let that be the Standard whereby to eſtimate others by; which laſt uſe, is of univerſal Advantage, and may aſſiſt the Phyſician, Apothecary, or Druggiſt in the Drugs, the Jeweller in Gens, and Precious Stones, and the African Merchant, in the Choice of the Sand or Duſt Gold, which is often Counterfeit.

Had the Curious *Dampier* known this Method, he might perhaps have trucked and gotten ſome of the *Indian* yellow Rings at the *Baſhee Iſland*: (*vid. Dampier's Travels, Edit.* 2. *Chap.* 15. *p.* 427.) which it appears he had no great Encouragement to do, not being able exactly to diſtinguiſh whether they were Gold or not.

II. *To weigh Mercury, or ſuch heavy Fluids that will ſink into, and not mingle with Water; as alſo the Fragments of, or ſmall Precious Stones, Pearls,* &c. *and all Powders that are heavier than Water, ſmall Sands, Filings of Metals, Gold Grains, or Duſt, and ſuch like ſmall things about which a Horſe-hair cannot be faſtened.*

To provide a ſmall Glaſs Jar, or a little Silver or Braſs Cup (but Glaſs is beſt when it can be had) with two Handles or Ears to it, and that ſhall hold about an Ounce and a Half, or two Ounces of Water; and weighing it carefully in the Air firſt, note exactly its Weight, (which lay by in ſome ready Place) then alſo find the Glaſs's Weight in Water, and lay the Weights carefully by, by themſelves; and if you intend to make frequent uſe of this Practice, 'twill be better to get two pieces of Lead, one of the weight of the Glaſs in the Air, the other of its weight in Water, which will be always in readineſs. This done, put the Mercury, Liquor, or Powder you intend to weigh into your Glaſs, (which may be called the *Hydroſtatical Bucket*) and putting into the oppoſite Scale the before-found weight of the Bucket, find the weight of the Matter in Air, and write it down (as in *Experiment* 1.) then take the Bucket out of the Scale, and pour into it, by degrees (that it may mingle well with it, and exclude all Air) Water enough to cover the Matter, or wet it throughly; and then putting into the oppoſite Scale the weight that anſwers to the Bucket in Water, faſten your Bucket by a Horſe-hair to your Scale, and let it down gently into a Veſſel of Water, and ſo find its weight carefully in the Water; then (as in *Experiment* 1.) Subſtract that from the weight in Air, and by the Remainder divide the weight in Air, and the Quotient will be the ſpecifick Gravity of the Liquor, Powder, *&c.* to as much Water as is equal to it in Bulk.

III. *To weigh ſuch ſolid Bodies as will diſſolve in, or be injured in Water.*

Weigh them (as before) firſt in Air, and then inſtead of Water, uſe the *clear Oil* or *Spirit of Turpentine*, which is cheap enough, and may be had at any Druggiſts, in which no *Salts*, nor *Vitriols*, nor *Acid Sublimates* will diſſolve; and proceed in all things, as if you weighed the Body in Water; and ſo you will obtain the ſpecifick Gravity of the Body in reſpect of *Oil of Turpentine*; which may be the Rule for *theſe ſorts of Bodies*, as common Water was for the others. And this way will have the ſame Uſe as the other: For having at any time weighed a piece of any Body (as ſuppoſe *Mercurius dulcis*) *in the Oil*, that you know is good; that may be your Standard to try more of the ſame Sublimate for the future; for if you find it hath not the ſame ſpecifick Gravity that the former (which you weighed) had, but is lighter, you may conclude it hath not its due proportion of *Mercury*; and conſequently, is adulterated, as indeed that which is Sold in the Druggiſts Shops often is; and therefore thoſe that deal much in ſuch things, may make a Table (from their own Experience) of the weights of Bodies in reſpect of *Oil of Turpentine*, which will be of ready Uſe to them: And then their ſpecifick Gravity in reſpect of Water (by a little Calculation) may be eaſily enough found by the following Experiment.

IV. *To find the Specifick Gravity of Liquids and Fluids.*

1. Theſe are of two ſorts, and conſequently 'twill be expedient to be furniſhed with a double Standard to examine them by. In order therefore to find the weight of *Common Water*, *Beer*, *Ale*, *Burning Spirits*, or any *Vegetable* or *Animal Liquors*; get either a piece of *Amber* or *Red hard Sealing*

ing Wax, or a *Roll of common Brimſtone*, and weigh it firſt in the Air, and then in the Liquor you intend to examine; and (proceeding as in *Exper.* 1.) you will thence find the ſpecifick Gravity of that *Body* in reſpect of the *Fluid*, and conſequently of the *Fluid* in reſpect of *that Body*: And therefore pitching on *that Body* as your *common Standard*, 'tis eaſie to compare the Weight of all Liquids of the firſt kind in reference to it; for thoſe in which the Body weighs *leſs*, will be the *Heavier Liquors*: And thoſe in which it weighs *more*, *lighter*, in proportion to the decreaſe or increaſe of the weights of your Standard in the Fluid.

2. But to find the Weights of *ſtrong briny Sea-water*, *ſaline Menſtrua*, and all *acid Spirits* and *Stygian-waters*, as the *Oil of Vitriol*, *Aqua-fortis*, &c. 'twill be neceſſary to employ a heavier Body for your Standard; and therefore *in ſuch*, weigh either a piece of *Rock-Chryſtal*, or which will do as well, *white Marble*, or a piece of ſolid Glaſs; ſuch as the Tobacco ſtoppers of that Metal, *&c.* which being more ponderous, will ſink in theſe Liquors, in which *Amber* or *Wax* will not; and proceed as above in the former part of this Experiment.

USES.

1. By theſe Experiments, the goodneſs of all kinds of Liquors may be examined: For, as to the firſt kind of Liquors before-mentioned, 'tis probable, the more fine and ſpirituous they are, the *lighter* they will be, and the more your piece of *Amber* or *Sealing-wax* will weigh in them; which having once weighed in ſome Liquor of the kind, that you were aſſured was good, the weight of your Piece in that, may be the Standard to compare others by. But the latter ſort of Liquors will require a *contrary* way of *eſtimation*; for the more ponderous they are, the better they may be judged to be; and conſequently, the leſs your piece of *Marble* or *Glaſs* weighs in them, the greater degree of goodneſs you may conclude them to contain. By weighing alſo the Solid in a parcel of any kind of *theſe* that you have proved as good, its weight may be the Standard, to compute the goodneſs of thoſe of the ſame ſort of Liquors.

2. Hence alſo you may moſt accurately diſcover, whether you are impoſed upon by the *Merchant*, *Vintner*, or *Diſtiller*, &c. in Quantities of *Wine* or *Spirits* which you have bought on the Credit of the Sample that was ſhewed you to examine; for if you find that the ſpecifick Gravity of the whole Veſſel *ſent you home*, is different from that parcel which you *tried*, you may be aſſured, that 'tis ſome way mix'd and adulterated.

3. The Chymiſt alſo may by this means adjuſt his *Menſtrua* for the diſſolving of Mineral or Metallick Bodies to the beſt advantage; by ſo tempering them, (either by weakening their Strength, or increaſing it) that they ſhall prove the moſt expedite Diſſolvents: For many know very well, that a *Menſtruum* may as well be too ſtrong, as too weak: And therefore the ſpecifick Gravity of an *apt Menſtruum* may perhaps be the beſt guide to portion another for the ſame purpoſe.

V. *To find the ſolid Content of any ſmall Body, tho' never ſo irregular, (if it be heavier than Water) by weighing it in Water.*

Mr. *Boyle*, by many curious Trials, found that a Cubic Inch of Water is equal in weight to about 256 Grains, or half an Ounce, and 16 Grains *Troy*: Which Number of Grains is very happy for ſuch Trials, becauſe of its many aliquot Parts; and alſo, becauſe every 32 Grains anſwers to juſt $\frac{1}{8}$ of an Inch.

Suppoſe therefore you weigh a Body firſt in Air, and then in Water, and ſhall find it in the latter Medium to loſe of its weight in Air juſt 256 Grains or $\frac{1}{2}$ Ounce 16 Grains, you may conclude that the ſolid Content of that Body is juſt one Cubic Inch; and if it loſe but $\frac{1}{2}$ or $\frac{1}{4}$, or $\frac{1}{8}$ of that number of Grains, the Content is $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ of a Cubick Inch. So on the other ſide, if it loſe more than 256 *gr.* as 2, 3, or 4 times that weight; its ſolid Content will be accordingly 2, 3, or 4 Cubic Inches. The like is true of all other proportional Decrements of the Bodies weight, in compariſon of 256, the Standard for one Cubick Inch.

The reaſon of this Proceſs is clear enough, if we conſider that every Body weighed in Water, loſes there ſo much of its weight as the Water amounts to, which is equal to that Body in Bulk; or in other words, That it weighs leſs in Water, than in Air, by the weight of as much Water as is equal to the Body in bulk, which is the Fundamental Theorem of all Hydroſtaticks, and is Mathematically demonſtrated by *Archimedes*, and Phyſically by Mr. *Boyle*, in his *Hydroſtatical Paradoxes*.

And ſince alſo, as is before declared, a Cubick Inch of Water weighs exactly 256 Grains, what every Body loſes in Water juſt that Sum (of its former weight in Air) muſt needs be in Solid Content equal to a Cubick Inch; for the Decrement of its weight is equal to the weight of as much Water as its bulk takes up, (by the univerſal Theorem) and that is found to be in weight 256 Gr. which is exactly equal to one Cubick Inch; therefore the Content of that Body is juſt ſo much.

USES.

This is more exact than any Menſuration can be for ſmall Bodies; 'tis very expeditious, and may be of good uſe (beſides its Curioſity) in a great many Caſes, as is obvious to any thinking Perſon.

VI. *To find the ſolid Content of a Body lighter than Water, by its weight in that Medium.*

This Experiment will have two Caſes.

1. When the Body to be meaſured will not be injured by the Contract of the Water, Weigh the Body in Air; and then take a piece of Lead, or ſome ſuch heavy Metal, and of a known and even weight, (as ſuppoſe a Penny-weight or Half a Penny-weight, *&c.* to avoid Fractions) and capable of ſinking your Body in Water. Weigh your Lead in Water, and Subſtract that weight from its weight in Air, and keep the Remainder as the Specifick weight of your piece of Lead in Water. This done, faſten your Lead with Horſe-hair to the

the Body you intend to measure; and weighing the Aggregate also in Water, Subtract this last weight from that just now found in Air, and the difference will be the Specifick weight of the said Aggregate in Water; and lastly Subtract from it the Specifick weight of the Lead alone in Water, and the remainder is the weight of the light Body you intend to measure, or to find the solid Content of; which is easily done by the Process in the close of the 5th Experiment: For this last found weight being divided by 256, or by its Half, ½, &c. will accordingly give you the Body's Solid Content in entire, half, or quarters of Cubick Inches.

Example.

Because this last Process hath something of difficulty in it, (especially to a young Hydrostatitian) I will subjoin the following Example, which will serve not only to enlighten this, but many other Rules of this nature.

	Gr.
1. A Cube of Oak which was made with great Exactness by a good Workman, weighed in Air.	192 ½
2. A piece of Lead just ½ an Ounce (to make it sink) weighed	240
3. The Lead in Water weighed	220
Which Subtracted from 240, the Lead's weight in Air, left for its Specifick weight in Water.	020
4. The Aggregate of the Wood and Lead's weight in Air was	433½
5. The weight of the Aggregate in Water was	162
6. Which Subtracted from the weight of the Aggregate in Air 433 ½ left	271 ½
7. The Specifick weight of the Lead in Water (*viz.* 20) being Subtracted from which last remainder I left for the weight of the Cube in Water	251

Which last Number wants but 4 Gr. and a ½ of 256, the Standard before mentioned, *viz.* Of the weight in Grains of a solid Inch of Water.

CASE 2.

When there is danger of injuring the *Body* by its either being dissolved by Water, or else admitting it too much into its Pores, you may use Oil of Turpentine instead of Water; only instead of the Standard 256 Grains for a Cubick Inch, you must use 221, for that Mr. *Boyle* found a Cubick Inch of that Oil to weigh; and therefore proceed altogether as in the last Case, only use Oil instead of Water, and divide the weight of your Solid in Oil of Turpentine, by 221, and the Quotient will give the Contents of it in Cubick Inches or parts of an Inch.

You may also in some cases, having first found the weight of the Body you would examine in Air, over-lay it carefully with a Coat of Bees-wax, to keep it from being injur'd by the Water, and having then found the weight of the Bees-wax used to cover it, (which is easily done by weighing the Body again when covered, and then from that weight Subtracting the weight of the naked Body before found) sink it in Water with a piece of Lead as before taught; and observing the weight of the Aggragate, then proceed with the remaining part of the Experiment, as is Case 1.

VII. *To find the weight of any Floating Body, tho' never so great, by knowing what part of it is under Water.*

Suppose a Ship should have under Water a part of its Hull equal to 100000 Cubick Feet, I chuse such a round Number to avoid Fractions, (how to find the Content of the Part of a Ship, that is under Water doth not belong to this Place, but it may be easily enough done by one versed in solid Mensuration). 'Tis found by Experience, that a Cubick Foot of Water weighs 76 Pound *Troy*, and *Archimedes* hath demonstrated, That as much Water as is equal in bulk to the part of the floating Body that is under Water, is in weight equal to the whole floating Body. Therefore 'tis plain, That to solve this Problem, you need only Multiply 100000 by 76, (which is 7600000) and the Product is the weight of the whole Ship in Pounds *Troy*.

A Table of Specifick Gravity of Bodies in Proportion to Water, from Mr. Boyle *and my own Experiments.*

	Proportion.
Amber	as 1, 04 to 1
Agate	as 2, 64 to 1
Allom Stone	as 2, 18 to 1
Antimony (Hungarian)	as 4, 07 to 1
Antimony Crude, which seem'd to be very good	as 4, $\frac{17}{121}$ to 1
Regulus, made of that above, and the common way	as 6 $\frac{3}{5}$ to 1
Cinnabar of Antimony	as 7 $\frac{3}{7}$ to 1
Bezoar Stone	as 1, 48 to 1
—— Another	as 1, 64 to 1
A fine Oriental one	as 1, 53 to 1
-----Another	as 1, 34 to 1
A piece of cast Brass	as 7 $\frac{3}{3}$ to 1
An old Brass Gold Weight (mark'd XXXIII.)	as 8, 83 to 1
A piece of hammer'd Brass	as 8, 66 to 1
Coral red	as 2, 63 to 1
Chrystal	as 2, 21 to 1
Cornelian	as 3, 29 to 1
Calculus humanus	as 1, 72 to 1
-----Another	as 1, 47 to 1
-----Another	as 1, 57 to 1
Coco-shell	as 1, 34 to 1
Native Crabs-Eyes	as 1, 89 to 1
Artificial Crabs-Eyes	as 2, 48 to 1
Calx of Lead	as 8, 94 to 1
Copper Stone	as 4, 09 to 1
Copper Ore	as 4, 15 to 1
Copper Ore Rich	as 4, 17 to 1
An old Copper Half-penny, (*Charles* 2d's Coin)	as 9, to 1
Common Cinnabar	as 8, $\frac{1}{50}$ to 1
Cinnabar of Antimony	as 7, 03 to 1
-----Another Piece	as 7, 06 to 1
Coral white	as 2, 54 to 1
Chalk, found by Dr. *Slare* to be	as 1, $\frac{23}{29}$ to 1
Gold Ore not Rich from *India*	as 2, 63 to 1

----An-

——Another lump of the ſame	as 2,	55	to 1
An old Jacobus	as 18	7/8	to 1
A piece of Gold Common-wealth Coin	as 17	5/8	to 1
The Gold of a Seal	as 16	1	to 1
Granatiminera	as 3,	1	to 1
Granate Bohemian	as 4,	36	to 1
A piece of common Glaſs Coffe-Diſh of a brown colour	as 1,	76	to 1
Hæmatites Engliſh	as 3,	76	to 1
A Hone to Set Razors on	as 2,	96	to 1
An Icicle broken from a Grotto, found by Dr. *Slare* to be	as 1,	19	to 1
Ivory	as 1,	91	to 1
A piece of burnt or roaſted Iron Ore	as 3	1/3	to 1
A piece of hammer'd Iron (perhaps part Steel)	as 7	3/5	to 1
Lapis manati	as 2,	86	to 1
Lapis Lazuli	as 2,	98	to 1
Lapis Calaminaris	as 4,	92	to 1
Lapis Judaicus	as 2,	69	to 1
Lead Ore	as 7,	14	to 1
Lead (an ordinary piece)	as 11	1/3	to 1
——Another	as 11,	42	to 1
Lead Ore from *Cumberland* Rich	as 7,	54	to 1
A good Load-ſtone	as 4,	75	to 1
——Another	as 4,	93	to 1
Marcaſites	as 4,	45	to 1
——Another from *Stalbridge*	as 4,	50	to 1
Mercury revived from the Ore	as 14		to 1
Manganeſe	as 3,	57	to 1
Mineral (Corniſh) ſhining like a Marcaſite	as 9,	06	to 1
Marble white	as 2,	7	to 1
Oſteocolla	as 2,	24	to 1
Pearl (a large one)	as 2,	51	to 1
Fine Orient Seed Pearl	as 2,	75	to 1
Rhinoceros-horn	as 1,	99	to 1
Sulphur vive	as 2,		to 1
---Another very fine from *Germany*	as 1,	98	to 1
Slate (Iriſh)	as 2,	49	to 1
A Silver Half-crown (K.W's Coin)	as 10,	75	to 1
Silver Ore, choice from *Saxony*	as 4,	97	to 1
——Another piece	as 7		to 1
A Whetſtone, not fine, ſuch as Cutlers uſe	as 2,	74	to 1
A round Pebble-ſtone (within of Flint)	as 2,	61	to 1
Talc, a piece like Lapis Amianthus	as 2,	28	to 1
Talc (Venetian)	as 2,	73	to 1
Talc (Jamaican)	as 3,		to 1
New Engliſh Tin Ore, Mr. *Huberts*	as 4,	8	to 1
Tin Ore, black, rich	as 4,	18	to 1
Another choice Piece	as 5		to 1
Tutty	as 5		to 1
Tin Glaſs	as 9,	55	to 1
Vitrum Antimonii per ſe	as 4,	76	to 1
Vitriol Engl. a very fine Piece	as 1,	88	to 1
Unicorns-horn, a Piece	as 1,	91	to 1
Human Blood, Mr. *Boyle* found	as 1,	1/25	to 1
Serum of the Blood to Water, he found to be	as :: 302		to 253
Aſphaltum, Mr. *Boyle*,	as 1,	14	to 1
Scotch Coal	as 1,	13	to 1

A Table of Specifick Gravity, from Phil. Tranſ. N. 169.

Pump water	1000
Dried *Firr*	546
Dried *Elm*	600
Dried *Cedar*	613
Dried *Walnut Tree*	631
Crab-tree (meanly dry)	705
Aſh, meanly dry, and ſappy	734
Heart *Aſh*, pretty well dry'd	845
Maple dry	755
Yew of Knot or Root 16 Years old	760
Beach meanly dry	854
Oak, very dry, and almoſt Worm-eaten	753
Oak a Year old, but ſappy	870
Oak (Heart) found and dry	929
Another Piece	932
Logg-wood	913
Box	1031
Red-wood	1031
Speckled Virginia-wood	1313
Lignum Vitæ	1327
Pitch	1150
Pitt-Coal of *Staffordſhire*	1240
Glaſs Bottle	2666
Stone Bottle	1777
Ivory	1826
Alabaſter	1872
Brick	1979
Heddington-ſtone, of the ſoft lax kind	2029
Burford-ſtone, an old dry piece	2049
Paving-ſtone, a hard ſort from about *Blaidon*	2460
Flint	2542
Black Italian Marble	2704
White Italian Marble	2718
Block Tin	7312
Copper	8843
Lead	11345
Quick-ſilver	14019
Quick-ſilver, another parcel more carefully weigh'd	13595
Claret	993
Urine	1033
Moil Cyder, not clear	1017
Sea-water, clear	1028
College Plain Ale	1028
Milk	1031
Sack	1033
Beer Vinegar	1034

A Table of Specifick Gravity, by Mr. J.C. *from* Phil. Tranſ. N. 199.

Cork	237
Saſſafras-wood	482
Juniper-wood (dry)	556
Plum-tree (dry)	663
Maſtic	849
Santalum Citrin	809
Santalum Album	1041
Santalum Rubrum	1128
Ebony	1177
Lignum Rhodium	1125
Lignum Aſphaltum	1179
Aloes (I believe he means the Wood)	1177
Succinum Pellucidum	1065
Succinum Pingue	1087
Jet	1238

The

	Proportion.
The Top-part of *Rhinoceros*'s Horn	1242
The Top-part of an *Ox-horn*	1840
The *Blade-bone of an Ox*	1656
Calculus humanus	1240
Another	1433
Another	1664
Common Brimſtone	1811
Borax	1720
A ſpotted factitious Marble	1822
A Gally-pot	1928
Oyſter-ſhell	2092
Murex ſhell	2590
Lapis Manati	2270
Selenitis	2322
Wood petrefied in *Lough Neagh* in *Ireland*	2341
Onyx-ſtone	2510
Turcois-ſtone	2508
Engliſh-Agate	2512
Grammatias Lapis	2515
Cornelian	2568
Corallachates	2605
Talc	2657
Coral	2686
Hyacinth (Spurious)	2631
Jaſper (Spurious)	2666
A Pellucid Pebble	2659
Chryſtallum Diſdiachaſticum	2704
A Red Paſte	2842
Lapis Nephriticus	2894
Lapis Amiantus, from *Wales*	2913
Lapis Lazuli	3054
A Hone	3288
Sardaketes	3598
A Granate	3978
A Golden Marchaſite	4589
A blue Slate, with ſhining Particles in it	3500
A Mineral Stone, yielding one part in 160 of Metal	2650
The Metal Extracted thence	8500
The Silver Ore of Wales (as it is reputed)	7464
The Metal thence Extracted	11087
Biſmuth	9859
Spelter	7065
Spelter Soder	8362
Iron of a Key	7643
Steel	7852
Caſt Braſs	8100
Wrought Braſs	8280
Hammer'd Braſs	8349
A falſe Guinea	9075
A true Guinea	18888
Sterling ſilver	10535
A Braſs Half-crown	9468
Electrum (a Britiſh Coin)	12071
A Gold Coin of Barbary	17548
A Gold Medal from Morocco	18420
A Mentz Gold Ducat	18261
A Gold Coin of Alexander's	18893
A Gold Medal of Queen Mary	19100
A Gold Medal of Queen Elizabeth	19125
A Medal eſteemed to be near fine Gold	19636

SPECIFCK *Medicines*, are ſuch as have a Peculiar Vertue againſt ſome Diſeaſe; as the *Quinquina*, or *Cortex Peruviana*, hath to cure Intermitting Fevers: And Phyſicians mention in their Books three kinds of Specifick Medicines.

1. Such as are Eminently, and Peculiarly Friendly to this or that Part of the Body, as to the Heart, the Brain, the Stomach, *&c.*

2. Such as do ſeem to Attract, Expel, or Evacuate ſome determinate Humour by a kind of Specifick Power, that they are endowed with. Thus Jalap Purges, Watry Humors, Rhubarb Bile, *&c.* And,

3. Such as have a Virtue to cure by ſome hidden Property, this or that Particular Diſeaſe.

That there are ſuch Medicines as theſe, in the latter and moſt proper Senſe of the Word, Mr. *Boyle* makes very probable, by theſe Reaſons.

1. The Concurrent Teſtimony of Experience both Ancient and Modern. *Galen* promiſed a Book on this Subject, but it is loſt if he ever Wrote it.

2. 'Tis manifeſt that Inconſiderable Quantities of Poyſon can do very great miſchief, and produce great and diſmal Effects without any manifeſt Quality appearing to be in them: And therefore by Parity of Reaſon, one would conclude, Medicines may be found which ſhall heal and do good the ſame way.

3. The Teſtimony of Phyſicians themſelves who in their Writings, do always mention ſome one Specifick or other, which they believed was really ſuch.

And certainly it would be well worth while to keep an account of the Operations of as many pretended Specificks, as can come to any Phyſicians knowledge, and by no means to reject all things of that Nature, becauſe a Reaſon cannot preſently be given for the Cure; for if we ſhould always do ſo, we muſt reject almoſt every thing.

SPECILLUM, is a Surgeons Inſtrument called uſually a *Probe*, by which he ſearches the Depths, Windings, *&c.* of Wounds and Ulcers.

SPECULUM *Lucidum.* See *Septum Lucidum.*

SPECULUM *Oculi*, the Apple, or Pupil of the Eye. See *Aranea Tunica Oculi.*

SPECULUM *Oris.* See *Dilatatorium.*

SPELL, a *Sea Word* ſignifying to let go the Sheats and Bowlings of a Sail, (chiefly the Miſſen) and Bracing the Weather Brace in the Wind, that the Sail may lie looſe in the Wind: This is done, when a Sail hath too much Wind in it, and there is Danger of Wronging the Maſt. This Word is moſtly uſed about the *Miſſen-ſail.* For there inſtead of ſaying take in the *Miſſen* and *Peek it up*; they ſay in one Word *Spell the Miſſen.*

To do a Spell alſo with them, ſignifies doing any Work for a ſhort time, and then leaving it: Therefore a *Freſh Spell* is when Freſh Men come to Work; and to *give a Spell*, is all one as to ſay Work in ſuch an ones Room.

SPENT, The Seamen ſay a Ship hath *Spent* any Maſt, or Yard, when it is broken down by foul Weather, or any ſuch accident: But if it be done by an Enemies Shot in Fight, they ſay ſuch a *Yard or Maſt was ſhot by the Board.*

SPERMATICK *Veſſels*, and *Parts*, are thoſe Arteries and Veins, which bring the Blood to, and convey it from the Teſticles: Likewiſe thoſe Veſſels through which the Seed paſſes: Likewiſe

all

all whitiſh Parts of the Body, which becauſe of their Colour, were anciently thought to be made of the Seed: Of this ſort are the Nerves, Bones, Membranes, Griſtles, &c.

SPERMATOCELE, a Rupture cauſed by the Contraction of the Veſſels which eject the Seed, and its falling down into the *Scrotum*.

SPHACELUS, is a ſudden Extinction of Life and Senſe in every Part.

SPHÆNOIDALIS *Sutura*, is a Suture that ſurrounds the *Os Sphænoides*, ſeparates it from the *Os Occipitis*, from the *Os Petroſum*, and from the *Os Frontis*.

SPHÆNOIDES, is a Bone of the *Cranium*, common both to the Skull and upper Jaw; it is of a very irregular Figure; and is ſituated in the middle of the Baſis of the Skull, and is joyned to all the Bones of the *Cranium*, by the *Sutura Sphænoidalis*, except in the middle of its Sides, where it is continued to the *Oſſa Petroſa* as if they were one Bone. This Bone has a ſmall Protuberance in the middle thereof, from which the Muſcles of the *Uvula* ariſe: On its Inſide it has 4 Proceſſes called *Clinoides*. Betwixt the two Tables of this Bone, under the *Cella Turica*, there is a *Sinus* divided in two in the middle, which opens by two Holes into the Cavity of the Noſtrils. In this Bone ſome ſay, there are alſo 12 Holes; by the firſt and ſecond paſs the Optick Nerves; by the reſt paſs other Nerves for the Motion of other Parts, as alſo of Veins and Arteries.

SPHÆNOPALATINUS, is a Muſcle of the *Gargareon*, which deſcends from a round fleſhy Origination at a Proceſs of the *Os Sphænoides*, which is in a direct Line between the *Ala Veſpertilionis*, and *Proceſſus Styloides*, thence it becomes a round fleſhy Belly in half its Progreſs, grows leſs again near its lateral Inſertion to the Poſterior Part of the *Gargareon*.

This with its Partner acting, draw the *Gargareon* with the *Uvula* upwards and backwards; which hinders the maſticated Aliment from Regurgitating through the *Foramina Narium* in *Deglutition*.

SPHÆNOPHARINGÆUS, is a pair of Muſcles ariſing from the *Sinus* of the inner Wing of the *Os Cuneforme*, and going Obliquely downward, is extended into the Sides of the Gullet; it dilates the Gullet.

SPHÆNOIS. See *Os Cuneforme*.

SPHÆNOPTERIGOPALATINUS, See *Pterigopalatinus*.

SPHAGITIDES, according to ſome, are the Jugular Veins in the Neck.

SPHERE, is a Solid Body, made by the Rotation of a *Semicircle* about its Diameter.

1. All Spheres are to one another as the Cubes of their Diameters. For under the Word *Cylinder*, you will find it proved, *That Cylinders whoſe Altitudes are equal to the Diameters of their Baſes, are in Proportion to each other as the Cubes of their Diameters*; which is thus expreſs'd $\frac{1}{2}rddd\,\frac{1}{4}r$ DDD :: *ddd*. DDD. wherefore, be the Ratio of a Sphere to a Cylinder of the ſame Diameter and Height to it, what it will, (and what it is, is ſhewn in another place) call it *y*: Therefore $\frac{1}{4}rddd.\,\frac{1}{4}r$ DDD :: $\frac{1}{4}ryddd\,\frac{1}{4}ry$ DDD. But $\frac{1}{4}ryddd.\,ry$ DDD :: *ddd*. DDD. That is, Spheres are to each other as the Cubes of their Diameters. Q. *E. D.*

2. The ſolidity of a Sphere is equal to the Surface multiplied into $\frac{1}{3}$ of the Radius; as is proved from Cor. 1. of Prop. 4. in the word *Cylinder*.

3. A Sphere is equal to $\frac{2}{3}$ of a Cylinder having the Diameter of its Baſe and its Axis equal to that of the Sphere, *i. e.* a Sphere is $\frac{2}{3}$ of the Cylinder circumſcribed: And the Surface of the Sphere and the curved one of the Cylinder circumſcribing it, is the ſame in Quantity; as is proved in *Cylinder*, *Prop.* 4. and *Corollaries*; as alſo very briefly under the word *Indiviſibles*.

4. The Surface of the Sphere is equal to four times the Area of a great Circle. See *Cylinder*, *Prop.* 4. *Coroll.* Wherefore add to the Curve and Surface of the Cylinder its two circular Baſes, and that will make ſix great Circles of the Sphere: So that the Surface of the Sphere is but $\frac{2}{3}$ of the whole Surface of the Cylinder. See alſo *Cylinder*.

An entire Sphere of Glaſs will unite the Parallel Rays of any Object at the Diſtance of near its Semidiameter behind it. *Molyneux Dioptr.* p. 93.

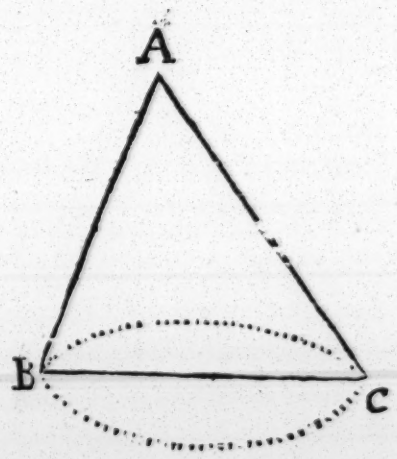
SPHERE *of Activity*, of any Body, is that determinate Space or Extent all round about it, to which, and no farther, the *Effluviums* continually emitted from that Body do reach, and where they operate according to their Nature. Thus we ſee the *Magnetical Effluvia* have certain Bounds and Limits, beyond which they will have no Influence to turn or to attract the Needle: But where-ever a Needle be placed, ſo as that it can be moved by a Load-ſtone, it may be ſaid to be within the *Sphere of Activity* of the Stone.

SPHERICK *Geometry*, or *Projection*, is the Art of Deſcribing on a Plane the Circles of the Sphere, or any Parts of them in their juſt Poſition and Proportion, and of Meaſuring their Arks and Angles when Projected.

As an Introduction to which, you muſt underſtand.

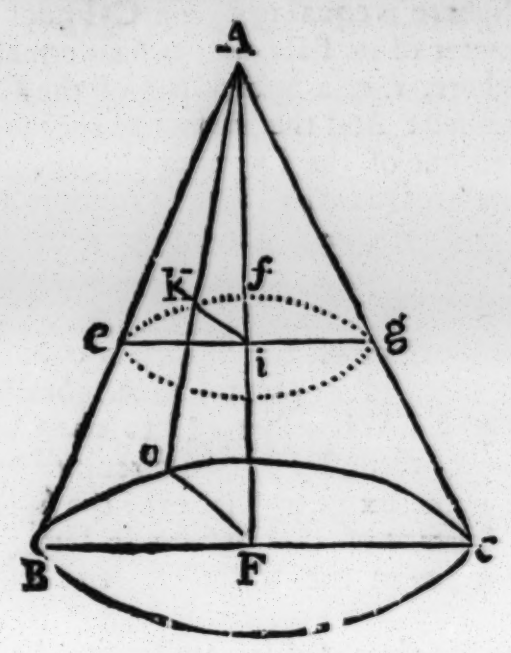
PROPOSITIONS.

I. *If a Cone, as* A B C, *be cut by a Plane, either by the Axis, or through the Vertex, the Section will be a Triangle.*



For the Point A is the Vertex of the Cone, and will be ſo of the Triangle, and B C is a Right Line, becauſe 'tis the Diameter of the Circle of the Baſe, and A B and A C muſt be Right Lines, becauſe the Surface of the Cone will be deſcribed by either of them; wherefore the Section A B C is a Triangle. Q. *E. D.*

II. *If a Cone as* A B C *be cut by a Plane Parallel to its Baſe, the Section e f g h will be a Circle.*



For let F be the Centre of the circular Baſe; then will A F be the Axis; and if the Cone be cut by the Axis, the Section A B C will be a Triangle. Let *e g*, the Diameter of the Section, be drawn, cutting the Axis in *i*, wherefore *e g* the Diameter of the Section will be parallel to B C, the Diameter of the Baſe.

And conſequently,

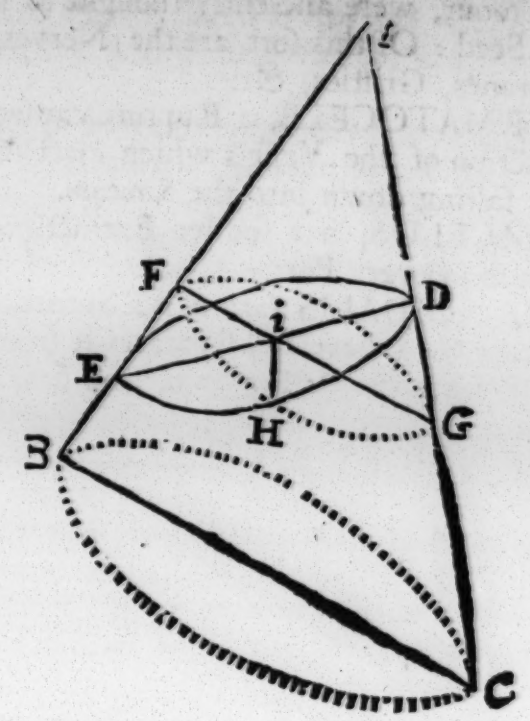
A F : F B : : A *i* : *i e* : and
as A F : F C : : *A i* : *i g*.

Wherefore, by *Inverſe Proportion*, and *ex æquo*, as F C : F B : : *i g* : *i e*.

But B F = F C, therefore *i e* = *i g*.

And the ſame conſequence will ariſe if you take *o* and K, any two other Points in the Baſe and in the Section; for K *i* being parallel to *o* F, and A *o* F being a Triangle. A F : *o* F : : A *i* : K *i*. but as A F : F B : : A *i* : *i e*. Wherefore *ex æquo o* F : F B : : K *i* : *i e*. And therefore K *i*, and *i e* are equal alſo, and conſequently the Section is a Cricle: For *i* is a Point from whence more than two Right Lines drawn to the Curve *e h g f* are equal; wherefore that Curve muſt be a Circle. *Q. E. D.*

III. *If a Scalenous Cone* A B C *be cut by a Plane in a ſubcontrary Poſition to its Baſe, the Section* D E H *will be a Circle.*



1. The Section A B C made through the Axis, is a Triangle.

2. The Triangle A E D is Similar to A B C, tho' placed a contrary way, (by the Suppoſition) (which is called Subcontrary Poſition.)

3. E D being the mutual Interſection of two Planes will be a Right Line, on which take any Point, as (*i*) and through it draw F *i* G parallel to B C, and there let the Cone be cut alſo, then the Plane that cuts it being parallel to the Baſe of the Section, F H G muſt be a Circle, and F G a Diameter.

Now, becauſe both theſe Interſecting Planes are Right to the Plane of the Triangle A B C their common Interſection I H, will alſo be a Right Line, and perpendicular to the Plane of the Triangle, and to the two Lines E D and F G. And then, becauſe the Triangles A B C, A E D and A F G are all Similar, the Angles at G and E muſt be equal; and the Vertical ones at *i* being ſo too, the Triangle F E I muſt be Similar to I D G. Wherefore D I : I G : : F I : I E, therefore U D I E = ∩ F I G; but becauſe F G is the Diameter of a Circle, and I H perpendicular to it, and terminated at the Circumference, 'twill be a middle Proportional between the Segments of the Diameter, and have its Square equal to the Rectangle F I G, (as alſo to its Equal E I D) wherefore the Point H is in the Circumference of a Circle, whoſe Diameter is D E. *Q. E. D.*

DEFINITION I.

A Circle of the Sphere, as to its *Projection* on any Plane, is of four kinds.

1. The *Primitive Circle*, or Limb which bounds the *Projection*, and within which 'tis always made.

2. A *Direct Circle*, whoſe Plane is directly oppoſite to the Eye, or when the Eye is in the Axis of the Plane.

3. A *Right Circle*, whoſe Plane is coincident with the Axis of the Eye; or with the viſual Rays.

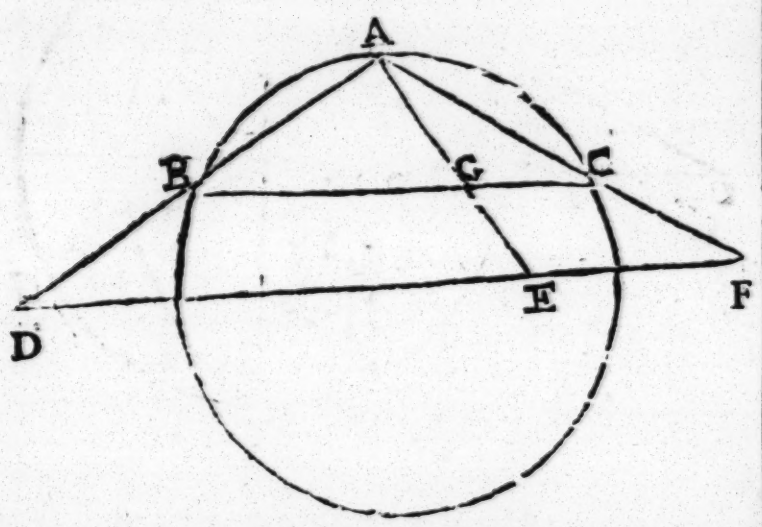
4. An *Oblique Circle*, whoſe Plane lies oblique to the Axis of the Eye, ſo that it makes unequal Angles with it.

To *Project* the *Sphere* truly in *Plano*, is a Part of *Perſpective*; whereof there are ſeveral kinds; but the moſt uſual is what is properly called the *Stereographick*, or *ſolid Projection of the Sphere*; and the *Orthographick*, or the *Analemma*: The latter of which, ſee in *Analemma*.

In the former, the Circles of the Globe are drawn or repreſented on a Plane, which paſſes through its Center, and hath the Eye, ſuppoſed to be in the Pole or 90° diſtant from it; *Projecting* the ſeveral Circles or Arks of Circles on that Plane, or on any one parallel to it.

In this Projection, if a Line paſs through the Eye, or be coincident or parallel to the Axis, it will be repreſented by a Point.

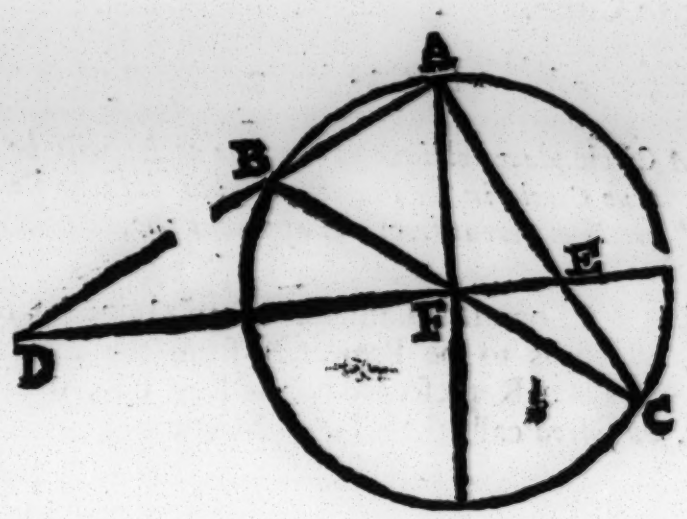
IV. *If a Line be direct to the Eye, it will be projected into a Right Line, whoſe Parts will be in the ſame Proportion to one another, as thoſe of the Primitive Line, of which it is the Repreſentation.*



For, ſince the Line B C (which may be the Diameter of a Parallel Circle) is ſuppoſed to lie Parallel to D F, and is projected into it from the Eye at A, if you draw the Lines A D, A E, and A F, the Triangles A B G and A D E will be Similar; as alſo will A G C and A E F; wherefore as A B: A D:: B C: D F. and as A B: A D:: A G: A E. alſo as A G: A E:: B G: D E:: G C: E F. Wherefore as the whole B C to the whole D F:: the Part B G: to the Part D E:: G C: E F.

PROP. 5.

But if a Line lie oblique to the Eye, the Parts of it in the Projection *will not be in the ſame Proportion, as they are in the Line it ſelf, but thoſe Parts of it which lie neareſt to the Eye, will in the Projection appear longer than thoſe which lie more remote from it.*



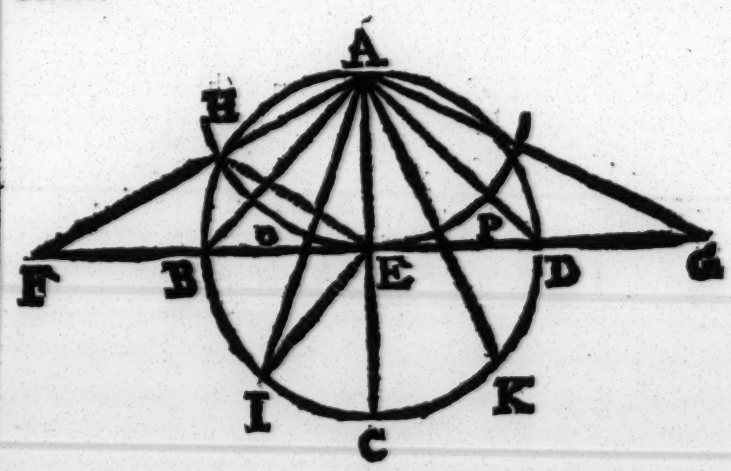
Thus, if the Eye be at A, I lay the Line B C lying oblique to it, will be projected into the Line D E; and its half B F, which lies nearer to the Eye, ſhall be repreſented by the Line D F, which is longer than FE, the Repreſentation of the other half which lies remote from the Eye; as is in a manner ſelf evident.

If a Circle be right to the Eye, or hath its Plane coincident with, or parallel to its Axis, it will be Projected into an infinite right Line.

PROBLEM I.

Prop. 6. *To repreſent on the Plane of the* Projection *a* Right Circle, *and to diſtinguiſh there ſuch Parts and Diviſions as ſhall truly correſpond to thoſe of the* Right Circle *given.*

Let the Circle given be A B C D; and let it be divided into eight equal Parts, as in the Figure; and let the Eye be at A. Draw F G at right Angles to A C, the Axis of the Eye, to repreſent the Plane of the *Projection*; and draw alſo from A, A F, A B, A I, A C, A K, A D, A G, through the ſeveral Diviſions of the given *Circle*; Then will F B, B O, O E, E P, P D, and D G, be the proper Repreſentations of the Parts of the given Circle.



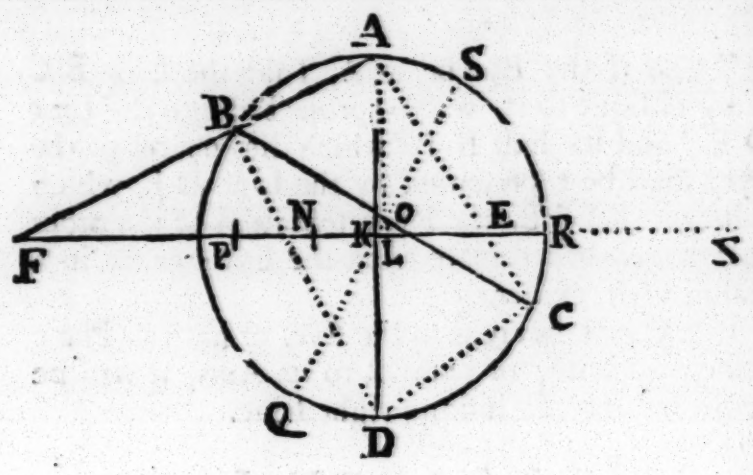
And if on A as a Center with the Diſtance A E, another Circle be deſcribed, 'tis plain, that O E, E B and E F, &c. will be Tangents of the Angles OAE, B A E, F A E, &c. at the Circumference,

ference, which are ſeverally the halves of the Angles I E C, B E C, H E C, &c. at the Centre: Of which latter Angles, the Arks of the Circle given C I, C B, and C H, are the proper meaſures; wherefore the Right Lines O E, B E, F E, &c. are the Tangents of half thoſe Arks; which ſhews us that every Diameter of a great Circle, or its Parts within or without the Primitive, is to be meaſured on the Scale of Half Tangents; and that the Diviſions of it begin at the Centre of the Primitive Circle.

PROP. 7.

A Circle placed oblique to the Eye at A, *will be a true Circle in the Projection; but its true Centre is different from its apparent one.*

Let B C be the Diameter of an oblique Circle, which is to be Projected from the Eye at A, on a Plane Repreſented by the Line F R, which Mr. *Oughtred* calls the *Line of Meaſures.*



1. 'Tis plain the Diameter B C will be repreſented by the Line F E. 'Tis alſo plain, that if right Lines were drawn from A to all the Parts of the oblique Circle, of which B C is the Diameter, they would make an oblique Cone of Rays, as A B C.

2. But I ſay that the Scalenous Cone of Rays A B C is cut by the Plane F R, *ſubcontrarily* to its Baſe, and conſequently the Section will be a Circle (by the 3d) wherefore the giving oblique Circle will always be repreſented by a Circle on the Plane of the *Projection.*

That the Scalenous Cone A B C is cut Subcontrarily to its Baſs, may be thus proved.

Draw A D through the Centre of the Sphere K, and join B D and C D.

The Angle A C D is a right one, (being in a Semicircle) and the Angle A K E is right, by Suppoſition and Conſtruction; and the Angle D A C is common to the two Triangles A K E and A D C; wherefore they are Similar, and conſequently the Angle A D C is equal to the Angle A E K.

But the Angle A D C is equal to the Angle ABC, as being in the ſame Segment; and the Angle ADC was before proved = to the Angle AEK; wherefore the Angle A B C = Angle A E K; and ſince the Angle A B C is common to both, therefore the Angle F muſt be equal to the Angle C, and conſequently the Cone ABC is cut *ſubcontrarily*, and therefore F E is the Diameter of a true Circle, whoſe real Centre will be in P the middle Point; but the apparent Centre of the Circle will be at L, where the Point O (which is the middle Point of B C) is *projected.*

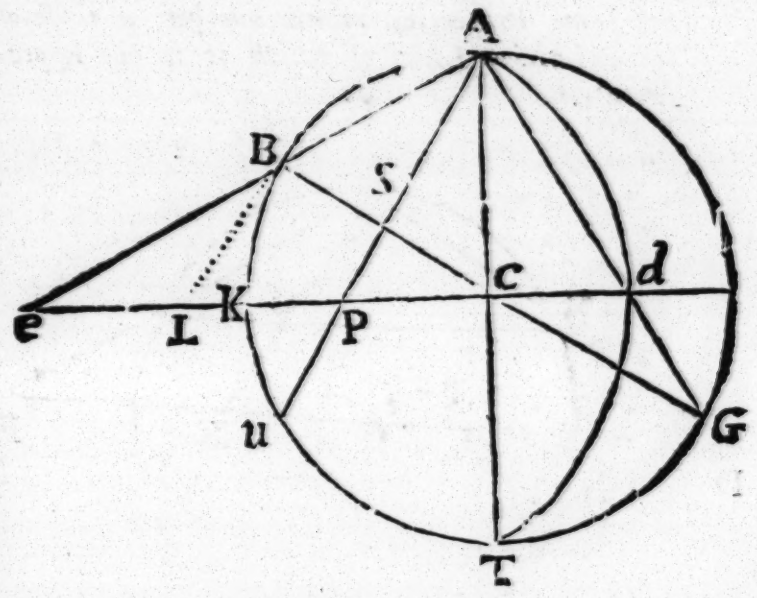
There are ſeveral other ways of finding P the Centre of the *Projected Circle*; but this is as expeditious as any.

To *Project* the Poles of the oblique Circle B C, draw through K the Centre of the Sphere, a right Line as Q S, perpendicular to B C, which therefore will be the Axis of the oblique Circle: Then a Ruler laid from A through Q and S, the Pole of that Axis ſhall *Project* the Polar Points in N and Z.

PROP. VIII.

The Center (P) *of every great Circle* (B G) *which lies oblique to the* Primitive *(in the* Projection*) is ſo far diſtant from* C, *the Centre of the* Primitive, *as is the Tangent of the* Ark of Elevation *of its Plane, above the Plane of the Primitive.*

Make the Ark B *u* = G T, the Complement of the Angle of Elevation, and draw *u* A, which will find the Point P, the Centre of the Projected Circle.



DEMONSTRATION.

Becauſe the Angle B A *u* = Angle C A G as being on equal Arches) and the Angles A B G equal to the Angles A *d e*, (by the Subcontrary Poſition) therefore the Triangles B A S and A C *d* are Similar, and conſequently the Angle B S A (which is equal to the Angle A C *d*) is a right one.

Draw B L perpendicular to B C, wherefore, the Triangles B L C and A P C are Similar; for Angle B L C = Angle P C A, as being both right ones; and the Angle A P C = B L C, becauſe B L and A P, are Parallels; wherefore the Angle B C L = Angle P A C.

But P C is the Tangent of the Angle P A C, and therefore of its equal the Angle B C L, or of the Ark B K, which is equal to the oblique Circle's Elevation above the Plane of *e d*; wherefore P the Centre of the oblique Circle is diſtant from C by the Tangent of its Elevation above the Plane *e d*. *Q. E. D.*

COROL.

Alſo, becauſe the Triangles *e* P A and A C G are Similar, (as having Angle *e* = Angle G, by Subcontrary Poſition) and the Angle B A P = Angle C A G (as being on equal Arks) therefore will

e P : P

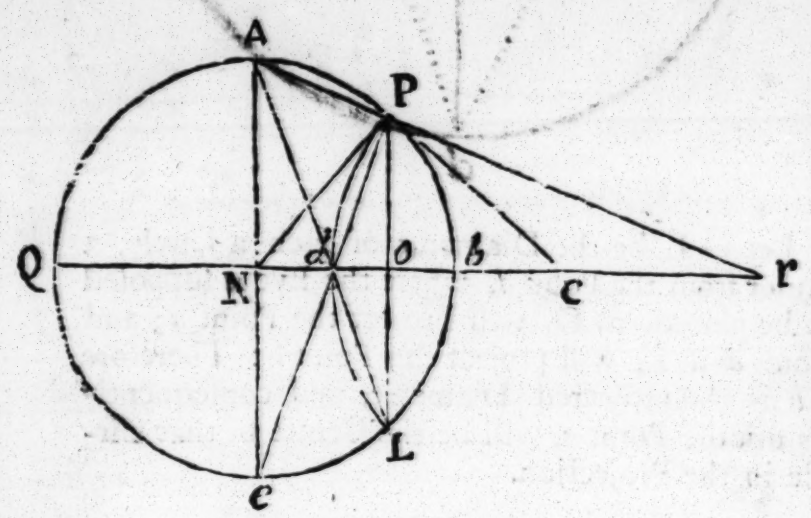
e P : P A :: A C : C G, that is, *e* P = P A. But P A is the Secant of the Angle P A C, or of the Ark B K; wherefore the Secant of the Elevation *e* P ſet from *e*, ſhall find P the Centre as before; P *e*, P A, or P *d* being its Radius.

PROP. IX.

Problem. 2.

To project a Leſſer, or Parallel Circle P L, *whoſe Poles are in the Line of Meaſures* Q, *r*; *repreſenting the Plane of the Projection.*

First, *Project* the Diameter of the Leſſer Circle P L, into that of the *Projection* in the Points *d* and *r*, and draw a Line from P to N; to which erect P C at Right Angles; ſo ſhall C be the true Centre of the projected Circle.



DEMONSTRATION.

The Angle N A P, is equal to the Angle O P *r*; becauſe A N is parallel to P O: Alſo the Angle A *e* P, is equal to the alternate Angle *e* P L: But the Angle *e* A P, added to the Angle *e*, is equal to a Right one. Wherefore the Angle O P *r* + P *r* O, = a Right Angle: That is, The Angle *d* P *r*, is a Right Angle. Wherefore *d r*, is the Diameter of a Circle.

Now N P C, being right by Conſtruction, take from thoſe two right Angles, the common one *d* P C, and the Angle N P *d* (= ∠ *e*) muſt remain equal to the Angle C P *r*, and the Angle *r*, is = to the Angle *e*, becauſe the Triangles N *d e*, and P *d r*, are ſimilar: Wherefore the Triangles P C *r*, and N P *e*, are ſimilar; and conſequently, *e* N : N P :: P C : C *r* but *e* N = N P; therefore P C = C *r*. Therefore both are Radii of a Circle. Q. *E. D.*

And to prove P C = *d* C, *and conſequently that they alſo are Radii.*

I ſay, The Triangle *d* P C, is an Iſoſceles, becauſe the Angle P *d* C, is equal to the Angle *d* P C; which I thus prove.

The Angle P *d o* + ∠ *d* P *o* = Right Angle, = ∠ *d* P C + ∠ C P *r*, but C P *r* = ∠ *e* = *d* P *o*: Therefore taking away the common Angle *d* P *o*, (or its equal C P *r*) *d* P C muſt remain equal to P *d* C: wherefore P C (= C *r*) = C *d*. Wherefore *c* is the true Centre of the projected Circle.

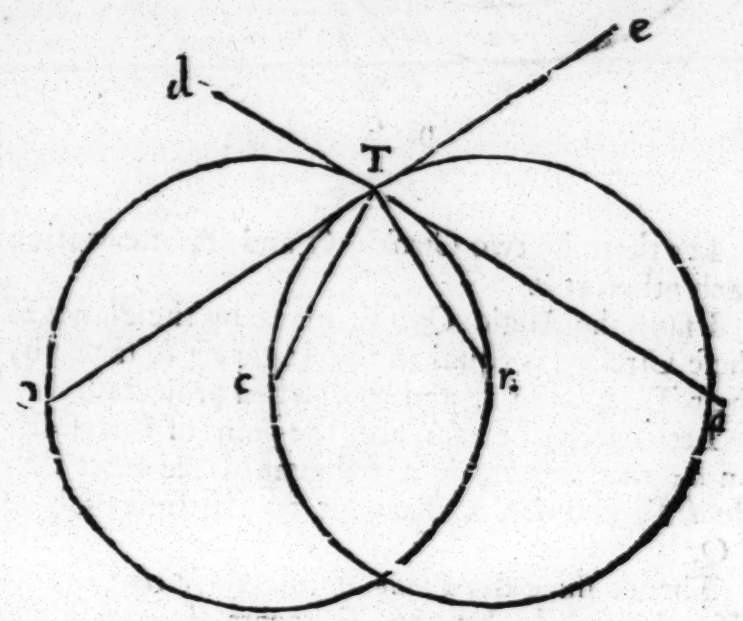
COROLLARY I.

1. Hence 'tis plain, That making N P the Radius of a Circle, whoſe Centre is N, the projected Circles Centre C, is diſtant from N, the Centre of the Primitive, by N C; the Secant of the Ark P *b*, or of that leſſer Circle's Diſtance from its Pole *b*.

2. The Semi-diameter of this projected Circle (C *d*) is equal to (C P) which is the Tangent of the ſaid Ark P *b*, or of that Circle's Diſtance from its Pole.

PROP. X.

The Angle of the Interſection of any two Circles on a Plain, is equal to the Angle made by their Radii drawn from their Centres to the Point of Interſection.



I ſay, The Rectilineal Angle *c* T *n*, made by the two Radii *c* T, and T *n*, is equal to the Curvilineal Angle *o* T *c*, made by the Arks *o* T, and *c* T; which is equal alſo to the Curvilineal Angle *n* T *a*, made by the Arks *n* T, and T *a*.

Draw *o* T, and T *a*, Tangents to the Interſecting Circles.

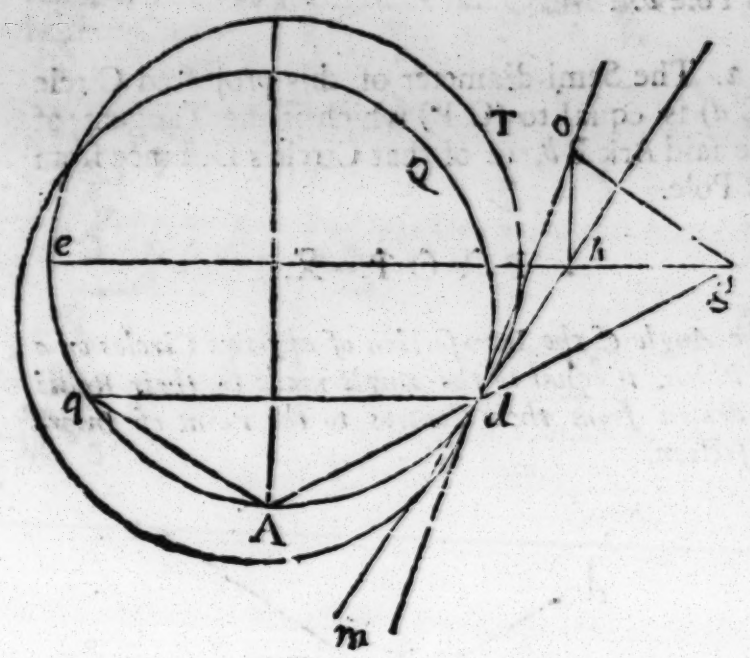
Then the Angles of Contact *o* T *c*, and *n* T *a*, which are made by the Tangents and the Curves, being leſs than any acute ones, and indeed no Quantity; the Tangent *o* T *e*, and *d* T *a* will fall in with the Circles, and make the ſame Angles with one another, as the Arks of thoſe Circles do: Wherefore the Curvilineal Angle *o* T *c*, is equal to the Rectilineal one *o* T *d*; and on the other ſide, the Curvilineal Angle *n* T *a*, is equal to the Rectilineal one *a* T *e*.

Wherefore ſince the Right-lin'd Angles *d* T *c*, and *o* T *n*, are both Right Angles, and equal: If you take away the common Angle *o* T *c*, the Angle *d* T *o*, muſt be equal to the Angle *c* T *n*; and conſequently the Angle *e* T *n*, is equal to the Angle of Interſection *o* T *c*. Q. *E. D.*

PROP. XI.

PROP. XI.

All Angles made by Circles on the Superficies of the Sphere, are equal to those made by their Representatives on the Plane of the Projection.



Let there be two Circles, Q and T, interfecting each other at *d*.

I say, the Angle Q *d* T, made by the Planes of these Circles, is equal to the Angle *o g h*, made by their Tangents *o d*, and *d h*, when projected.

Let the Eye be at A, and the point of Intersection *d*; then draw *d h*, a Tangent to the outer Circle *d* T, and *d o*, a Tangent to the Inner Circle *d* Q.

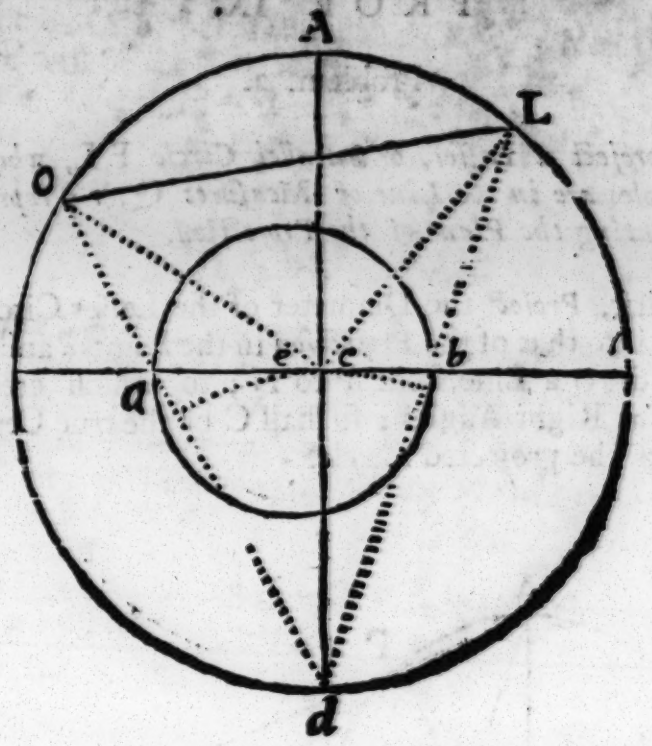
Thence since the *Plane* of the *Projection e g*, as also that made by the Tangents *d h*, and *d o*, (which are in the same Plane) are both perpendicular to the Plane of the Circle *e* T *d* A; their common Intersection *o h*, must be a Right Line, and also perpendicular to *e g*.

Draw all the Lines, as in the Figure; then will the Angle A *d m*, (made by the Tangent and Secant) be equal to the Angle *q*, (in the opposite Segment) which is equal to *q d* A, because the Triangle *q* A *d*, is an *Isosceles*; but the Angle *q d* A = ✓ *h g d*, because *q d* is parallel to *e g*: Therefore the Angle *h g d* = ✓ *A d m* = Vertical Angle *h g d*: Wherefore the Triangle *h d g*, is an *Isosceles*, and consequently *d h* = *h g*.

Hence the Triangle *o d h*, hath two Sides, *o h*, and *h d*, and the Right Angle *o h d*, equal to two Sides, and one Angle, in the Triangle *o h g*: Wherefore all things are equal, and consequently the Angle *o g h*, is equal to the Angle *o d h*, equal to the Curvilineal Angle Q *d* T. *Q. E. D.*

PROP. XII.

To Project a lesser Circle, when its Poles are not in the Plane of the Projection.



Let O L be the Diameter of such a Circle, a Ruler from the Point *d*, where the Eye is supposed to be placed, to O, will Project the Point *a*; and from *d* to L, will project the Point *b*: Therefore *a b* is the projected Diameter, and consequently its middle Point *e*, will be the Centre of that Circle in the Projection.

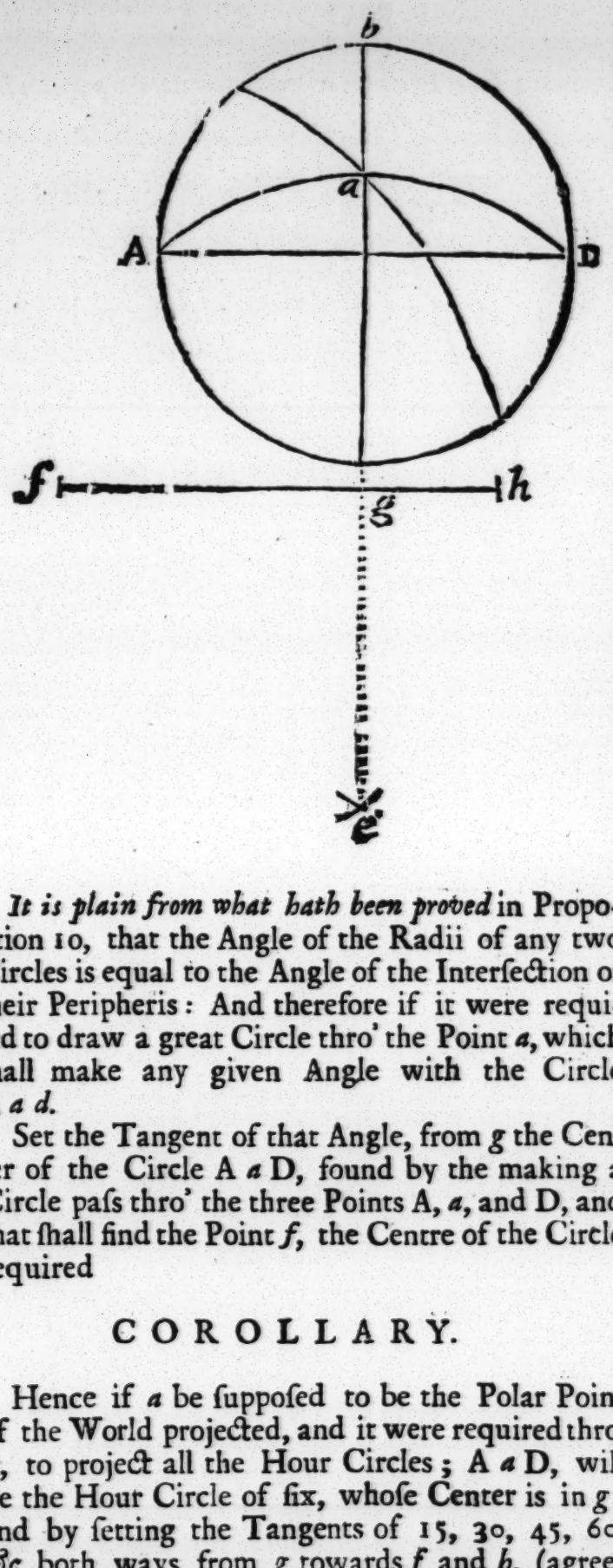
The Demonstration you have universally in *Prop.* 4.

Or, since by (*Prob.* 1.) C *a*, and C *b*, will be the half Tangents of the Arks A O, and A L, (for the Primitive Circle is right to the Eye at *d*:) Therefore to project such a lesser Oblique Circle, you need only take the half Tangents of the Distance of each end of the Diameter of such a lesser Circle from the Point A, opposite to the Eye supposed at *d*; and set them from the Centre C, and they will find the Points *a* and *b*, the ends of the projected Diameter; and *a b* bissected, will give the Centre *e*.

PROP. XIII.

PROP. XIII.

All Great Circles of the Sphere, *passing through any Point* a, *in the Diameter of the Projection, ſhall have their Centres in the Line* g f, *which is perpendicular to the Diameter* g b, *and their Centers will be diſtant from the Point* g, *the Centre of the Circle* A *a* D, *by the Tangent of the Angle of their Interſection with the ſaid Circle* A *a d.*



It is plain from what hath been proved in Propoſition 10, that the Angle of the Radii of any two Circles is equal to the Angle of the Interſection of their Peripheris: And therefore if it were required to draw a great Circle thro' the Point *a*, which ſhall make any given Angle with the Circle A *a d.*

Set the Tangent of that Angle, from *g* the Center of the Circle A *a* D, found by the making a Circle paſs thro' the three Points A, *a*, and D, and that ſhall find the Point *f*, the Centre of the Circle required

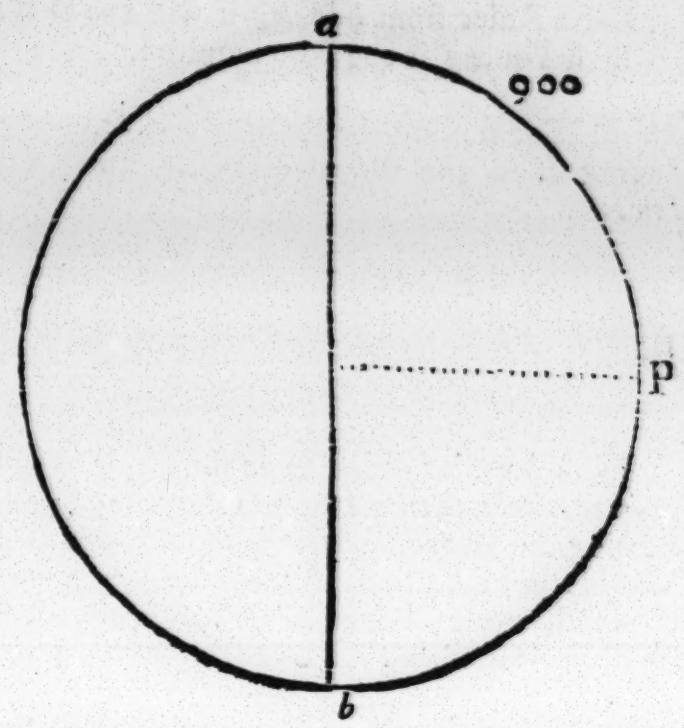
COROLLARY.

Hence if *a* be ſuppoſed to be the Polar Point of the World projected, and it were required thro' it, to project all the Hour Circles; A *a* D, will be the Hour Circle of ſix, whoſe Center is in *g*; and by ſetting the Tangents of 15, 30, 45, 60, *&c.* both ways from *g* towards *f* and *h*, (agreeable to the Radius *a g*) all the other Hour Circles may be deſcribed on the Plane of the *Projection*; from their Centers in the Line *f h.*

Which is the Foundation of all *Dyalling*, or the *True Projection* of the *Hour Circles of the Sphere* on any given Plane.

PROP. XIV.

Problem 3. *To find the Pole of any Great Circle.*



If the *Pole* of the *Primitive Circle* be required 'tis its Centre.

If the *Pole* of a *Right* or *Perpendicular Circle* be ſought, 'tis 90 Degrees diſtant, reckoned upon the Limb from the Points, where this Circle (which is a Diameter) cuts it.

As P is *Pole* of the *Perpendicular Circle a b.*

If the *Pole* of an *Oblique Circle* be deſcribed, which in the Projection will be an Ark of a great Circle.

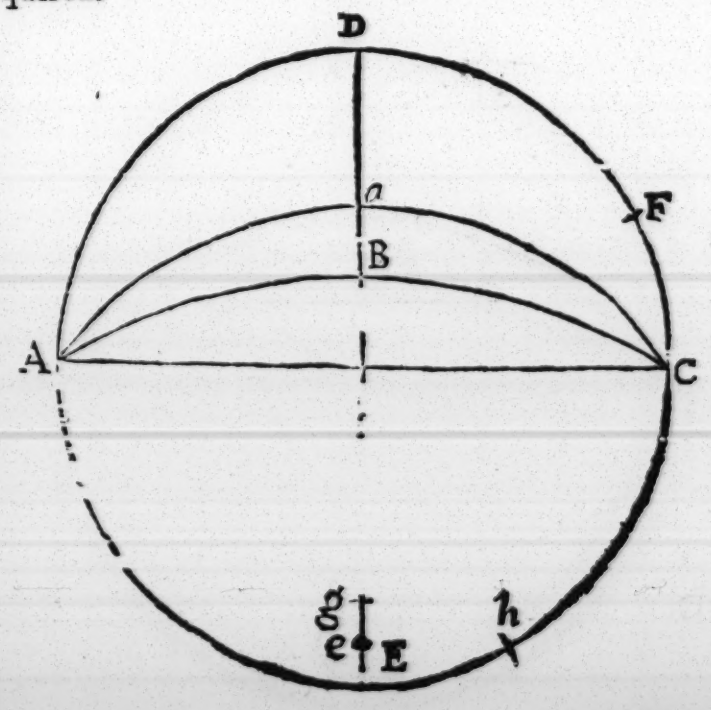
1. Conſider that this Circle muſt cut the Primitive in two Points, that will be diſtant from each other juſt a Diameter, as is the Caſe of the Interſection of all great Circles.

2. The Pole of this Circle muſt be in a Line Perpendicular to its Plane. And,

3. This Circle Poles cannot but lie between the Centre of the Primitive one, and its own.

For Inſtance.

Let the Poles of the *Oblique Circle* A B C, be required.



1. Draw

1. Draw the Diameter A C, and then another as D E, Perpendicular to it.

2. Lay a Ruler from A to B, it will cut the Limb in F; then take the Cord of 90 Degrees, and ſet it from F to *h*.

3. Lay a Ruler from *h* to A, it will cut D E in *g*; which Point *g* is the Pole required.

N. B. The finding the Points *f* and *h*, is called reducing B to the *Primitive Circle*, and to the *Diameter*.

PROP. XV.

Problem 4. *To deſcribe a* Spherical Angle *of any Number of Degrees given.*

1. If the Angular Point be at the Center of the *Primitive Circle*, then 'tis made at any Plane Angle, numbring the Degrees in the Limb, from the Line of Cords: For all Circles paſſing thro' the Centre, and which are at Right Angles with the Limb, muſt be projected into Right Lines.

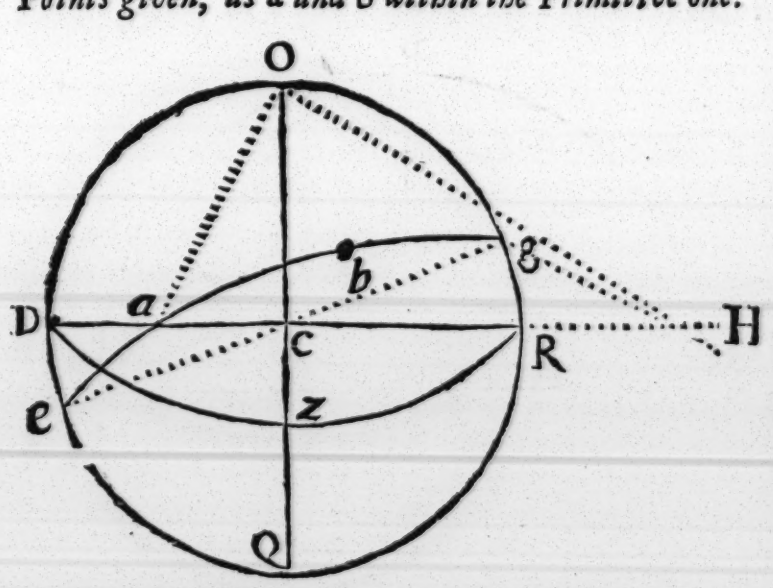
2. If the Angular Point be at the Periphery of the *Primitive Circle*; draw a Diameter as A C; (ſee the laſt Figure:) Then take the ſecant of the Angle given in your compaſſes, (as ſuppoſe 65 Degrees(and ſetting one Foot in A, croſs the Diameter in *e*, or if no Diameter be drawn, placing one Foot in C, and croſſing the former Ark, you will find the ſame Point *e*, which is the Center of the Circle A *a* C, which with the *Primitive* makes an Angle D A *a* of 65 Degrees.

N. B. If the Angle given be obtuſe, take the ſecant of its Supplement to 180 Degrees.

3. If a Point as *a* were aſſigned, thro' which the Ark of the Circle conſtituting the Angle muſt paſs; draw the Diameter A C (as before:) Then take the ſecant of the given Angle, and ſetting one Foot in A or C, ſtrike an Ark as at *e*, and then with the ſecant of the given Angle, ſetting one Foot in *a*, croſs the other Ark in *e*, which will be the Centre of the *Oblique Circle* required.

PROP XVI.

Problem 5. *To draw a great Circle thro' any two Points given, as* a *and* b *within the Primitive one.*



Draw a Diameter thro' that Point which is furtheſt from the Center, as D R, producing it beyond the Limb if there be occaſion; ſet 90 Degrees from D or R to O, and draw O *a*.

Then erect O H, Perpendicularly to *a* O, and produce it till it cuts the Diameter prolonged in H; that Interſection H is a third Point, thro' which as alſo this *a* and *b*, if a Circle be drawn, it will be a great Circle, as *e a b g*.

Which is eaſily proved, by drawing the Line *e* C *g*; for that Line is a Diameter: Becauſe its Parts multiplied into one another, are equal to *a c* + *c* H = O C *q*, by 35. *è* 3, and *Cor.* 8 *è* 6, *Euclid.*

PROP. XVII.

Problem 6. *To draw a great Circle Perpendicular to, or at Right Angles with another.*

Let it paſs thro' it's Poles, and 'tis done.

Of which there will be four Caſes.

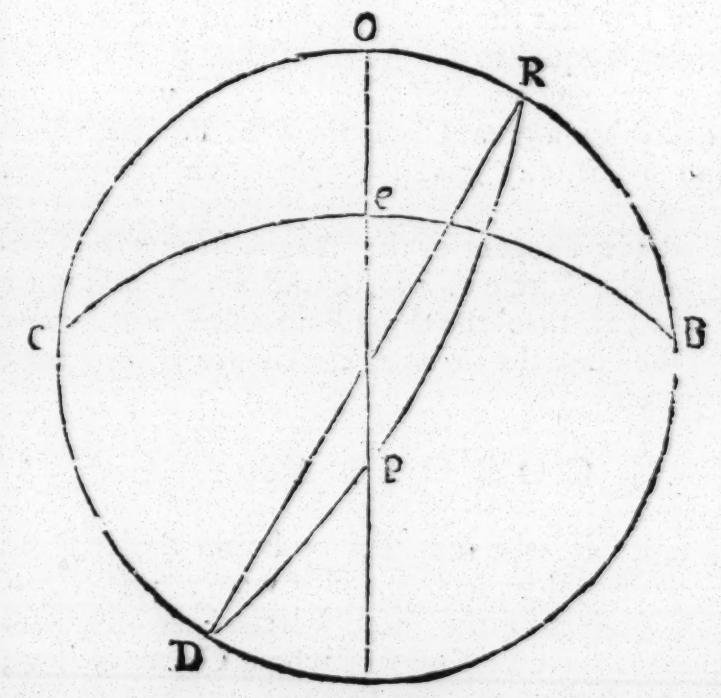
1. To draw a Circle Perpendicular to the Primitive; which is done by any ſtraight Line paſſiin thro' the Centre.

2. To draw a Circle Perpendicular to a Right Circle; is only to draw a Diameter at Right Angles with that Right Circle.

3. To draw an Oblique Circle Perpendicular to a Right one; only draw a Circle which ſhall paſs thro' both the Poles of ſuch a Right Circle, and 'tis done.

Thus the Oblique Circle D ϛ R, is Perpendicular to the Right one O Q, becauſe it paſſes thro' its Poles D and R. See the laſt Figure.

4. To draw one Oblique Circle Perpendicular to another.



Find Firſt P the Pole of the given Oblique Circle C *e* B, and then draw any how the Diameter D R, ſo a Circle drawn thro' the Three Points; D P and R ſhall be the Circle required; for paſſing thro' the Poles of the Oblique Circle C *e* B, it muſt be Perpendicular to it.

PROP. XVIII.

PROP. XVIII.

Problem 7. *To measure the Quantity of the Degrees of any Arch of a great Circle.*

1. If the Arch be part of the Primitive, 'tis measured on the Line of Chords.

2. If the *Arch* be any Part of a Right Circle, the Degrees of it are measured on the *Scale of half Tangents*, supposing the Centre of the Primitive Circle to be in the beginning of the Scale, so that if the Degrees are to be reckoned from the Center, you must account according to the order of the *Scale of half Tangents*.

But if the Degrees are to be accounted from the Periphery of the Primitive, as will often happen, then you must begin to account from the end of the *Scale of half Tangents* calling 80, 10, 70, 20, &c.

3. To measure any Part of an *Oblique Circle*; first find its Pole, and there laying the Ruler, *Reduce the two Extremeties of the Ark required to the Primitive Circle*, and then measure the Distance between those Points on the Chords.

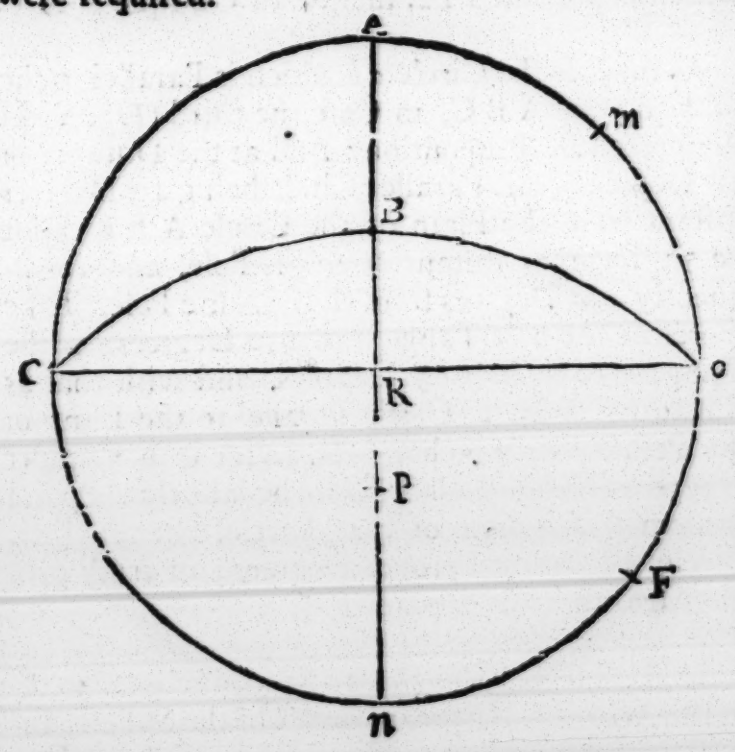
Thus in the last Figure, if the Quantity of *e* B an Arch of the Oblique Circle C *e* B were required; lay a Ruler to P the Pole, and reduce the Points *e* and B, to the Primitive Circle, so shall the Distance between *o* and B, measured on the Chords, be the Quantity of Degrees in the Ark *e B*.

PROP. XIX.

Problem 8. *To measure any* Spherical Angle.

1. If the Angular Point be at the Centre of the Primitive, then the Distance between the Legs taken from the Limb, and measur'd on the Chords, is the Quantity of the Angle.

2. If the Angular Point be at the Periphery of the Primitive Circle, as suppose the Angle A C B were required.



Here the Poles of both Circles being in the same Diameter; find the Pole of the Oblique Circle C B O, which let be B P. Then the Distance R P, measured on the Scale of half Tangents, is the measure of the Angle A C B.

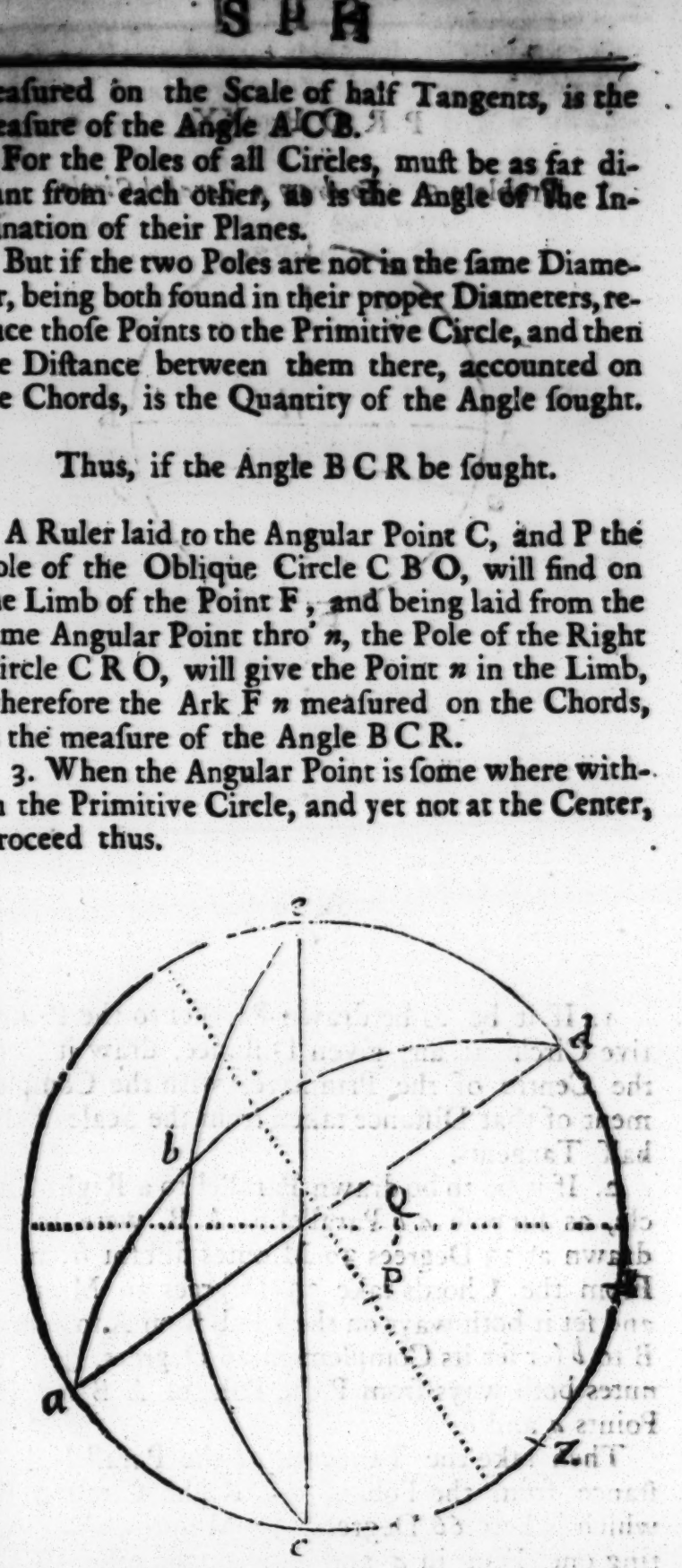
For the Poles of all Circles, must be as far distant from each other, as is the Angle of the Inclination of their Planes.

But if the two Poles are not in the same Diameter, being both found in their proper Diameters, reduce those Points to the Primitive Circle, and then the Distance between them there, accounted on the Chords, is the Quantity of the Angle sought.

Thus, if the Angle B C R be sought.

A Ruler laid to the Angular Point C, and P the Pole of the Oblique Circle C B O, will find on the Limb of the Point F, and being laid from the same Angular Point thro' *n*, the Pole of the Right Circle C R O, will give the Point *n* in the Limb, wherefore the Ark F *n* measured on the Chords, is the measure of the Angle B C R.

3. When the Angular Point is some where within the Primitive Circle, and yet not at the Center, proceed thus.

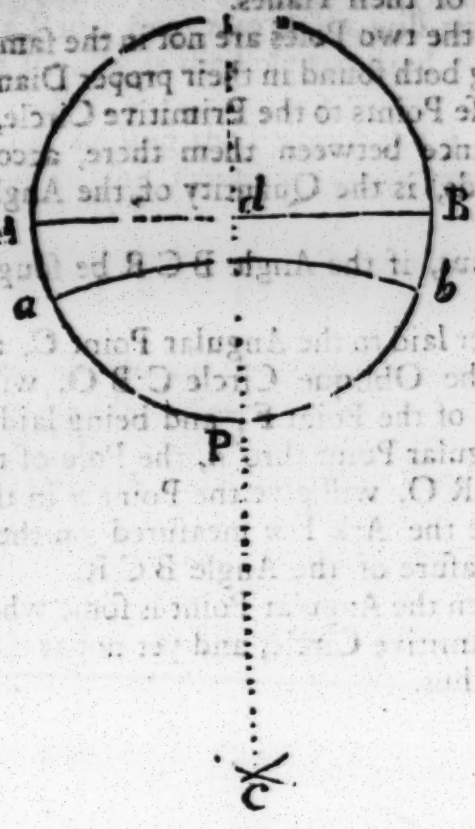


Suppose the Angle *a b c* be sought.

Find the Pole P of the Circle *a b d*, and then the Pole of the Circle *e b* C: After which lay a Ruler to the Angular Point; and the two Poles P and Q. and reduce them to the Primitive Circle, by the Points *x* and *z*; so is the Ark *x z* measured on the Chords, the Measure of the Angle *a b c* required, and C *b d* is its Complement to 180 Degrees.

PROP. XX.

Problem 9. *To draw a Parallel Circle.*

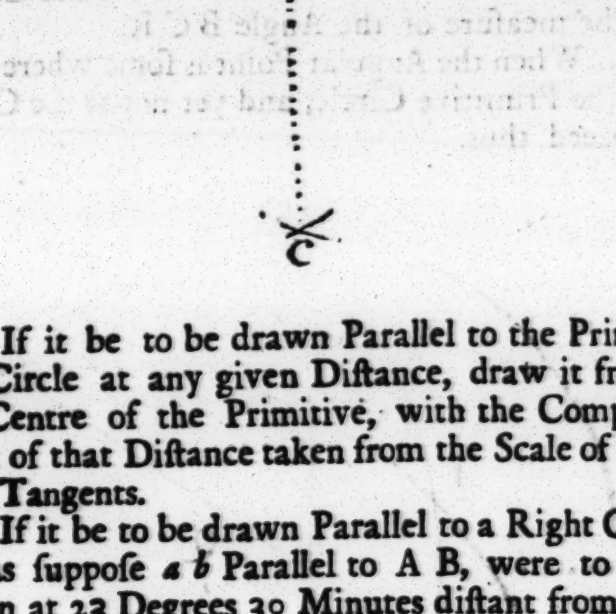


1. If it be to be drawn Parallel to the Primitive Circle at any given Distance, draw it from the Centre of the Primitive, with the Complement of that Distance taken from the Scale of the half Tangents.

2. If it be to be drawn Parallel to a Right Circle, as suppose *a b* Parallel to A B, were to be drawn at 23 Degrees 30 Minutes distant from it; From the Chords take 23 Degrees 30 Minutes, and set it both ways on the Limb from A to *a*, and B to *b* (or set its Complement 66 Degrees, 30 Minutes both ways from P the Pole of A B) to the Points *a* and *b*.

Then take the Tangents of the Parallels Distance from the Pole of the Right Circle A B, which is here 66 Degrees, 30 Minutes, and setting one Foot in *a* and *b*, with the other strike two little Arches to Intersect each other some where above P, which will give C the Centre of the Parallel Circle *a b d* required.

3. If it be to be drawn Parallel to an Oblique Circle, and at the Distance suppose of 40 Degrees.



First, find P the Pole of the Oblique Circle A B C, and then measure on the Scale of half Tangents the Distance g P, which suppose to be 34 Degrees, then add to it 50 Degrees the Complement of the Circles Distance, it will make 84 Degrees, and also subtracting 50 from it, or it from 50, it will make 16 Degrees: Then this Sum and Difference taken from the half Tangents, and set each way from P the Pole of the Oblique Circle, will give the Diameters two extreams *a* and *b*, or the Points of the Intersection of the Parallel; and then the middle Distance between *a* and *b*, is the Centre of the true Parallel Circle P *a b*, which is Parallel to the given Oblique Circle A B C, and at the given Distance of 40 Degrees; or the half Tangent of 84 set from *g*, will give *b*, and the half Tangent of 16 Degrees set also from *g*, will give the Point *a*, the two ends of the Parallel Circles Diameter.

PROP. XXI.

Problem 10. *To measure any Projected Arch of a Parallel Circle.*

Here will be three Varieties.

1. If it be Parallel to the Primitive, then a Ruler laid thro' the Centre and the Division of the Limb, will divide the Parallel into the same Degrees, or determine in the Limb the Quantity of any Ark Parallel to it.

2. If the Circle be Parallel to a Right one, as *a b d* is, in Case the second of the last Proposition, and it were required to measure that Ark *a b*, or to divide it into proper Degrees: Since that Parallel Circle is 66 Degrees, 30 Minutes distant from P, the nearer Pole of the Right Circle A B, and consequently 113 Degrees, 30 Minutes distant from its other Pole, take the half Tangent of 113 Degrees, 30 Minutes, or the Tangent of its half 56 Degrees, 45 Minutes, and with that Distance, and on the Centre of the Primitive, draw a Circle Parallel to the Limb; and divide that half of it, which lies towards the opposite Pole of AB into its Degrees, which is easily done by a Sector: Then a Ruler laid from P, and the equal Divisions of that Semicircle, shall divide *a b*, or measure any Part of it.

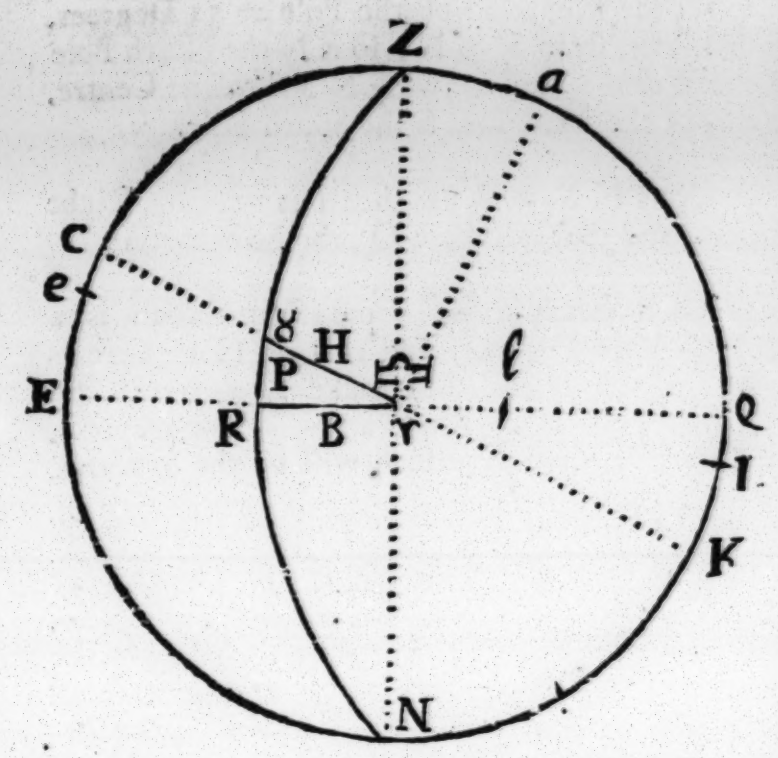
3. To measure or divide the Ark of a Circle which is projected Parallel to an Oblique one.

As suppose the Circle *a b* which is Parallel to the Oblique one A B C, in Case the third (*Fig.* 2.) of the preceding Proposition: And at the Distance of 40 Degrees; this Parallel Circle being 40 Degrees distant from the Plain of the Circle A B C must be 50 Degrees distant from its Pole, and consequently 130 Degrees from the opposite Pole. Take therefore the half Tangent of 130 Degrees, or the Tangent of its half 65 Degrees, and with that as a Radius, draw a Circle Parallel to the Limb of the Primitive; which Circle divide it into proper Degrees: Then shall a Ruler be laid thro' P, and the equal Division of that Circle, cut the little Circle *a b* into its proper Degrees; or truly give the Measure of any part of it.

SPHERICK *Triangle*, is a Space included within the Arks of three great Circles of the Sphere, Intersecting each other on the Surface of the Globe, and every such Triangle is either *Quadrantal*, which hath on one Side (at least a Quadrant and one Angle Right. Or *non Quadrantal*, which hath all its

its Sides more or less than 90 Degrees; and all its Angles bigger or lesser than Right ones.

The Application of Spherick Geometry, *to the Construction and Mensuration of all the Parts of Spherick Triangles.*



In the Right-angled Spherick Triangle ♈ R ♉.

H = 54 Degrees, 15 Minutes, the Sun's Longitude from the next Equinoctial Point, or 24 Degrees, 15 Minutes of ♉.

B = 51 Degrees, 52 Minutes, the Sun's Right Ascension.

P = 18 Degrees, 15 Minutes, the Sun's Declination.

♉ = the Angle of the Sun's Position.

♈, ♎, the Angle of the Sun's greatest Declination.

To make the Triangle.

With 60 Degrees of a Line of Chords, describe the Circle Z C K Q, which is the Limb, or Primitive Circle, and here represents the solsticial Colure. Draw the Diameter E Q, which will be the Equator *g* here represented by a Right Line, because the Eye is at ♈ or ♎, in its Plane. Take 23 Degrees, 30 Minutes from the same Chord, and set it from E to C, so shall C K be the Ecliptick, which will be a Right Line also for the same Reason. Then either the Sun's Place set from ♈ on the Ecliptick, or his Right Ascension set from thence on the Equator, will give the Point ♉, or R, accordingly. Then draw Z N at Right Angles to the Equator, and so you will have three Points Z ♉ N, or Z R N, thro' which the Circle of Declination Z ♉ R N, may be easily drawn.

To measure the Sides and Angles.

The Sides H and B being straight Lines, are measured on the Scale of half Tangents, by *Prop.* 6. of *Spherick Geometry*; and the Side P is measured by finding *l*, the Pole of the Oblique Circle Z ♉ H; and from thence laying a Ruler to the two Extremities of the Side P, (*i. e.*) thro' ♉ and R, in order to reduce them to the Limb in E and *e*; the Ark E *e*, measured on the same Line of Chords, will give the Quantity of the Side ♉ R = 18 Degrees, 15 Minutes.

And this is the general Rule to measure the Arks of all Oblique Circles, Prop. 18. Case 3.

For the Angles.

That at R, is a Right one, and so known.

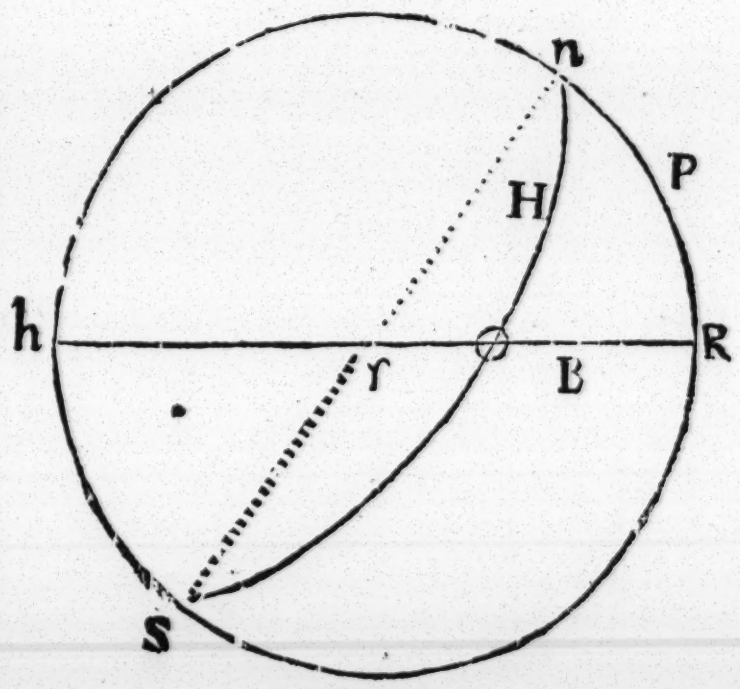
That at ♈, is the Angle of the Sun's greatest Declination = 23 Degrees, 30 Minutes, and its Measure is the Ark E C of the Limb, by *Prop.* 19. *Numb.* 1.

The Angle of the Sun's Position ♉, is measured by laying a Ruler thro' ♉, the Angular Point, and thro' *a* and *l*, the Poles of the Circles C ♈ K, and N ♉ Z, which will find the Points *a* and L in the Limb, and the Ark *a* L = 72 Degrees, is the Measure of the Angle ♉ required, by *Prop.* 19. *Numb.* 3.

You may consider also, the Triangle Z C ♉, where one Angle is at the Periphery of the Primitive Circle, and this will help to shew the Varieties of Right-angled *Spherick Triangles.*

Here the Angle C is a Right one, being made by an Hour Circle, or the Meridians cutting the Equator; for here C K may represent the Equator, and let Z be the Zeinth of any Place, then will C ♉ be the Hour from Noon; C Z will be the Latitude of the Place, and ♉ Z, the Complement of the Sun's Height, being now supposed to be in the Equator. The Angle Z will be the Sun's Azimuth from the South, the Oblique Circle Z ♉ R N, being a Vertical one; and the Angle ♉, will be the Angle of the Sun's Position. Which Triangle C ♉ Z may be formed, and all its Sides and Angles measured by the Propositions and Rules above delivered.

Again,



In the Right-angled Spherick Triangle N ⊙ R.

R = Right Angle made between the Horizon H R and the Meridian *n* R.

B = Complement of the ⊙'s Amplitude = 50 Degrees 8 Minutes.

H = to the Sun's Distance from the Pole above the Horizon *h* R; or the Complement of his Declination.

P = to the Elevation of the Pole, or Latitude of the Place.

⊙ = the Angle of the Sun's Poſition.

⊙ *n* R = the Hour from Midnight.

To deſcribe this Triangle.

Firſt, Draw the Circle *h n* R, repreſenting the Meridian, and then the Diameter *h* R, for the Horizon of *London*: Set the Poles height 51 Degrees, 30 Minutes from R to *n* the North Pole, and draw the Obſcure Axis, *n* ♈ S. Then if the Sun's Amplitude be given, ſet that, Suppoſe 39 Degrees 52 Minutes, from ♈ to ⊙, which will limit the Baſe B, and give a Point thro' which and the two other given Points *n* and S, a great Circle may be drawn, which will form the Triangle. But if inſtead of that, the Angle ⊙ *n* R, or the Time from Midnight had been given, then you muſt turn that Time into Degrees, and by *Prop.* 15. *Caſe* 2. make a Spherick Angle with the Limb, of that Number of Degrees, at the Point *n*, and that will determine the Point ⊙.

The Angle ⊙ *n* R, is meaſured by *Prop.* 19. *Caſe* 2.

Thus alſo in Oblique angled Spherick Triangles, *all the Sides and Angles may (by this Method) be meaſured, and the Triangles conſtructed.*

In the following Obtuſe-angled Spherick Triangle ⊙ Z N.

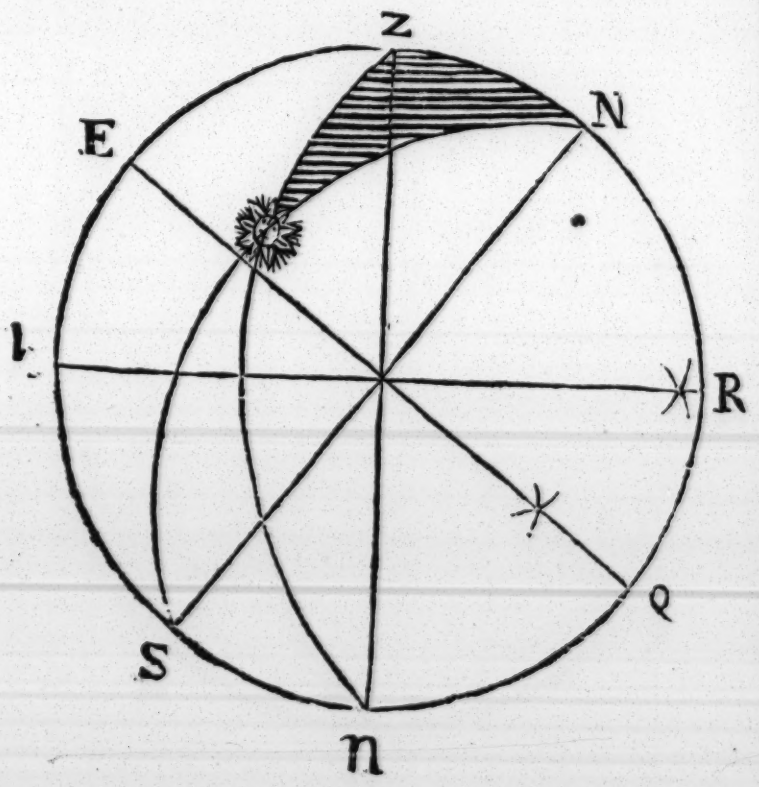
Z N = to the Complement of the Poles Elevation, = 38 Degrees, 30 Minutes.

⊙ N = the Complement of the Sun's Declination from the Equator E Q.

⊙ Z = 46 Degrees, 49 Minutes = the Complement of the Sun's Altitude above the Horizon *h* R.

⊙ N Z = 30 Degrees, is the Hour from Noon or Ten a Clock in the Morning.

⊙ Z N = 137 Degrees, 47 Minutes is the Sun's Azimuth from Z R *n*, the North part of the Meridian.



To Conſtruct the Triangle.

1. With 60 Degrees of a Line of Chords, draw the Primitive Circle Z R *n h*; which croſs in the Centre with two Diameters, *h* R repreſenting the Horizon of *London*, and Z N, the Prime Vertical Circle.

2. Set the Elevation of the Pole = 51 Degrees, 30 Minutes, from R to N; ſo is N the North Pole of the World: And drawing N S thro' the Centre, it will be the Axis, and S the South Pole.

3. Croſs N S with another Diameter at Right Angles, and that will be E Q, the Equinoctial.

4. Then becauſe the Time from Noon is 2 Hours, or 30 Degrees, and that all Hour Circles paſs thro' the Poles, and make Angles with the Meridian; make an Angle at N, of 30 Degrees, by *Prop.* 15. *Caſe* 2. which will be the Spherick Angle E N ⊙.

5. And ſince the Azimuth is 137 Degrees 47 Minutes, from the North, ſubduct that out of 180, and there will remain 42 Degrees, 13 Minutes, the Sun's Azimuth from the South; and becauſe all Azimuths, or Vertical Circles, paſs thro' Z the Zenith; make an Angle with the Primitive at Z, of 42 Degrees, 13 Minutes, (by *Prop.* 19. *Caſe* 2.) and ſo will your Triangle be Stereographically projected, and the Reaſon of the Thing made plain and eaſie.

I don't give Inſtances of the *Analemma*, or of the ſeveral Stereographick Projections on the Plains of the Horizon, Equator, Meridian, *&c.* becauſe you will find them in their proper Places under thoſe Words.

SPHERICAL *Numbers.* See *Circular Numbers.*

SPHEROID, is a ſolid Figure made by the Rotation of a *Semi-Ellipſis* about its Axis; and is always equal to ⅔ of its circumſcribing Cylinder, *Archim. de Conoid. & Spheroid.* 18. & 25. 2.

SPHINCTER, is a Muſcle that contracts the Gullet, *Anus*, Bladder, *&c.*

SPHINCTER *Ani*, is a large, thick, fleſhy Muſcle encompaſſing the *Anus*: Its Figure and Series of Fibres externally, immediately under the Skin, incline to an oblong Oval: It is connected forward, to the *Accelerator Urinæ*; backwards, to the *Os Coccygis*; its Fibres are Circular for near two Inches in breadth; it is much larger in Men than in other Animals, in whom by reaſon of the erect Poſition of the Body, there is greater Force required to retain the *Fæces*, which is the Office of this Muſcle.

SPHINCTER *Gulæ.* See *Oeſophagus Gulæ.*

SPHINCTER *Vaginæ*, is a Muſcle lying immediately under the *Clitoris*, encompaſſing the *Vagina* with Circular Fibres 3 Fingers in Breadth: In ſome Subjects (ſaith Mr. *Cowper*) it ſcarce appeareth fleſhy. When this Muſcle acts, it not only ſtraitens the *Vagina*, but thereby it alſo hinders the Blood in its return from the *Plexus retiformis* of the *Pudendum*, by compreſſing ſome of its Veins that paſs underneath, by which means the *Labia* becomes diſtended, and the *Vagina* contracted.

SPHINCTER *Veſicæ*, is a Muſcle ſeated in the upper part of the Neck of the Bladder, immediately

ately above the *Glandulæ Proſtatæ*; whoſe Contraction hinders the Involuntary Egreſs of the Urine.

SPHYGMICA, is that Part of Phyſick which treats of Pulſes. *Blanchard.*

SPIKES, or as the Seamen call them *Speeks*, are large long Iron Nails with flat Heads; they are of divers Lengths, ſome a Foot or two long, and ſome are jagged, ſo that they cannot be drawn out again. They are uſed to faſten the Planks and Timbers. They call alſo a kind of ſmall *Fidd*, which ſerves them to open and ſplice ſmall Ropes, a *Marling Spike.*

SPIKING *up the Ordnance*, is faſtning a *Coin*, or *Quoin* with Spikes to the Deck, cloſe to the Breech of the Carriages of the Great Guns, that they may keep cloſe and firm to the Ship-ſides and not break looſe when the Ship *Rolls*, and by that means endanger the breaking out of the *Butt-head* of a Plank.

SPINA *Dorſi*, are the hinder Prominences of the *Vertebræ.*

SPINA *Ventoſa*, is an Ulceration, in which the Bones are eaten by a malignant Humour without any Pain of the *Perioſteum*, or Membrane that covers the Bone: After that, a Swelling being riſen without any Pain, the Part affected is quite eaten out with the Ulcer, from whence frequently follows a Neceſſity of Amputation.

SPINALIS *Colli*, is a Muſcle ſo called, becauſe it accompanies the Spines of the Neck; it ariſes from the five ſuperior Tranſverſe Proceſſes of the *Vertebræ* of the *Thorax*, and inferior of the Neck, and in its Aſcent becomes more fleſhy, and is ſo inſerted largely into the inferior Part of the *Vertebræ* of the Neck laterally, *&c.* Theſe draw the *Vertebræ* of the Neck directly backwards.

SPINALIS *Medulla.* See *Medulla Spinalis.*

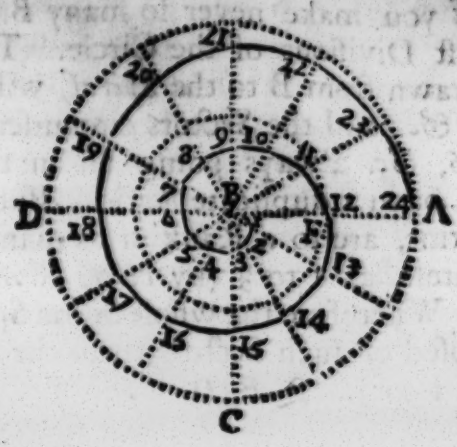
SPINDLE, is the ſmalleſt Part of a Ship's Capſtan which is betwixt the two Decks. The *Spindle* of the *Jeer Capſtan* hath *Whelps* to heave the *Viol.* Alſo the Axis of the Wheel of a Watch or Clock is called the *Spindle*, and its Ends the *Pevets.*

SPINE, the Back-Bone, or long jointed Chine-Bone that goes down the Back.

SPINSTER, a Term in Law, being an Addition uſually given to all unmarried Women, from the Viſcount's Daughter downward.

SPIRAL-*Line*, in Geometry, is according to *Archimedes* thus generated.

If a Right Line as A B, having one end fix'd at B, be equally moved round, ſo as with the other end B, to deſcribe the Periphery of a Circle; and at the ſame time a Point be conceived to move forward equally from B towards A in the right Line B A, ſo as that the Point deſcribes that Line, while the Line generates the Circle. Then will the Point with its two Motions deſcribe the curve Line B, 1, 2, 3, 4, 5, *&c.*



which is called an *Helix* or Spiral Line; and the plane Space contained between the Spiral Line and the Right Line B A, is called the *Spiral Space.*

If alſo you conceive the Point B to move twice as ſlow as the Line A B, ſo as that it ſhall get but half way along B A when that Line ſhall have formed the Circle; and if then you imagine a new Revolution to be made of the Line carrying the Point, ſo that they ſhall end their Motion at laſt together; there will be formed a *Double Spiral Line*, and two Spiral Spaces as you ſee in the Figure. From the Geneſis of which may eaſily be drawn theſe Coroliaries.

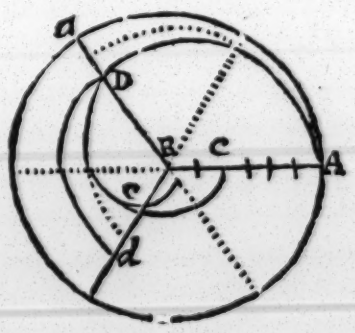
1. That the Lines B 12, B 11, B 10, *&c.* making equal Angles with the firſt and ſecond Spiral, (as alſo B 12, B 10, B 8, *&c.*) are in Arithmetical Proportion.

2. The Lines B 7, B 10, *&c.* drawn any how to the firſt Spiral, are to one another as the Arks of the Circle intercepted betwixt BA and thoſe Lines. Becauſe whatever Parts of the Circumference the Point A deſcribes, as ſuppoſe 7, the Point B will alſo have run over 7 Parts of the Line A B.

3. Any Lines drawn from B to the ſecond Spiral, as B 18, B 22, *&c.* are to each other, as the aforeſaid Arks, together with the whole Periphery added on both ſides: For at the ſame time that the Point A runs over 12, or the whole Periphery, and perhaps 7 Parts more, ſhall that Point B have run over 12 and 7 Parts of the Line A B, which is now ſuppoſed to be divided into 24 equal Parts.

PROPOSITIONS.

I. *The firſt Spiral Space* A D c B *is to the firſt Circle* : : *as* 1 *to* 3.



Divide the Circumference of the Circle into 3 = Parts by Lines drawn from the Center B, beginning from the firſt Line B A; then will (by *Cor.* 1.) B *c* be = 1, B D = 2, and B A = 3; and the Sectors circumſcribed about the Spiral will be as the Squares of the *Radii*, *viz.* C B *c* = 1, D B *d* = 4,

D B d = 4, and A B a = 9; and ſo it will be always, if you make never ſo many Biſſections of the 3 firſt Diviſions of the Circle. That is, the Lines drawn from B to the *Spiral*, will be as 1,2, 3,4,5,6, *&c.* and the Sectors circumſcribed, as 1, 4, 25, 36, *&c.* always going on in the order of Squares, or in a duplicate Ratio. But a Rank of ſuch Terms, are to a Rank of as many, equal to the greateſt, as 1 to 3 (by *N.* 7. of *Arithm. Progreſſion.*) Wherefore the whole Spiral Space (which is compoſed of ſuch Sectors) is to the whole Circle : : as 1 to 3. *Q. E. D.*

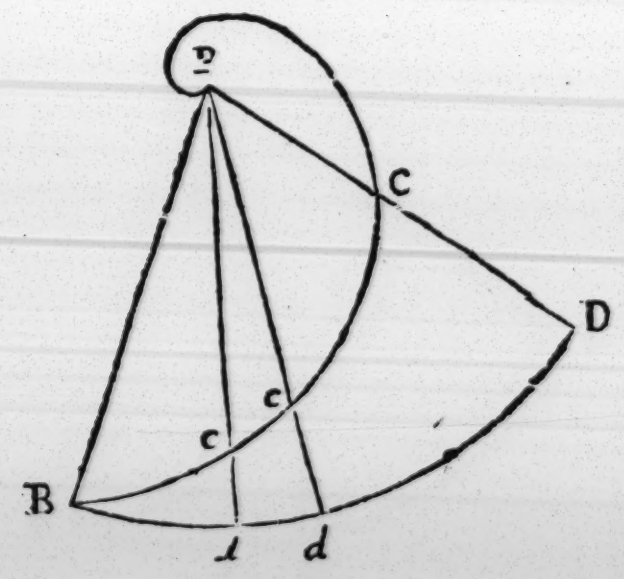
(Or,)

If another Circle be drawn with a Radius double to the former, its Area will be (as the Square of its Diameter) 4 times as great as that of the former. Therefore the firſt Circle to the ſecond will be as 1 to 4, or as 3 to 12. And ſince the Spiral Space is to the firſt Circle as 1 to 3, that Space to the ſecond Circle will be as 1 to 12; and to a 3d Circle ſo deſcribed, as 1 to 27; to a 4th, as 1 to 48, *&c.*

II. *The firſt Spiral Line is equal to half the Periphery of the firſt Circle; for the Radii of the Sectors, and conſequently the Arches are in ſimple Arithmetick Progreſſion, while the Periphery of the Circle contains as many Arches equal to the greateſt; wherefore the Periphery to all thoſe Arches, is to the Spiral-line as* 2 *to* 1 (*by* N. 6. *of* Arithm. Progreſſion.)

I thought one Propoſition, with a Corollary or two, enough on this Subject, to give the Reader a Specimen of the *Geneſis*, *Nature* and *Properties*, and way of Demonſtration uſed about *Spiral Lines*: Thoſe that will ſee more, may conſult *Archimedes*, Dr. *Wallis*'s *Arithmetick of Infinites*, or *Sturmius*'s *Matth. Enucleat.* lib. 2. Chap. 4.

Proportional Spirals, are ſuch Spiral Lines as the Rhumb Lines on the Terreſtial Globe, which becauſe they make equal Angles with every Meridian, muſt alſo (as we ſhew in *Prop.* 7. of Spherick Geometry, which ſee) make equal Angles with the Meridians in the Stereographick Projection on the Plane of the Equator; and therefore will be, as the Learned Capt. *Halley* obſerves, *Proportional Spirals* about the Polar Point. From whence that excellent Mathematician demonſtrates, That the Meridian Line is a Scale of Log. Tangents of the $\frac{1}{2}$ Meridian-complements of the Latitudes. See *Meridian Line.*



In Proportional Spirals; the Angles BPD, BP*d*, *&c.* or the Arches B D, B *d*, *&c.* are *Exponents* of the *Ratio's* of B P to P C. For if the Arch B D be divided into innumerable equal Parts, right Lines drawn from them to the Center P, ſhall divide the Curve B *c c* C into an Infinity of Proportionals; and all the Lines P *c*, P *c*, *&c.* ſhall be an Infinity of Proportionals between P B and B C, whoſe Number is equal to all the Points *d d*, in the Arch B D: But an infinite Number of Proportionals between the two Terms of the Ratio, is to that infinite Number of equal Parts between any other two Terms : : as the Logarithm of the one Ratio is to the Logarithm of the other; therefore, as B D to B *d*, or as the Angle B P D to the Angle B B *c*; ſo is the Logarithm of the Ratio of P B to P C, to the Logarithm of the Ratio of P B to P *c*. *Q. E. D.*

SPIRIT, which the Chymiſts call Mercury, is one of the 5 Principles ſeparable from a mixt, by Fire; 'tis ſubtil, light, penetrating, and active, and hath its Particles in a very quick Motion. This is propably that which cauſes the Growth and Encreaſe of all Bodies; but where it abounds moſt, thoſe Bodies do ſooneſt corrupt, becauſe of its rapid Motion. This appears in Vegetable and Animal Bodies, which yield the greateſt Quantity of Spirit; whereas moſt Minerals, as having but a ſmall Proportion of Spirit in them, are almoſt incorruptible.

This Principle is never drawn pure, any more than the others; and when it comes over involved in a little Oil, 'tis called an Ardent Spirit, ſuch as Spirit of Wine, which therefore ſhould rather be called an exalted Oil; and when it hath in it a little Volatile Salt diſſolved, 'tis called a *Volatile Spirit*, as the Spirit of Hartſhorn, Urine, *&c.* If it be impregnated with Acid Salts, its Volatility is then check'd, and 'tis called an *Acid* or *Fixt Spirit*, as Spirit of Salt, Vitriol, Allum, *&c.* which truly are only an Acid Salt diſſolved and put into Fuſion by a ſtrong Fire.

SPIRIT *of Niter* is thus drawn: Mix one part of Salt-peter with three times as much Potters-earth dried; put this Mixture into a large earthen Retort, and ſet it in a cloſe Reverberatory Fire; diſtil off the Phlegm with a ſmall Fire in about 4 or 5 Hours, and when no more Drops will come, lute on a very large Receiver, and encreaſe the Fire gradually to the 2d Degree, ſome more volatile Spirits will come out in white Clouds: Keep the Fire thus about two Hours, and then encreaſe it to the greateſt Violence you can give it, the Vapours will come red; continue the Fire till no more red Fumes come; in 14 Hours the Operation will be over. If you uſed 2 Pounds of Nitre, you will draw 1 Pound 14 Ounces of Phlegm and Spirit together. The Veſſels had need be large, and $\frac{1}{3}$ of the Retort left empty, elſe there will be danger of breaking all to pieces, the Spirits come forth with that Violence.

This Spirit is the beſt *Aqua-fortis*, and is chiefly uſed for Solution of Metals. But when dulcified, is a good Medicine inwardly in many Caſes.

SPIRIT *of Salt*, is made by drying and powdering the Salt, and then mixing of it with thrice its Weight of Potters-earth powdred: A Paſte is made of theſe two with a little Rain-water, and then the Paſte is made into little Balls or Pellets about as big as Nuts. A large earthen Retort or glaſs one coated, hath one third of it filled with theſe,

theſe, and being placed in a Reverberatory Fire, hath a large Receiver fitted to it. The Junctures muſt not be luted at firſt, but a very moderate Fire uſed for a time, to diſtil out all the Water: But as ſoon as you ſee ſome little white Clouds appear, throw out the incipid Liquor in the Receiver, and Lute it well to the Retort: Then encreaſe the Fire by degrees to the higheſt, and ſo let it continue 12 or 15 Hours, or till no more Clouds appear; when the Operation is ended, you will find the Spirit of Salt in the Receiver. Some rectifie this Spirit afterwards in a Cucurbite, by drawing off ſome of the weaker Spirit in a gentle Sand-heat, and then what remains is very ſtrong of a yellow Colour, and very weighty.

If equal Parts of this acid Spirit and Spirit of Wine are mixed together, and digeſted for about 3 or 4 days, 'tis called *Spirit of Salt dulcified.*

Spirit of Salt will diſſolve Leaf Gold, and will precipitate what *Aqua Fortis* hath diſſolved. Which ſhews how very differently formed and figured the Point and Pores of *Acid Menſtruums* may be, and frequently are.

SPIRIT of *Sulphur*, commonly call'd Oil of Sulphur, *per Campanam*, (from the Veſſels form being like a Glaſs Bell, in which it is uſually drawn) is only the acid Part of Sulphur turned into a Liquor by the means of *Fire*. *Lemery* uſes a great Glaſs Tunnel for this Operation; which ſeems to be the beſt way of drawing this Spirit, *vid.* p. 445. *laſt Edition*. Some make uſe of Salt-petre in the drawing of Spirit of Sulphur, but that is not a good Practice, becauſe the Nitre alters ſomething of the mixture of the Spirit.

SPIRITS *in an Animal Body*, were reckoned of three ſorts; the Animal Spirits in the Brain, the Vital in the Heart, the Natural in the Liver: But late Authors diſtinguiſh 'em only into two kinds; the Animal in the Brain, the Vital and Natural (which are accounted the ſame) in the maſs of Blood. The Animal Spirits are a very thin Liquor, which diſtilling from the Blood in the outward or Cortical Subſtance of the Brain, are by the proper Ferment of the Brain exalted into Spirit, and thence through the Medullar Subſtance of the Brain, the *Corpus Calloſum*, and *Medulla Oblongata*, are deriv'd into the Nerves and Spinal Marrow, and in them perform all the Actions of Senſe and Motion.

The Vital or Natural Spirits are the ſubtileſt Parts of the Blood which actuate and ferment it, and make it fit for Nouriſhment.

SPLANCHNICA, are Medicines proper againſt Diſeaſes of the Inteſtines.

SPLEN, *ſive Lien*, the Spleen, is a Receptacle for the ſalt and earthy Excrements of the Blood, that there, by the Aſſiſtance of the Animal Spirits, it may be volataliz'd, and returning again into the Blood, may concur to its farther Fermentation. The Spleen conſiſts of a great number of little Bladders, between which the Glandules are ſcattered up and down, and ſupply the place of Veins. The Spleen has likewiſe an Artery, Nerves, and Lymphatick Veſſels, firſt diſcover'd by *Fr. Ruiſch*, ſays *Blanchard*. But you will find a much better Account of it in *Gibſon's* Anatomy, p. 106. See Vol. 2.

SPLENA, are Bolſters made of Linen, three, four, or five times doubled, even to the thickneſs of the Spleen: They are uſed upon Wounds, Ulcers, and Fractures. The Figure is threefold, according to the manner of Application, *viz.* at length obliquely, or tranſverſly: They are called alſo *Plumaceoli*, and *Plagulæ*. *Blanchard.*

SPLENETICK *Artery*, is ſaid by ſome to be the greateſt Branch of the *Cœliaca*, whence it goes to the *Spleen*, and therein ends.

SPLENII *Muſculi*, ariſe partly from the five lower *Vertebræ* of the Neck; and partly from the points of five of the upper *Vertebræ* of the Thorax: The Fibres of theſe Muſcles tend obliquely, and are faſtened to the hinder part of the Head. The uſe of 'em is to draw the Head backward. It hath its Name from its Figure, being ſomething like to an Ox's Spleen.

SPLICE. At Sea they ſay a Cable or Rope is *ſpliced*, when the ends of two pieces being untwiſted, the ſeveral Strands are wrought into one another by a Fidd. Alſo when an Eye is to be made at the end of a Rope, the ends of the Strands are by a Fidd drawn into the ends of the other Ropes Strands; and this is called a *Splice*.

SPLIT; the Seamen ſay when a Sail is blown to pieces, it's Spilt.

SPOLIATION, is a Writ that lies for one Incumbent againſt another, in any caſe where the Right of the Patronage cometh not in Debate: As if a Parſon be made a Biſhop, and hath Diſpenſation to keep his Rectory, and afterwards the Patron preſent another to the Church, which is Inſtituted and Inducted; the Biſhop ſhall have againſt this Incumbent, a Writ of *Spoliation* in Court *Chriſtian*.

SPONDÆUS, is the Foot of a Latin Verſe, conſiſting of two Syllables, and both of 'em long, as *Ingens*.

SPONGOEIDEA *oſſa*. See *Cribriformia*.

SPOONING, when a Ship being under Sail in a Storm at Sea, cannot bear it, but is forced to put right before the Wind; then the Seamen ſay, *ſhe ſpoons*; and when in ſuch a caſe there is Danger leſt ſhe ſhould bring her Maſts by the Board with her rowling about, or Seel under Water, and ſo Founder, they uſually ſet up the Fore-ſail to make her go the ſteadier, eſpecially if there be Sea-room enough; and this they call *Spooning with the Fore-ſail*.

SPORADICI *Morbi*, are thoſe Diſeaſes which (tho' different in Nature) ſeize ſeveral People at the ſame time, and in the ſame Country.

SPOTS *in the Sun*. 'Tis certain thoſe opake Maſſes which ſometimes appear at the Sun, are not Planets revolving at any, even the leaſt diſtance from him, but *Spots* or *Maculæ* adhering to him; for whereas they revolve but once in about 26 Days; on Calculation it will appear, that a Planet near the Sun's Surface, as theſe muſt be, cannot have above 3 Hours allowed for its periodical Revolution, which being ſo different from the forementionꝺ ſpace of 26 Days, quite decides that Controverſie, and demonſtrates thoſe Maſſes to be real *Maculæ* adhering to the Body of the Sun, as is here aſſerted.

Anno 1660, *April* 27th, 8 H. A. M. the Honourable Mr. *Boyle* obſerved a *Spot* in the lower Limb of the Sun, a little towards the South of its Equator, which was entred about $\frac{1}{40}$ of the Sun's Diameter, it ſelf being about $\frac{1}{180}$ in its ſhorteſt Diameter of that of the Sun, its longeſt about $\frac{1}{4}$ of the ſame.

May the 8th, about 10 in the Morning, it appeared near about the ſame diſtance from the Weſtward Limb, a little South of its *Equator*; tho' at firſt it appear'd to be from the Eaſtward Limb, a little South alſo of its *Equator*. *May* the 9th, it diſap-

diſappeared. This *Spot* was very dark, and almoſt of a Quadrangular Form, and was encloſed round with a kind of duskiſh Cloud.

May the 25th, the ſame *Spot* appear'd again, and ſeemed to be in a part of the ſame Line it had formerly traced, and was entred about $\frac{1}{13}$ of its Diameter, about 7 h. P. M. At which time there appear'd another *Spot*, which upon its entrance was not above $\frac{1}{13}$ part of the Sun's Diameter: It appear'd to be longeſt towards the North and South, and ſhorteſt towards the Eaſt and Weſt: and there ſeemed to be diſperſed about it divers ſmall Clouds here and there.

Anno 1671, *Auguſt* the 11th, 6 h. P. M. Mr. *Caſſini*, by the help of a Three-foot Glaſs, obſerved in the Sun's Diſk *two Spots* very dark, and diſtant from his apparent Center about $\frac{1}{3}$ of his Semidiameter.

But, that he might the more exactly note their Situation, in reſpect of the ſeveral Parts of the World, he made uſe of two very fine Threads, cutting one another at Right Angles in the common *Focus* of the two Glaſſes, and in the Axis of the Teleſcope; ſo that he might ſee the Sun's Center, and according as one of theſe Threads advanced Weſtward, it mark'd in the Sun a Circle parallel to the *Equator*; and the other Thread marked the Circle of *Declination*, or the *Horary Circle*. Then he obſerved that the *Spots* were in the Southern part of the Sun; that their Elongation from this Parallel, paſſing thro' his Center, could be no more than about $\frac{1}{16}$ of his Diameter; and that they were ſituated on the Eaſtern-ſide in reſpect of the ſaid Center of the Sun. He alſo meaſured ſeveral times, from 6 a Clock at Night, to 7, the time which lapſed between the paſſage of the Sun's Center, and that of the firſt of theſe Spots, thro' the ſaid *Horary Circle*, which ſometimes he found to be 23, ſometimes 22 *Seconds*, the Semidiameter of the Sun then paſſing in 66 *Seconds*.

Auguſt the 12th, he obſerved them from the time of Sun-riſing, and perceived that now they were nearer his Center. The time between the paſſage of the Sun's Center, and that of the interior edge of the Coronet which encompaſſed them both, was then of 16 Seconds. At 7 a Clock it was but of 15, and the Southern Limb of the Coronet touched the Parallel paſſing through the Sun's Center.

From 6 at Night unto 7, the time between the paſſage of the Sun's Center and that of the Coronet's Limb, was found to be one time of 8 Seconds, at another time of 7", and another of 7" $\frac{1}{2}$. The diſtance of the *Spots* unto the Parallel, paſſing thro' the Sun's Center, was near the ſame on the North-ſide, with what it had been obſerved to be in the Morning on the South ſide.

Auguſt the 13th, about 6 in the Morning, the edge of the Coronet was diſtant from the Equator, on the North-ſide, 30 Seconds; and there was but one Second of Time from the paſſage of the Sun's Center into the paſſage of the ſame anterior edge of the Coronet.

At 8 h. 30', the Fore-edge was in the ſame *Horary Circle* with the Sun's Center; ſo that in one Day and an half, theſe Spots have run thro' very near the third part of the Sun's apparent Semidiameter, which giveth an Arch of 19 Degr. 30 Min. of the Circumference of the Sun's Body; and conſequently their Diurnal Motion about the Sun's *Axis* hath been of 13 Degr. and the time of their Periodical Revolution as far as could be conjectured in ſo little Time, muſt be about 27 Days and a half; which was confirmed afterwards by farther Obſervations. *Phil. Tranſ.*

Auguſt the 30th, 1671, Dr. *Hook* obſerved a large *Spot* in the Center of the Sun's Face about Noon.

Sept. the 1ſt, he ſaw the ſame *Spot* again, and obſerved it to be moved about $\frac{1}{4}$ of the Sun's Diameter Weſtward.

April the 25th 1683, Mr. *Flamſtead* ſaw a large *Spot*, having 3' 40" more *North Declination* than the *Sun's Center*, and at 3 h. 35' after Noon he meaſured its *Diſtance* from the next *Limb*, 8', 40".

April the 26th, he ſaw it more remote from the *Limb*, and at 8 a Clock determined its Longitude from the Sun's Axis 66 $\frac{1}{2}$ Degr. and its Declination from the Solar Equator 8 $\frac{1}{2}$ Degr. South.

The Revolution of this *Spot*, Mr. *Flamſtead* found to confirm his former Theory of the Sun's Motion round his Axis in 25 d. 6 h. and that the Angle of his Equator and our Ecliptick is 7 Deg. and the Longitude of his Northern Pole was in ♈ 16°.

SPRING *of the Air*, or its *Elaſtical Force*, ſee more in *Air*.

That there is ſuch a Spring or Elaſticity in the Air, is clear from the following Experiments.

1. That Bladders but half blown up, and having their Necks well tied, did ſwell in their *exhauſted Receiver* as if blown to their full Dimenſions; and that full blown Bladders, and even thin ſquare glaſs Viols well ſtop'd, will break to pieces when once the Air is well pump'd out of the Receiver.

2. A glaſs Syphon whoſe recurved Leg was turn'd up parallel to the upper and longer, and was ſealed Hermetically at the end of the leſſer or ſhorter Leg, had a Quantity of Quickſilver poured into it, and by its being moved often up and down, the Air in the ſealed and ſhorter Leg, was brought to the ſame Temperament of the External. After this more Mercury was poured in, till the Air in the ſealed Leg was compreſſed into about half its uſual Dimenſions, and then the Mercury in the longer Leg was 29 Inches higher than that in the ſhorter: By which it appears plainly, That the Spring of the Air in the ſealed Leg was ſo great, as to equiponderate a Column of Mercury of 29 Inches in Length. *Boyle* againſt *Linus*.

3. A Viol filled to but a 4th part with Quickſilver, had a long and ſlender glaſs Pipe faſtened into its Neck, with Sealing-Wax or Cement, whoſe lower Orifice was a good way under the Quickſilver in the Viol; then having blown in a little Air, to try whether the Viol were well ſtopp'd, it was convey'd into a long and ſlender Receiver; and after the Air was drawn off by the Pump, the Spring of the included Air within the Bottle, impelled the Mercury up to the Height of 27 Inches in the Pipe, and there kept it ſuſpended; till upon the Re-admiſſion of the Air, the Quickſilver fell down to its firſt Station in the Pipe. This Experiment Mr. *Boyle* often tried, and with deſir'd Succeſs.

And when it was tried with a Bottle that held a Quart, the Spring of ſuch a Quantity of Air was able to raiſe the Mercury up to 29 Inches $\frac{1}{8}$. But nothing could make it raiſe above the common Height of the Quickſilver in the Baroſcope.

4. Into a Copper Veſſel of a Cylindrical ſhape, was put almoſt Water enough to fill it, and then was immerſed into it and kept under Water by a Weight, a ſquare glaſs Viol that would hold 9 or 10 Ounces of Water, and was well ſtopp'd: After this, Mr. *Boyle* placed the Copper Veſſel in his *Penumatical Engine*, and pumping up the Air, he found, That the Spring of the Air included in the Viol broke it all to Pieces, tho' under Water, with a great Noiſe, and made a kind of Smoak or Miſt appear above the Surface of the Water.

Which Experiment proves both the great Force of the Natural Spring of the Air, when the Weight of the Atmoſphere is removed; and alſo that the Weight of the Atmoſphere acts upon Bodies under Water; for that could by its univerſal preſſure keep the Spring of the Air in the Bottle bent while it was under the Surface of the Water; but when once *that*, by plying the Pump, was taken off, the Elaſtick Particles unbent themſelves violently, and broke the Viol. *See the Experiments about the Preſſure of the Airs Spring on Bodies under Water.*

The Spring of the Air, is equal every where in a natural State to the Weight of the incumbent Atmoſphere; juſt as if a Perſon ſhould ſqueeze or compreſs together either by the force of his Hand, or by a Weight, any parcel of Wool, or ſuch Elaſtick Bodies, the Wool would by its Spring equally preſs againſt the Hand or Weight. According to the third Axiom of Sir *Iſaac Newton*'s Principia, *Actioni contrariam ſemper & æqualem eſſe Reactionem.*

The Accurate Dr. *Hook* on Experiments well made, thinks we may conclude the Spring of the Air to be *Reciprocal* to its *Extenſion*. *Micrograph.* p. 227.

And the Reſiſtance of the *Spring of the Air*, is found to be nearly equal to the Weight or Force that compreſſes it; and the Spaces that the ſame Air occupies under differing Preſſures, are Reciprocally as thoſe Preſſures.

The Quantity of the Dilatation and Expanſion of Air only by the Operation of its Spring, without any additional Heat, Mr. *Boyle* found to be ſo great, that a Bubble of Air included in a proper glaſs Pipe almoſt filled with Water, was extended to above 150 times its former Dimenſions; and he believes would have taken up 200 times its former Room, had the Tube been long enough to have tried the Experiment. *New Exper. Phyſ. Mech. Edit.* 3. *p.* 32, 33.

He found alſo, that a Cylinder of Air of an Inch in Diameter, and leſs than two Inches in Length, would, when included in a Bladder, and the Weight of the Atmoſphere taken off by pumping, by its bare Spring only, raiſe a Weight of above 10 Pounds *Averdupois*.

He found alſo, that the Spring of a Cylinder of Air of 2 Inches Diameter, and of the former length, was in the ſame Engine able to raiſe up 42 Pound Weight.

Whence it appears, that the Force of the Spring of different Cylinders of Air is in a duplicate Ratio, to the Diameters of thoſe Cylinders.

The Spring of the Air, may be explicated either by ſuppoſing the Air near the Earth to conſiſt of an heap of ſuch little Springy or Elaſtick Bodies lying one upon another reſembling thoſe of a Fleece of Wool.

Or elſe according to *D. Cartes* his way by ſuppoſing, That the Air is nothing but a *Congeries* of flexible Particles of ſeveral kinds of Figures and Sizes, which are raiſed by Heat into the fluid and ſubtile *Ethereal Matter* that ſurrounds the Earth, and by the continual Agitation of that *Matter*, wherein thoſe Particles ſwim, are ſo whirled about, that each Corpuſcle endeavours to beat off all others from coming within the little Sphere requiſite to its Motion about its own Center, and (in caſe any, by intruding into that Sphere ſhall oppoſe its free Rotation) to drive it away.

SPRING *a Maſt*; ſo the Seamen call it, when a Maſt is only crack'd, but not quite broken, in any part of her; as in the *Partners*, the *Hounds*, &c. then they ſay, *The Maſt is Sprung*.

SPRING-*Arbor*, in a Watch, is that part in the middle of the Spring Box which the Spring is wound or turned about, and to which it is hooked at one end.

SPRING-*Box*, is that Cylindrical Caſe or Frame that contains within it the Spring of a Watch or other Movement.

SPRING-*Tide*, is the increaſing higher of a Tide after a dead Neipe; this is about 3 Days before the Full or Change of the Moon; but the top or higheſt of the Spring-Tide is 3 Days after the Full or Change; then the Water runs higheſt with the Flood, and loweſt with the Ebb, and the Tides run more ſtrong and ſwift than in the Neipes.

SPRINGS *and Fountains*. Concerning the Origin of theſe, there is much Diſpute, eſpecially of ſuch as are found on the tops of high Mountains.

Some, as Dr. *Hook*, Dr. *Plott*, and many others, think that they ariſe from the Sea-water percolated through the Bowels of the Earth, which by that means being deprived of its Salt, is rendred much Lighter than before, and ſo is capable of riſing up to the height we commonly find Springs at, as Water riſes in a Filtre, or in very ſmall Tubes, &c.

And Dr. *Hook* hath a pretty Experiment about this, in his *Microgr. p.* 25.

But I cannot ſee how by this Hypotheſis, ſuppoſing the Gravity of the whole Atmoſphere could be taken off, Water can ariſe above 34 or 35 Foot above the level of the Ocean.

The Learned Capt. *Halley* ſuppoſes them to be cauſed from the Vapours exhaled by the Sun out of the Sea, &c. Of which ſee an Account under the Word *Vapour*.

The Ingenious Dr. *Woodward*, in his Natural Hiſtory of the Earth ſuppoſes, That the great Abyſs of Waters placed in the Bowels of the Earth, is the ſtanding Fund and promptuary which ſupplies Water to the Surface of the Earth, and furniſhes as well Springs and Rivers, as Vapours and Rain.

For he aſſerts, That there is a nearly uniform, and conſtant Fire or Heat, diſſeminated thro'out the Body of the Earth, and eſpecially in the inferior Parts of it: The Bottoms of the deeper Mines being very ſultry, and the Stone and Ores there being very ſenſibly hot even in Winter. That 'tis

this ſubterraneous Heat which evaporates and elevates the Waters of the Abyſs, buoying it up indifferently on all Sides, and towards all Parts of the Surface of the Globe.

That this riſing Vapour, or Water, pervades not only the Fiſſures and Intervals of the *Strata*, but the very Bodies of the *Strata* themſelves, permeating the Interſtices of the Sand, Earth, or other Matter, whereof they conſiſt; yea, even the moſt firm and denſe Marble and Sand-ſtone; for theſe give Admiſſion to it, tho' in leſſer Quantity, and are always found ſaturated with it; which is the reaſon that they are ſofter, and can be cut much more eaſily when they are firſt taken out of the Earth, than they can afterwards, when they have lain ſome time expoſed to the Air, and when that Humidity is evaporated.

This Vapour he aſſerts to proceed directly up towards the Surface of the Globe, on all ſides, unleſs when impeded and diverted by the Interpoſition of *Strata* of Marble, the denſer ſorts of Stone, or other like Matter, which is ſo cloſe and compact, that it can admit it only in a ſmaller Quantity, and this very ſlowly too.

And when it is thus intercepted in its Paſſage, the Vapour which cannot penetrate the *Stratum* directly, will ſome of it glide along the lower Surface of the *Stratum*, permeating the Horizontal Interval, which is betwixt that and the next *Stratum* lying underneath it; the reſt will paſs the Interſtices of the Maſs of the ſubjacent *Strata*, whether they be of laxer Stone, of Sand, Marle, or the like, with a Direction parallel to the ſite of thoſe *Strata*, till it arrives at their perpendicular Intervals.

And when the Water is once come to theſe *Intervals*, in caſe the *Strata*, whereby the aſcending Vapour was collected and condenſed into Water, (as we uſually ſpeak) in like manner as by an Alembick, happen to be raiſed above the *Level* of the Earth's Surface; as thoſe *Strata* always are, whereof Mountains do conſiſt; then the Water being likewiſe got above the ſaid *Level*, flows forth of thoſe Intervals or Apertures; and if there be no Obſtacle without, forms *Brooks* and *Rivers*. But where the *Strata*, which ſo condenſe it, are not higher than the mean Surface of the Earth, it ſtagnates at the Apertures, and only forms *ſtanding Springs*.

He adds, That tho' this Supply of Water from the Abyſs, be continual, and nearly the ſame at all Seaſons and alike to all Parts of the Globe, yet when it arrives at or near the *Surface of the Earth*, where the Heat (the Agent which evaporates and bears it up) is *not ſo conſtant* and uniform, as is that reſident within the Globe, but is ſubject to Viciſſitudes and Alterations, being at certain Seaſons greater than at others; being alſo greater in ſome Climates and Parts of the Earth than in others: It thence happens that the Quantity of *Water at the Surface of the Earth*, tho' ſent up from the Abyſs with an almoſt conſtant equality, is *various and uncertain*, as is the Heat there at *ſome Seaſons*, and in *ſome Countries*, the Surface abounding, and being even drown'd with the Plenty of it, the Springs full, and the Rivers high: At *other Seaſons* and in *other Countries*, both Springs and Rivers may be exceeding low, and ſometimes totally fail.

When the Heat in the exterior Parts of the Earth, and in the Ambient Air, is as intenſe as that in the interior Parts of it, then all that *Water* which paſſes the *Strata directly*, mounting up in ſeparate Parcels, or in form of Vapour, does not ſtop at the Surface, becauſe the Heat there, is equal both in Quantity and Power to *That* underneath, which brought it out of the Abyſs.

This Heat therefore takes it here, and *bears it up*, part of it immediately out of the Surface of the Earth; the reſt thro' the Tubes and Veſſels of the Vegetables which grow thereon, Herbs, Shrubs, and Trees, and along with it a ſort of Vegetative Terreſtial Matter, which it detaches from out the uppermoſt *Stratum* wherein theſe are placed; this it depoſes in them for their Nutriment as it paſſes thro' them, and iſſuing out at their Tops and Extremities, it marches ſtill on, and is elevated up into the Atmoſphere, to ſuch an height, that the Heat there being leſs, it becomes condenſed, unites and combines into ſmall Maſſes, or Drops, and at length falls down again in *Rain*, *Dew*, *Hail*, or *Snow*.

And for the other part of the Water, which was condenſed at the Surface of the Earth, and ſent forth collectively into *ſtanding Springs and Rivers*; *this* alſo ſuſtains a Diminution from the Heat above, being evaporated more or leſs in Proportion to the greater or leſſer Intenſeneſs of the Heat, and the greater or leſſer Extent of the Surface of the Water ſo ſent forth.

And as theſe Evaporations are *at ſometimes greater*, according to the greater Heat of the Sun, ſo where ever they alight again in Rain, 'tis ſo much ſuperior in Quantity to the Rain of colder Seaſons, as the Sun's Power is then ſuperior to its Power in *Thoſe Seaſons*: This is apparent in our Northern Clime, where the Sun's Power is never very great, but yet our Rains in *June*, *July*, and *Auguſt*, are much greater than thoſe of the colder Months, the Drops larger, and conſequently heavier, and falling much thicker and faſter than at other times.

But much more apparent is this in the Regions of the Earth, nearer to, or under the Equator, where the Sun having a much greater Force, their Rains (which are Periodical, happening uſually about the ſame time, and laſting ſeveral Months) fall in ſuch Quantities as to be more like deſcending Rivers than Showers; and by theſe are cauſed the mighty Inundations of the *Nile*, and other Rivers in thoſe Regions.

But when the Heat in the *exterior* parts of the Earth, and in the Ambient Air, is leſs than that in the *interior*; the *Evaporations* are likewiſe leſs; and the Springs and Rivers do not only ceaſe to be *diminiſhed*, proportionably to the Relaxation of the Heat, but are much *augmented*, a great part of the Water which aſcends to the Surface of the Earth, ſtopping there for want of Heat to amount it thence up into the Atmoſphere, and ſaturating the ſuperficial, or uppermoſt *Strata* with Water; which by degrees drains down into *Wells*, *Springs*, and *Rivers*, and ſo makes an Addition to them; and is the reaſon that *theſe abound with Water* in the *Colder Seaſons*, ſo much more than they do in the Hotter.

And the Water which is thus diſpenſed to the Earth and Atmoſphere from the great Abyſs, being carried down by *Rains* and by *Rivers*, into the Ocean, which communicates with the Abyſs, is by that means reſtored back again to it; and from thence it returns again in a continual Circulation,

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to the Surface of the Earth, in Vapours and Springs.

SPRINGY, or *Elaſtick Bodies*, are ſuch as having had their Figure changed by the Stroak or Percuſſion of another Body, can recover again their former Figure; which Bodies which are not Elaſtical will not do. Thus, If a piece of Steel be bent any way, it will recover again its former ſtraitneſs, but a piece of Lead will ſtand bent in any form.

SPUNGING of a great Gun, is clearing of her Inſide, after ſhe hath been diſcharged, with a Wad of Sheep-skins, or the like, rolled about one end of the Rammer: Its deſign is to prevent any parts of Fire from remaining in her; which would endanger the Life of him who ſhould load, or charge her again.

SPUN-YARN, or Rope-yarn, whoſe Ends are beaten or ſcraped thin, in order to faſten one piece to another, that ſo it may be as long as is neceſſary: It is of uſe to make *Caburns*, and for many other Purpoſes aboard a Ship.

SPURIÆ. See *Nothæ coſtæ*.

SPURKETS, are the Spaces in a Ship's Side, betwixt the upper and lower Futtocks, or betwixt the Rungs fore and aft.

SQUAMMOSA *Sutura*, is one of the Sutures of the Bones of the Skull; ſo called, becauſe the Parts of the Bones united by the Suture, do lie very ſlope, and like Scales.

SQUARE, is an Inſtrument of Braſs, or Wood, having one ſide perpendicular, or at Right Angles to the other; ſometimes made with a Joint to fold (for the Pocket) and ſometimes has a Back to uſe on a drawing Board, to guide the *Square*.

SQUARE *Figure*, in Geometry, is one whoſe Right-lined Sides are all equal, and its Angles all right. See *Quadrilateral*: For its *Area*, ſee *Area*.

SQUARE *Number*, is one multiplied into itſelf; as 4, which ariſes from the Multiplication of 2 by 2; and 9, the Product of 3 by 3; alſo 16 made by 4, multiplied by 4, *&c.*

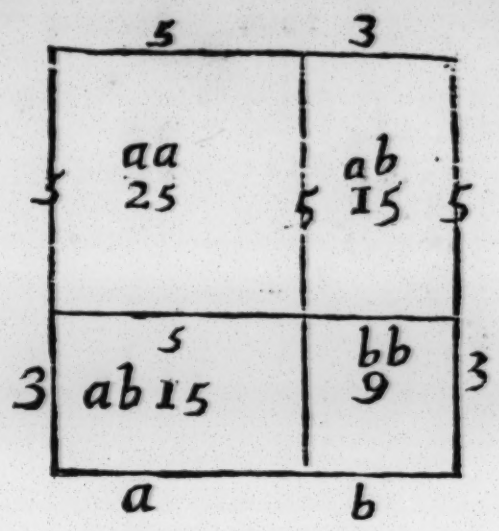
And a *Square Number* may be ranged into the Form of a Square, but that which cannot be ſo ranged, cannot be a *Square Number*.

The Square of any Number, or Line, as $5 + 3$, or $a + b$, divided into two Parts, is equal to the Sum of the Squares of thoſe Parts, and alſo to the double Rectangle, or Product of thoſe Parts, as is plain from only multiplying $a + b$ by it ſelf, Algebraically. See *Euclid. Lib.* 2. *Prop.* 4.

Thus the Square of $5 + 3$, or 8, which is 64, is equal to

$a\ a$	25
$b\ b$	9
$2\ a\ b$	15
	15

$\square a + b = a\ a + 2\ a\ b + b\ b = 64$



To Compoſe any Square Number *according to this Propoſition.*

2 5	
4 . .	$a\ a$
2 0 .	$2\ a\ b$
. 2 5	$b\ b$

$6\ 2\ 5 = \square 25$

1. Write the Number down with the Diſtance of one Place between each Figure.

2. Find the Square of 2, the firſt Figure to the left Hand, writing it down under 2.

3. Then write the double Rectangle of 2 multiplied by 5, *i. e.* 20, under 4, as in the Margin.

4. Then Square 5, and write its Square down in that Order, as you ſee; and adding all together into one Sum, you will have $625 = \square 25$.

When a Number conſiſts of more than two Places, proceed thus.

1. Find the firſt Square as before.

2. Multiply the two firſt Figures (towards the left Hand) and write down the Product twice, one under another.

3. Then find the Square of the ſecond Figure, which write in its proper Order as before; add all theſe into one Sum for a new Square of *a*.

4. Then multiply the third Figure into the ſecond, which taken together make *a*; and write its Product down twice as before (in Step. 2.)

5. Square the third Figure, and ſubſcribe its Square as before (in Step, 3.) then add all into one Sum, and repeat this Proceſs as often as there is Occaſion; the laſt Sum of all is the true Square required.

Thus,

3 6 5

9	$a\,a$
18 ... }	$2\,a\,b$
18 ... }	
36 ..	$b\,b$
1296 ..	$a\,a$
180 . }	$2\,a\,b$
180 . }	
25	$b\,b$

133225 = Square of 365.

From which Method of compoſing a Square, 'twill be eaſie to underſtand the way to extract the Square Root of any Number given,

. . .

As ſuppoſe 133225. For,

1. Beginning at the right Hand, make a Point over the firſt Figure (5); and after that over every other Place alternately: Which Points ſhew you the Number of Places in the Root.

2. Find the neareſt Square Root to the firſt part 13, which is 3, write it in the Quotient, and then place its Square (9) under, and ſubſtract it from 13. This Root is a, and the Square $a\,a$.

3. To the Remainder (4) bring down the next Square 32, which will make 432, and will be equal to $2\,a\,b + b\,b$, in the laſt Step of all, elſe always bigger, and is called the *Reſolvend*. Then double the Figure (3) in the Quotient, and make it a Diviſor to all the *Reſolvend*, except the laſt Figure towards the right Hand, enquiring how often you can have 6 in 42, and place the Anſwer 6 (for tho' you can have it 7 times, yet 7 muſt not be taken, becauſe 'tis too large) in the Quotient, and alſo after 6 in the Diviſor. Then multiply the thus augmented Diviſor by 6, and write the Product under, and ſubſtract it from the *Reſolvend*: To the Remainder 36, bring down the next Square 25, and then you have 3625 for a new Reſolvend: Then, as before, double the Quotient 36, which makes $72 = 2\,a$, for a new Diviſor, and enquire how often you can have 72 in 362, write the Anſwer $5 = a$ in the Quotient, and alſo after the Diviſor; and multiplying the augmented Diviſor by it, you will have a Product 3625, $= 2\,a\,b + b\,b$, which ſubſtracted from the *Reſolvend*, leaves nothing, and ſo the Work is over, and the true Root found to be 365. If there had been more Points, the Work in this third Step muſt have been repeated till all was done.

The *Example* follows.

. . .

133225 (365

$a\,a = 9$

$2\,a + b = 66)$ 432 = Reſolvend.

396 $= 2\,a\,b + b\,b$

$2\,a + b = 725)$ 3625 = Reſolvend.

3625 $= 2\,a\,b + b\,b$

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But when a whole Number hath not a Square Root exactly expreſſible by any rational Number, then to approach infinitely near the exact Root, proceed thus.

Place as many Pairs of Cyphers on the right Hand of the Remainder, as you would have Decimal Places in the Root, and work as before, diſtinguiſhing them from the Integers by a Comma, thus: If the Square Root of 12 be deſir'd to three Places in Decimals; annex 6 Cyphers to 12, and 'twill ſtand thus:

. . . . .

12, 000000

Whoſe Square Root being extracted, is found to be 3, 464, or $\frac{464}{1000}$, but becauſe of the Remainder, it muſt be that 3, 464 is leſs than the true Root, and 3, 465 greater than it; yet not wanting the $\frac{1}{1000}$ of an Unite of the true Root.

The Square Root of a Vulgar Fraction, is thus found.

Firſt, if the Fraction be not in its leaſt Terms, let it be reduced to the leaſt Terms; then extract the Square Root of the Denominator for a new Denominator, and of the Numerator for a new Numerator; this new Fraction ſhall be the Square Root of the Fraction propoſed. Thus the Square Root of $\frac{9}{16}$ is $\frac{3}{4}$, of $\frac{1}{4}$ is $\frac{1}{2}$.

If the vulgar Fraction given, be incommenſurable to its Square Root, both in the given Terms, and alſo in any other Terms that it is reducible to; then reduce the ſaid Vulgar Fraction into Decimals, conſiſting of an even Number of Places; and then extract the Square Root thereof by Approximation, according to the Precepts already delivered.

Thus: If the Square Root of $\frac{3}{4}$ be required, its equivalent Decimal is 75, whoſe Square Root, 86602, *&c.* Therefore the Square Root of $\frac{3}{4}$ is, 86602 *fere*.

If a mix'd Number were given for Extraction, whoſe Fractional Part is expreſt in Terms of a Vulgar Fraction; reduce it into an improper Fraction, and (if commenſurable, extract the Square Root of the Numerator and Denominator, (as before;) obſerving to reduce the Fractional Part of the mix'd Number, (or the improper Fraction equivalent to the mix'd Number) into its leaſt Terms.

Thus: The Square Root of $5\frac{4}{9}$ is $2\frac{1}{3}$, for the improper Fraction equivalent to $5\frac{4}{9}$, is $\frac{49}{9}$, and the Square Root of $\frac{49}{9}$, is $\frac{7}{3}$, or $2\frac{1}{3}$.

To extract the Square Root, according to the Method of Converging Series.

Suppoſe $a\,a = c = 2$.

For a take any Binomial, as ſuppoſe $r + S$; 'tis beſt to make $r = 1$, *(i. e.)* to the firſt Root, or Side of the given Square, becauſe then S will converge the ſooner.

Then will $r\,r + 2\,r\,S + S\,S = a\,a = c$.
Reject the Power of S, as being of ſmall Value.
Then will $r\,r + 2\,r\,S = c$, or $2\,r\,S = c - r\,r$.

Divide all by $2\,r$; and then $S = \frac{c - r\,r}{2\,r}$

which is the ſtanding *Theorem*.

Suppoſe therefore $r = 1$; then $\left.\begin{matrix} -c = 2 \\ -r\,r = 1 \end{matrix}\right\} = 1$

Make $2\,r$ the Diviſor) 1, 0 (,5 = S
To the firſt $r = 1$, add ,5 = S, for a ſecond r, in order for a new Operation.

Then 1, 5 is the new r, the Square of which, is 2, 25 $= r\,r$; from which ſubſtract $2 = c$, becauſe 2 is leſs than 2, 25, and 'twill ſtand thus.

$r\,r = 2, 25$
$-c = 2$
$2\,r = 3)\ 0, 25$

Which muſt be divided by $2\,r = 3$, and the Quotient will be $-\ 083 = S$; which having a defective Sign, muſt be ſubſtracted from the laſt.

$r = 1, 5$ 1, 5
$-, 083$
1, 417

Which will be a new r, for a third Operation; and its Square being 2, 007889 $= r\,r$, (as before greater than $2 = c$.) Take $2 = c$ from it, thus.

$r\,r = 2\ 007889$
$-c = 2$
Leaves $-$. 007889 $= S$.

Which being divided by twice the laſt $r = 2, 834$, gives in the Quotient $-$. 002783 $= S$; and this S ſubſtracted from the laſt.

$r = 1, 417$
$, 002783$
$1, 414217 = a$

Which gives the Root at 7 Places at three Operations.

But if more exactneſs be neceſſary, call it a new r, for a fourth Operation, and proceed juſt as before.

N. B. This Method, which is Mr. *Raphſon*'s, is very pretty, but it labours under two Inconveniencies, *viz.* *The greatneſs of the Diviſors*, and *the high Involutions*; eſpecially in extracting Roots out of higher Powers, as the *Cube*, *Biquadrate*, *Fifth*, *Power*, &c.

To obviate which, 'tis much better to uſe the following way, which is Mr. *Ward*'s.

Let as before $a\,a = c = 2$, and $r + S = a$.
Then $r\,r + 2\,r\,S + S\,S = a\,a = C$.
Divide all by 2; then 'tis $\frac{1}{2}\,r\,r + r\,S + \frac{1}{2}\,S\,S = \frac{C}{2}$ the Reſolvend; and $r\,S + \frac{1}{2}\,S\,S = \frac{1}{2}\,C - \frac{1}{2}\,r\,r = D$, the Dividend.

Whence ariſes this *Theorem*, $\frac{D}{r + \frac{1}{2}\,S} = S$, by dividing all by $r + \frac{1}{2}\,S$.

Let then (as before) the Square Root of $2 = C = a\,a$, be required.

Firſt, Take $r = 1$: Then halve the Reſolvend $= \frac{C}{2} = 1$: And from it take $\frac{1}{2}\,r\,r = .5$, there remains $5 = D$. Make

$r = 1$, the Diviſ.) .50 (4 = S. ſubſcri. $\frac{1}{2}SS = 8$ under
$48 = r\,S + \frac{1}{2}\,S\,S$ [the Cypher.

Di. $= r + S = 1,4$) 20 (20 (1, = S
$145 = r\,S + \frac{1}{2}\,S\,S$

Di. $= r + S = 1,41$).5500 (3 = S
$4234,5 = r\,S + \frac{1}{2}\,S\,S$

$r + S = 1,413$) 126550 (8 = S
$113072 = r\,S + \frac{1}{2}\,S\,S$

$r = S = 1,4138$) 1347800 (9 = S
$127246,5 = r\,S + \frac{1}{2}\,S\,S$

1,41389) 7533500 (5 = S
$7069462,5 = r\,S + \frac{1}{2}\,S\,S$

$\therefore a = 1,413895.\ \ 464037,5.$

This Root $a = 1,413895$ differs from the former Root found, but by 0, 000022 (a little more than $\frac{3}{100000}$) for no exact Root can be found by either way.

Here alſo, if more exactneſs had been required, the Remainder encreaſed by Cyphers, might have been made a new Dividend, and 1,413895 a new Diviſor; and ſo you may proceed on as far as you think fit.

The vaſt Advantage of this Method above the former, any one will ſoon find that will try both.

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An Example of this way, in a true Square Number.

The Square Root of 133225, is required.

$r = 3$ 66612.2 $= \frac{1}{2}$ C.
$-4,5 = \frac{1}{2} r r$ S S

Diviſor $= r = 3)$ 216 $(6 =$ S.
$198 = r$ S $+ \frac{1}{2}$

$r = 36)$ 1812,5 $(5 =$ S
1812,5 $= r$ S $+ \frac{1}{2}$ SS

0000,0

Therefore $a = 365$.

SQUARING. By the Word *Squaring*, Mathematicians underſtand the making of a Square equal to any Figure given. Thus the *Quadrature* or *Squaring* of the Circle, is the finding a Square equal to the Area of a Circle, which hath not yet been done Geometrically.

SQUINANCY, or *Quinſey*, a Swelling and Inflammation in the Throat. See *Angina*.

STAGMA, are Juices of Plants mix'd together in order to Diſtillation.

STALACTITÆ, are a ſort of ſtony, ſparry Iceſiles which hang down from the Top or Arches of Grotto's, Caves, or Subterranean Caverns, and from the Roofs of the Buildings and Capitals of the Pillars of ſuch Places as are built over the *Thermæ*, or Hot Springs. Of this kind are the *Sal Alumen* and *Vitriolum Stalactícum*, the *Minera Ferri-ſtalactica*, the *Vitriolam Capillare*, and the *Alumen Capillare*, &c. Theſe Stalactícæ Dr. *Woodward* ſaith, ſhould rather be called *Stagonitæ*.

STAMINA, in Botany, are thoſe little fine Threds or Capillaments which grow up within the Flowers of Plants encompaſſing round the *Style*, and on which the *Apices* grow, at their Extremities. Whence the Botaniſts call that a

STAMINEOUS *Flower*, which is ſo far imperfect, as to want thoſe coloured Leaves which are called *Petalæ*, and conſiſts only of the *Stylus* and the *Stamina*.

And ſuch Plants as do bear theſe *Stamineous Flowers* Mr. *Ray*, makes to conſtitute a large Genus of Plants, which he calls *Herbæ flore Imperfecto ſive apetalo Stamineove*.

And theſe he divides into ſuch as,

1. Have their Fruit or Seed totally divided from the Flower; and theſe are ſuch Plants as are ſaid to be of *different Sexes*: The reaſon of which is, that from the ſame Seed ſome Plant ſhall ariſe with Flowers and no Fruit, and others with Fruit and no Flowers: As *Hops*, *Hemp*, *ſtinging Nettles*, *Spinach*, *Cynocrumbe*, *Mercarialis*, and *Phyllon*.

2. Such as have their Fruit only a little disjoin'd from their Flowers; as the *Ambroſia*, *Bardana minor*, *Ricinus*, and the *Heliotropium Tricoccon*.

3. Such as have their Fruit immediately contiguous, or adhering to their Flower: And t. Seed of theſe is either,

1. *Triangular*: And of this ſort, ſome are lucid and ſhining, as the *Lapathum*, *Rhabarbarum*, and *Biſtorta*, to which alſo may be reckoned the *Perſicaria*.

Others are rough and not ſhining; as the *Helleborus Albus*, *Fegopyrum*, *Convolvulus niger*, and the *Polygonum*.

2. Such as have a roundiſh Seed a little flatted or compreſſed, or of any other Figure but the former *Triquetrous* or Triangular one. And theſe have their Flower, or the Calyx of the Flower adhering to the *Bottom* or *Baſis* of the Seed or Fruit; as the *Potamogiton*, *Blitum Silveſtre*, *Porietaria*, *Atriplex*, *Blitum Sativum*, *Amuranthes Hoclocerieus*, and the *Saxifraga Aurea*.

3. Such whoſe Flowers adhere to the top or uppermoſt of the Seed; as the *Beta*, *Aſarum*, *Archimilla*.

And to theſe kind of Plants, Mr. *Ray* reduces alſo the *Kaligeniculatum Sedum fruticoſum*, the *Scoparia*, or *Belvidere* of the Italians.

STANCHIONS in a Ship, are thoſe Timbers which being ſet up Pillarwiſe, do ſupport and ſtrengthen the waſt Trees.

STANDING *Part* of the *Sheat*, is that part which is made faſt to a Ring at the Ship's Quarter. When they ſay, *Over-hale the Sheat*, they mean, *Hale upon the ſtanding Part*; But when they ſay, *Hale the Sheat* barely, they intend it only of the Running Part.

STANDING *Ropes*, are thoſe Ropes which do not run in any Blocks, but are ſet taught, or let ſlack, as occaſion ſerves, as the Sheat-ſtays, Back-ſtays, and the like.

STANDING *Part* of a Tackle aboard a Ship, is the end of the Rope where the Block is ſeized or faſten'd; as the other which is haled, is called *Fall*.

STAPES, or the *Stirrop*, becauſe of its reſemblance to a Stirrop, is a little Bone in the Ear, of a Triangular Figure, and is made of two Branches ſet upon a flat Baſis, which ſtands upon the *Foramen Ovale*; the Union of the two Branches is called the Head of the *Stapes*, in which there is a ſmall Cavity, wherein lies another little Bone.

STAPHYLOMA, is a Diſeaſe of the Eye, in which the two Tunicks of the Eye, *Cornea* and *Uvea*, being broken, fall outward in the ſhape of a Grape.

STAR, in Fortification, is a Work with ſeveral Faces generally compoſed of from 5 to 8 Points with Saliant, and Re-entring Angles flanking one another; every one of its Sides containing from 12 to 25 Fathoms.

STARBOARD, the right Hand ſide of a Ship, as Larboard is the left: Thus they ſay, *Starboard the Helm*, or Helm a Starboard; when he that *Conds* would have the Man at the *Helm* put the Helm to the right ſide of the Ship.

STAR-*Fort*. See *Fort*.

STARS. See *Fix'd Stars*.

STATICAL *Baroſcope*, an Inſtrument invented by the Honourable Mr. *R. Boyle*, whoſe Deſcription ſee in *Baroſcope*.

STATICAL *Hygroſcope*. See *Hygroſcope*.

STATICKS, is a Science purely Speculative, being a Species of *Mechanicks*, converſant about Weights, and ſhewing the Properties of the *Heavineſs* and *Lightneſs*, or *Æquilibria* of Bodies. When it is reſtrained to the Specifick Weights and

Æqui-

Æquilibria of Liquors, it is called *Hydroſtaticks*; which ſee.

STATION, in Aſtronomy, ſignifies certain Places of the *Zodiack*, where a Planet being arrived, ſeems to ſtand ſtill for ſome time in the ſame Degree, either in aſcending to its *Apogee*, or deſcending to its *Perigee*.

STATION, is a place where a Man fixes himſelf and his Inſtrument, to take (as in Surveying) any Angles or Diſtances.

STATION-*Line*. See *Line of Station*.

STATION-*Staff*, is an Inſtrument conſiſting of two Rulers that ſlide to ten Foot, divided into Feet and Inches, with a moving Vane or Sight; two of which are uſed with a Level; and on the Edges, there are the Links of the Gunters Chain divided. It is uſed in Surveying for the more eaſie taking Off-ſets.

STATIONARY; a Planet is ſaid to be *Stationary*, when to any Eye placed on the Earth, it appears for ſome time to ſtand ſtill, and to have no progreſſive Motion forward in its Orbit round the Sun.

STATUS *Morbi*. See *Acme*.

STATUTE, is a Word that hath divers Significations; as firſt, it ſignifies an Act of Parliament made by the King and the Three Eſtates of the Realm; in which Senſe it is either General or Special. In another Signification, *Statute* is a Short Writing, called a *Statute-Merchant*, or a *Statute Staple*; which ſee. *Statutes* are alſo vulgarly taken for the *Petit-Seſſions*, by 5 *Eliz. cap.* 4.

STATUTE-*Merchant*, is a Bond acknowledged before one of the Clerks of the *Statutes*-Merchant and Mayor, or Chief-Warden of the City of *London*, or two Merchants of the ſaid City for that purpoſe aſſigned, or before the Mayor, Chief-Warden, or Maſter of other Cities or good Towns, or other ſufficient Men for that purpoſe appointed, Sealed with the Seal of the Debtor and of the King, which is of two pieces; the greater is kept by the Mayor Chief-Warden, *&c.* and the leſſer by the ſaid Clerks.

STATUTE-*Staple*, is ſo called either properly or improperly. A *Statute-Staple*, properly ſo called, is a Bond of Record, acknowledged before the Mayor of the *Staple*, in the Preſence of one of the two Conſtables of the ſame *Staple*; for which Seal, the Fee is of every Pound, if the Sum exceed not 100 *l.* an Half-penny; and if it exceed 100 *l.* a Farthing; and by Virtue of ſuch *Statute-Staple*, the Creditor may forthwith have Execution of the Body, Lands, and Goods of the Debtor. *Statute-Staple* improper, is a Bond of Record, founded upon the Stat. 23 *H.* 8. *cap.* 6. Of the Nature of a proper *Statute-Staple*, as to the Force and Execution of it; and acknowledged before one of the Chief Juſtices; and in their Abſence, before the Mayor of the *Staple*, and Recorder of *London*.

STATUTUM *de Laboratiis*, is a Writ Judicial, for the apprehending of ſuch *Labourers* as refuſe to work according to the Statute, *Reg. Judic. Fol.* 27.

STATUTO *Mercatorio*, is a Writ for the Impriſoning of him that has forfeited a Bond called *Statute-Merchant*, until the Debt be ſatisfied. Of theſe, there is one againſt Lay-perſons, and another againſt Eccleſiaſtical.

STATUTO *Stapulæ*, is a Writ that lies to take his Body to Priſon, to ſeize upon his Lands and Goods, that hath forfeited a Bond called *Statute-Staple*.

STAYS in a Ship, are Ropes whoſe uſe is to keep the Maſt from falling aft: All Maſts, Top-Maſts, and Flag-Staves have Stays, except the Sprit-ſail Top-Maſt; the Stay of the Main-maſt, which is called the *Main-ſtay*, is by a Lannier faſten'd to a Collar, which comes about a Knee belonging to the Head; the *Main-top-maſt Stay* is faſten'd to the Head of the Fore-maſt, by a Strap and a dead Man's Eye, and ſo is the *Main-top-gallant-maſt* ſtayed to the Head of the Fore-top-maſt; the Fore-maſt and Maſts belonging to it, are in the ſame manner ſtayed to the Bolt-ſprit and Sprit-ſail Top-ſail Maſt, which Stays do likewiſe ſtay the Bolt-ſprit it ſelf. The *Miſſen-ſtay* comes to the Main-maſt by the Half-deck, and the Top-maſt Stays come to the Shrouds with Crows-feet. The length of the Stay is the ſame with that of the Maſt it belongs to.

The Main-maſt, Fore-maſt, with the Maſts belonging to them, have alſo *Back-ſtays*, which help to keep the Maſt from pitching forward, or overboard, becauſe they go on either ſide of the Ship; *To bring a Ship upon the*

STAYES, or to *ſtay her*, is in order to her Tacking, which is thus done: At the ſame time bear up the *Helm*, *let fly the Fore-ſail Sheat*, *let go the Fore-bowling*, *Brace the Weather-brace* of the Fore-ſail; the ſame is alſo done to the *Top-ſail* and *Top-gallant-ſail*, only their Sheats muſt be kept faſt. If the Sprit-ſail be out, then at the ſame time let go the Sprit-ſail Sheat alſo, with the Fore-ſheet, and *brace the Weather-brace*: But the *Tacks*, *Sheats*, *Bracings*, and *Bowlings*, of the *Main-ſail*, *Main-top-ſail*, and *Miſſen* are not altered. And when the Wind comes in at the Bow, which before was the *Lee-bow*, it drives all the Sails backward againſt the Shrouds and Maſts, ſo that the Ship makes no way forward, but drives with her Broad-ſide. Thoſe are reckoned the beſt Ships which will ſtay with the feweſt Sails.

STEADY, a Word of Command at Sea, from him that Conns to the Man at Helm, to keep the Ship *ſteady* in her Courſe, and not to make Angles or Yaws (as they call them) in or out.

STATOCELE, is a Rupture or Tumor in the *Scrotum* of a fatty or Suet-like Conſiſtence. *Blanchard*.

STEATOMA is a preternatural Swelling which conſiſts of a Matter almoſt like Suet of the ſame Colour throughout, ſoft; and tho' not eaſily yielding to the Touch, yet ſuddenly returns, the Fingers being removed, to its proper Shape and Bigneſs.

STEEL, is made, according to Mr. *Lemery*, p. 154, by ſtratifying of Plates of Iron in a large Furnace, with the Horns or Nails, of Animals, under which is made a very great Fire: Thus is the Iron calcined; but when red Hot, and near Melting, they take the Plates out and dip them ſuddenly in cold Water, and ſo they become *Steel*.

Steel is not ſo good as Iron for Medicinal Operation, becauſe the volatile Parts are moſtly purged away in the Calcination, and what remains is hardly diſſolvable by the Juice in the Body.

STEER: To ſteer a Ship, is to guide or govern her by the Helm. He is the beſt *Steerſman* that uſes the leaſt Motion in putting the Helm over to and again, and that keeps the Ship beſt from making

making Yaws; that is, from running in and out. There are three ways to Steer by.

1. By any Mark on the Land, ſo as to keep the Ship even by it.

2. By the Compaſs, which is to keep the Ship's Head upon ſuch a Rhumb or Point of the Compaſs, as beſt leads to her deſired Port.

3. To Steer as one is bidden or conned, which is the Duty (in a great Ship) of him that is taking his Turn at Helm.

STEERAGE, a Part of a Ship where he ſtandeth that *Steereth*; that is, guides the *Helm* or *Rudder* of the Ship; and this in a Man of War is always before the Bulk-head of the great Cabbin; and where-ever the *Steerſman* be placed, he muſt ſtand ſo, as that he can ſee the *Letch* of the Sails, whether they be in the Wind or not.

STEEVE; the Seamen ſay that the *Bow-ſprit* or the *Beak-head* of the Ship doth *Steeve*, when either ſtands too upright, and not ſtraight enough forwards.

STEGANOGRAPHY, is the Art of ſecret Writing, which is known only to the Perſons correſponding with one another; and which if the Letters ſhould be opened, no one is ſuppoſed to be able to diſcover, or *Decypher*, as 'tis called. Tho' now-a-days hardly any thing, can be written by this Art, but what may be decyphered, and the Senſe and Meaning of it diſcovered. And in this Art of *Decyphering*, that Excellent Mathematician Dr. *Wallis*, is admirably ready.

STEGNOSIS, is a Conſtriction or ſtopping up of the Pores.

STEGNOTICA. See *Aſtringentia*.

STELLATE *Plants*, are by the Botaniſts call'd ſuch Plants as have their Leaves growing on the Stalks at certain Intervals or Diſtances, in the form of a Radiant Star; and according to Mr. *Ray*, this is the Tenth Genus of Engliſh Plants: Of this kind is *Cruciata* or Croſs-wort, *Mollugo*, *Wild-madder*, *Aſperula* or *Woodruff*, *Gallium* or *Ladies Bed-ſtraw*, *Aparine* or *Cleavers*, *Rubia Tinctorum* or *Dyers Madder*. To which he adds, as a-kin to this Genus, the *Naſturtium Indicum*, Indian Creſſe, or *yellow Lark-ſpur*.

STEM of a Ship, is that main piece of Timber which comes bowing or bending from the Keel below where it is *ſcarfed*, (as they call it) that is, pieced in, right before the Fore-caſtle; this Stem it is which guides the Rake of the Ship; and all the But-ends of the Planks (forwards) are fix'd into it. This in the Section of a Firſt-Rate Ship, is called the *Main-ſtem*.

STENTOROPHONICK-*Tube*, or Inſtrument, is the Speaking-Trumpet, invented by Sir *Samuel Moreland*.

STEP, that piece of Timber in a Ship whereon the Maſts or Capſtans do ſtand at bottom, is called the Step of the Maſt or Capſtan.

STERCOROSUS *Fluxus*, is that in which much liquid Excrement is often voided, proceeding from excrementitious Meats corrupted in the Stomach, or a great Quantity of Excrements heaped up in the Inteſtines. *Blanchard*.

STEREOBATA, in Architecture, is the *Greeks* Word for the firſt beginning of the Wall of any Building, and immediately ſtanding on the Foundation: This is wrongly confounded with *Stylobata*, which is the beginning of a Column, or its *Pedeſtal*.

STEREOGRAPHY, is the Art of drawing the Forms of Solids upon a Plane.

STEREOGRAPHICK *Projection*. See *Projection* of the Sphere *in Plano*.

STEREOMETRY, is the Art of meaſuring all ſorts of ſolid Bodies, which how to do, you will find under the proper Names of each Body.

STERN of a Ship, is all the hindermoſt or aftermoſt Part of her, generally ſpeaking: But properly, 'tis only the outmoſt Part of her, Abaft.

STERNFAST, is ſome faſtnings of Ropes, *&c.* behind the Stern of a Ship, to which a Cable or Hawſer may be brought or fixed, in order to hold her Stern to a Wharf, *&c.*

STERNPOST, is a great Timber let into the Keel at the Stern of a Ship, ſomewhat ſloaping, into which are faſtned the After-Planks; and on this Poſt, by its Pintle and Gudgeons hangs the Rudder.

STERNOHYOIDES, is that Pair of Muſcles which is commonly by Anatomiſts ſaid to ariſe from the uppermoſt part of the Breaſt-Bone: But this is ſince proved a Miſtake, for they ariſe from the internal Part of the *Clavicula*, next where its Origination is broad and fleſhy, and aſcends directly over the *Sternothyreoidæus* and *Larynx*, of an equal Breadth and Thickneſs, to its Inſertion at the Baſis of the Fore-Bone of the *Os Hyoides*. This with its Partner acting, pulls the *Os Hyoides*, together with the Tongue and *Larynx*, directly downwards.

STERNOTHYROEIDES, is a pair of Muſcles which do ariſe broad and fleſhy from the upper and internal Part of the *Sternum*, whence aſcending on the ſides of the Wind-pipe, over the *Glandulæ Thyroideæ*, its inſerted to the inferiour Part of the Thyroidal or Scutiformal Cartilage.

This, with its Partner, pulls the *Larynx* downward, and lengthens the *Canalis* or diſtance between the *Rimula* and Tip of the Tongue, (which latter ſeems to be the true *Plectrum Vocis*) whereby the Tone of the Voice is rendered grave.

STERNUM *Os*, the Breaſt-Bone is joyned to the Ribs in the foremoſt part of the Breaſt, conſiſting of 3 or 4 Bones, and frequently in thoſe that are come to ripeneſs of Age, grows into one Bone; to this is joined in the lower part of it, the *Cartilago Enſiformis*.

STERNUTATION, Sneezing, is a forcible driving out of the Head ſome ſharp Matter which vellicates and diſturbs the Nerves and Fibres: Or, as ſome ſay, 'tis an involuntary Motion of the Brain, which contracts the Muſcles of the Thorax and *Abdomen*, to the intent that the Matter which vellicates the Noſtrils and Brain may be driven out.

STERNUTATORIUM, *ſive Sternutamentum*, a ſneezing Medicine or Snuff.

STEWARD *of a Ship*, is he that receives all the Victuals from the Purſer; and he is to ſee it well ſtowed in the Hold; in his Cuſtody are all things of that Nature belonging to the Ship's uſe. He is to look after the Bread, and to diſtribute out the ſeveral Meſſes of Victuals in the Ship. He hath an Apartment for himſelf in the Hold, which is called the Steward's Room, where he ſleeps and eats.

STILE, in Dialling, is the Gnomon or Cock of a *Dial*, that casts the Shadow upon the Hour-Lines; and is always parallel to the Axis of the Earth, in all kinds of Dials.

STILLATITIOUS *Oils*, in Chymistry, are such as are Extracted out of Mixts, by the Force of Fire; and hereby are distinguished from such as are made by *Expression*, or by pressing.

STILLICIDIUM *Urinæ*. See *Stranguria*.

STIRRUP of a Ship, is a piece of Timber put upon a Ship's *Keel*, when some of her *Keel* happens to be beaten off, and they can't come conveniently to put or fit in a new piece; then they patch in a piece of Timber, and bind it on with an Iron which goes under the Ship's *Keel*, and comes up on each side of the Ship, where 'tis nailed strongly with Spikes; and this they call a *Stirrup*.

STROAKED, when in a Ship the Water in the Bottom can't come to the Well of the Pump, they say, *The Ship is a-stoak*, or *stoaked*: So they say also, *The Limber-holes are stoaked*, when the Water cannot pass through them; and that the Pump is *stoaked*, when something is got into it which choaks it up, so that it will not work.

STOCKS; so the Ship-Carpenters call a Frame of Timber, and great Posts made a-shore to build Pinnaces, Ketches, Boats, and such small Craft, and sometimes small Frigats: Hence we say, a Ship is on the *Stocks*, when she is a building.

STOLONES, are the *Suckers* which spring up from the Root of any Tree or Plant; and which, if not cut off, will hinder the Thriving of the Tree.

STOMACHUS, in Anatomy, is not the Stomach of an Animal, for that is called *Ventriculus*; but is properly the left or upper Orifice of the Ventricle, or Stomach, by which Meats are received into it. To this part descend Nerves from the eighth Pair and intercostal Nerves, and are mixed and interwoven with one another. The *Greeks* calls it καρδία, the Heart: Whence it is that a Pain which is sometimes felt in this part, is corruptly called the *Heart-burn*; and the Region of the Stomach hereabout is called also *Scrobiculus Cordis*, or the *Heart-Pit*. It hath its Fibres Orbicular, that its Orifice may exactly shut or close upon the Meat and Drink received into the Stomach, to prevent Fumes coming up from thence to affect the Head, and to hinder Concoction.

STONES, are such kind of Minerals as are hard and friable: To which also Bishop *Wilkins* annexes

Earthly Concretions, as being of a middle Nature between Stones and Metals, but are more soft usually and brittle than the former. And that Great Man distinguishes Stones into

1. *Vulgar*, and of no Price.
2. *Middle-priced*.
3. *Precious*: And these are of two kinds, either *more* or *less* Transparent.

1. *Vulgar Stones*, or such as are of little or no price are distinguishable from their different Magnitudes, Uses, Consistences, into the

Greater Magnitudes of Stone; used either about
- *Buildings*; whether of
  - *Walls*; chiefly being of a
    - *Softer* Consistence, whether Natural, or Factitious.
      - 1 *Free-stone*, *Brick*.
    - *Harder* Consistence; not easily yielding to the Tool of the Workman, growing either in
      - *Greater* Masses.
        - 2 *Ragg*.
      - *Lesser* Masses; whether such as are for their Figure
        - More Knobbed and Unequal, used for the striking of Fire, either the more common, which is less heavy; or the less common, which is more heavy, as having something in it of a Metaline Mixture.
          - 3 *Flint*. *Marchasite*, *Firestone*.
        - More Round and Even.
          - 4 *Pebble*.
  - *Roof* or *Pavement*, being of a laminated Figure, either natural or Factitious.
    - 5 *Slate*. *Tile*.
- *Metals*, either for the
  - *Sharpening* or trying of them
    - 6 *Whet-stone*. *Touch-stone*.
  - Polishing or cutting of 'em; being either of a more spongy and *soft*, or of a more hard Consistence.
    - 7 *Pumice*. *Emery*.
- *Lesser Magnitudes*, either *more* or *less* minute.
  - 8 *Sand*. *Gravel*.

2. *Middle-priced Stones*, are either of a
- *Shining Politure*, or capable of it; whether of a
  - *Simple white* Colour, and more soft consistence
    - 1 *Alabaster*,
    - Sometimes *White*, sometimes *Black*, or *Green*, and sometimes *Variegated* with Veins, growing in *greater* or *lesser* Masses.
      - 2 *Marble*, *Porphyrie*, *Agat*.
  - *Spotted* with Red upon a Greenish Colour, or with Spots of Gold-colour upon Blue.
    - 3 *Jaspis*, Heliotrope. *Lazul*, Azure-stone.
- *Transparency*, either
  - Brittle; whether Natural or Factitious.
    - 4 *Chrystal-ine*. *Glass*.
  - Fissil, into Flakes, either greater or lesser.
    - 5 *Selenite*, *Muscovia-glass*, *Ising-glass*, *Talk*. (*Spar*.
- Relation to Metals, attracting Iron, or making of Brass.
  - 6 *Load-stone*. *Cadmia*, Calaminaris.
- *Incombustible Nature*.

7 *Amiantus.*

Strange Original; not being properly Minerals, tho' uſually reckoned amongſt them; but either a *Sub-marine Plant*, or ſuppoſed to proceed from a *Liquid Bitumen.*

8 { *Coral-ine,* / *Amber.*

There are ſeveral other ſtony Conſiſtences mentioned in the Authors who Write *de Lapidibus.* Some that are found in the Bodies of Animals, their Stomachs, Guts, Bladders, Kidneys, &c. ſeveral of which are *Denominated* from the *Animals* in which they are found; as *Alectorius, Chelidonius, Bezoar,* &c. Others have peculiar Names from their *Shapes*; as *Aſtroides, Gloſſopetra,* &c. Others made of *Animals,* or Parts of *Animals* petrefy'd, which may be ſufficiently expreſs'd, without being particularly provided for in the *Tables.*

3. *Precious Stones, Gems, Jewels,* are ſuch as for their Variety and Beauty are every where more eſteem'd. Amongſt which, ſome are *leſs Tranſparent,* which are diſtinguiſhable chiefly by their Colours, either,

Repreſenting Variety of Colours, with Dimneſs leſs or more.
- 1 OPAL, / CATS-EYES.

Of Particular Colours.
- Whitiſh and ſhining; tho' this be not properly a Mineral, but a part of a teſtaceous Fiſh.
  - 2 *Pearl.*
- Red.
  - 3 *Sardius,* Cornelian, Blood-ſtone.
- *Pale, Fleſhy* Colour, like that of a Man's Nail.
  - 4 *Onyx.*
- Bluiſh.
  - 5 *Turcois.*
- Pale Purple.
  - 6 *Chalcedony.*

As for that which is commonly ſtil'd a *Toad-ſtone,* that is properly a Tooth of the Fiſh called *Lupus Marinus,* as hath been made evident to the Royal Society, by that Learned and Inquiſitive Perſon, Dr. *Merit.*

4. *More Tranſparent* Gems, may be diſtinguiſh'd into ſuch as are either,

- *Colourleſs*; either moſt hard and bright, or that which is very like to this in other reſpects, but only leſs hard and bright.
  - 1 *Diamond,* Adamant. / *Sapphire white.*
- *Coloured*; to be rang'd according to the Colours in the Rainbow.
  - *Red*; of a Luſtre greater or leſs.
    - 2 *Ruby,* Carbuncle. / *Granate.*
  - *Yellow*; whether paler or deeper.
    - 3 *Chryſolite.* / *Topaz.*
  - *Green*; either moſt bright and pleaſant, or of a darker kind of Sea-green.
    - 4 *Emerald,* Smaragd. / *Beryl.*
  - Bluiſh.
    - 5 *Sapphire.*
  - *Purple,* or *Violaceous*; more inclining to Blue, or to Yellow.
    - 6 *Amethyſt.* / *Hyacinth.*

5. Such *Earthy Concretions* as commonly grow in Mines, together with ſuch other factitious Subſtances as have ſome Analogy to theſe, and are *diſſolvable* by Fire or Water, may be diſtinguiſh'd by their being

- *Not Inflammable*;
  - More Simple; being ſeveral kinds of Salts, whether of the
    - Sea-water, the moſt neceſſary Condiment for Meat; or of the Air, uſed as a chief Ingredient in the making of Gun-powder.
      - 1 *Salt.* / *Nitre,* Salt-petre.
    - *Earth*; of a Styptick Quality, and Abſterſive, proper for the drying of Wounds, commonly boil'd up in a Conſiſtence from a *Mineral Water*; or that other kind of Earthy Salt dug up in great Lumps.
      - 2 *Alume.* / *Sal Gemmæ.*
    - *Metals* of all kinds; ſometimes call'd Sugars and Cryſtals, but agreeing in the common Nature with that which is ſtil'd
      - 3 *Vitriol,* Chalcanthus, Copperas.
    - *Vegetables,* made either by Fermentation, or by Burning.
      - 4 *Tartar.* / *Alcali.*
    - *Animal Subſtances,* made by Diſtillation, called,
      - 5 *Urinous Salt.*
  - More mix'd of other Salts; more Volatile, or Fixed.
    - 6 *Sal-Armoniac.* / *Chryſocolla,* Borax.
- *Inflammable*; of a more
  - *Dry* Conſiſtence, and *yellowiſh* Colour.
    - 7 *Sulphur,* Brimſtone.
  - *Clammy* and tenacious Conſiſtence.
    - Not *ſweet-ſcented*; more Solid, or more Liquid.
      - 8 *Bitumen.* / *Naphtha.*
    - *Sweet-ſcented.*
      - 9 *Ambergris.*

6. *Earthy Concretions not Diſſolvable,* may be diſtinguiſhed by their various Colours; being either

- *White* and ſoft, according to degrees, more or leſs.
  - 1 *Chalk.* / *Marle.*
- *Yellowiſh Red,* whether more Yellow, or more Red.
  - 2 *Oker,* Yellow Oker. / *Red Oker,* Ruddle.
- *Black*; of a finer or coarſer Grain.
  - 3 *Jett.* / *Pit-coal,* Sea-coal.
- *Gold-colour,* of a poiſonous Nature, either as it is dug out of the Earth, or as it is ſublim'd.
  - 4 *Orpiment,* Auripigmentum. / *Arſenick,* Rats-bane.
- *Reddiſh*; often found in the ſame Mines with Orpiment.
  - 5 *Sandarach.*

STOPPER, is a piece of Rope (in a Ship) having a Wale-knot at one end, with a *Lannier* ſpliced into it, and at the other end 'tis made faſt in the place where 'tis to be uſed. Its uſe is to ſtop the main Halliards, or the Cable. The Stopper for the Halliards is faſtened at the Main-Knight, and it ſerves when they are Hoiſing the Main-yard to ſtop it, while the Men that hale may ſtay and reſt a little. But 'tis chiefly uſed for the Cable, to ſtop it, that it don't run out too faſt: They bind the *Wale-knot* about the Cable with the *Lanniers*, and that ſtops it, ſo that it cannot ſlip away. This Stopper is faſtened to the Bottom of the Bitts by the Deck. The Word is, *Lay on the Stoppers.* And a Ship is ſaid to *Ride by the Stoppers*, when the Cable is faſtened or ſtayed only by them, and not *Bitted*; but this is not ſafe Riding in a ſtreſs of Weather.

STRABISMUS, Squinting, is occaſioned by the Relaxation, Contraction, Diſtortion, too great Length, or too great Shortneſs of the Muſcles which move the *Eye*. *Blanchard.*

STRAIT, or *Streight*, in Hydrography, is a narrow Sea ſhut up between Lands on either ſide, affording a Paſſage from one great Sea into another; as the *Strait of Magellan*, the *Strait of Gibralter*, &c.

STRAKE, in the Sea Phraſe, is a Seam between two Planks; as the *Garboard-ſtrake* is the firſt Seam next the Keel. They ſay alſo a Ship heels *a-ſtrake*, that is, hangs or inclines to one ſide, the Quantity of an whole Plank's breadth.

STRANGURY, is a difficulty of Urine, when the Urine comes away by Drops only, accompany'd with a conſtant Inclination of making Water.

STRAP, in a Ship, is the Rope which is ſpliced about any Block, and made with an Eye to faſten it any where on occaſion.

STRATA. Dr. *Woodward*, in his Natural Hiſtory of the Earth, obſerves (and that very truly) That the far greateſt part of the Terreſtrial Globe conſiſts from its Surface downwards to the greateſt Depth we ever Dig or Mine, of ſeveral *Layers* or *Strata* of different kinds of Earthy Matter lying one over another, without any regular Order. This Diſpoſition of the Earth into theſe *Strata*, had been before obſerved by *Steno*; but the Obſervations and Deductions that Dr. *Woodward* made from them, are wholly New, very Numerous, and of great Importance.

STRATARITHMETRY, is the Art of Drawing up an Army or Battallion of Men, according to any Geometrical Figure aſſigned: And alſo of expreſſing the juſt Number of Men contained in ſuch a Figure, as they ſtand in Array, either near at hand, or at a Diſtance.

STRATIFICATION, or *Stratum ſuper Stratum*, as the Chymiſts call it, is putting different Matters *Bed upon Bed*, or one Layer upon another, in a Crucible in order to calcine a *Metal* or *Mineral*. Thus in *Cementation* (which ſee) there is firſt laid a Bed of Cement, then a Plate of Gold; then another Layer of Cement, and then another Plate of Gold; and this is done alternately, till the Crucible is full; which the Chymiſts would expreſs by ſaying, *Stratifie* Gold and Cement in a Crucible.

STREAM-*Anchor*, is only a ſmall one made faſt to a *Stream-Cable* for a Ship to ride by in gentle Streams, and in fair Weather, when they would only ſtop a Tide.

STRETCH; when at Sea they are going to *Hoiſe the Yard*, or *Hale the Sheet*, they ſay, *Stretch forwards the Hale-Yards*, or *Sheets*; meaning that the part which the Men are to Hale by, ſhould be put into their Hands, in order to their Hoiſing or Haling.

STRIÆ, with the Writers of Natural Hiſtory, are the ſmall *Hollows*, *Channels* or *Chamferings*, which are found in the Shells of Cockles, Eſcollops, and other Shell-Fiſhes.

STRIKE, a Sea-word variouſly uſed: When a Ship in a Fight, or on meeting with a Man of War, lets down or lowers her Top-ſails, at leaſt half Maſt high, which they call Striking the Top-ſails upon the Bunt, they ſay, She *Strikes*, meaning, ſhe Yields or Submits, or pays her Devoir to that Man of War as ſhe paſſes by. When a Ship touches Ground in ſhoal Water, they ſay alſo, ſhe *Strikes*. When any Top-maſt is to be taken down, the Word is, *Strike the Top-maſt*: And when any thing is Let or *Lowered*, as they call it, down into the Hold, they call it Striking down into the Hold.

STRIKING-*Wheel*, in a Clock, is that which by ſome is called the *Pin-wheel*; becauſe of the *Pins* which are placed upon the Round or Rim (which in Number are the *Quotient* of the *Pinion* divided by the *Pinion* of the *Detent-wheel.*) In 16 Days Clocks, the *firſt* or *great Wheel* is uſually the *Pin-wheel*; but in Pieces that go 8 Days, the *ſecond* Wheel is the *Pin-wheel* or *Striking-wheel.*

STRUCTURE, is the Combination or Reſult of all thoſe Qualities or Modifications of Matter in any Natural Body, which diſtinguiſh it from others, and are what in other Words, is called the peculiar *Form* or *Texture* of it.

STRUMA. See *Scrophula.*

STUPEA, *ſeu Stupa*, is a piece of Linen dipt in a Liquor, and applied to the part affected.

STYLE, ſo the Botaniſts call that middle prominent part of the Flower of the Plant, which adheres to the Fruit or Seed: 'Tis uſually long and ſlender, whence its Name of *Stylus.*

STYLE, in Dialling, is that Line whoſe Shadow on the Plane of the Dial, ſhews the true Hour-Line. This is always ſuppoſed to be a part of the Axis of the Earth, and therefore muſt always be ſo placed, as that with its two extreme Points it ſhall reſpect the two Poles of the World, and with its Upper-end, the elevated Pole. This Line is the upper Edge of the Cock, Gnomon, or Index.

STYLOBATA, in Architecture, is the Pedeſtal of a Column or Pillar.

STYLOBATON, or *Stylobata*, in Architecture, is the ſame with the Pedeſtal of a Column. This is ſometimes taken for the Trunk of the Pedeſtal, between the Cornice and the Baſe; and then called *Truncus*, as it is alſo by the Name of *Abacus.*

STYLOCERATOHYOIDES, are Muſcles of the *Os Hyoides*, which draws upwards the Tongue and Larynx, as alſo the Jaws in Deglutition, whereby the Maſticated Aliment is not only compreſſed into the latter, (the Fauces being then dilated) but the Epiglottis is alſo depreſſed, and adequately covers the *Rimula* of the *Larynx*, by its Application to it; by which means the deſcent of the leaſt part of the Aliment into the *Aſpera Arteria* is hindred; which is a moſt wonderful Mechaniſm.

They ariſe from the outward Appendix of the *Os Styliforme*, and are extended to the Horns or Points of the *Os Hyoides*. The middle Tendon of the *Digaſtricus* of the Lower-Jaw is tranſmitted through it. 'Tis called alſo *Styloboidæus*.

STYLOEIDES, are Proceſſes of Bone faſhion'd backward like a Pencil faſtned into the Baſis of the Scull it ſelf.

STYLOGLOSSUM, is that pair of Muſcles which lift up the Tongue. They ariſe from the Appendix of the *Os Styliforme*, and are inſerted about the middle of the Tongue.

STYLOHYOIDÆUS. See *Styloceratohyoides*.

STYLOPHARYNGÆUS, is a pair of Muſcles placed at the Foot of the *Proceſſus Styloides*, that dilate the Gullet, and draw the *Fauces* upwards. They deſcend from an Appendix of a Bone in faſhion of a Pencil, and which reaches the Sides of the Gullet.

STYMMA, is that thick Maſs which remains after the ſteeping of Flowers, Herbs, *&c.* and preſſing out their Oil. *Blanchard.*

STYPTICK (Blood-ſtopping) the ſame with Aſtringents in the general; which ſee.

STYPTICK-*Water* of Mr. *Lemery*, is made of Colcothar, Burnt-Allum, Sugar-candy, of each half a Dram; the Urine of a Young Man and Roſe-water, of each half an Ounce; Plantane-water, 2 Ounces: Mix all in a Mortar, and let it ſtand on the Sediment in a Viol; and when you would uſe it, pour off the clear Water by Inclination: 'Tis of very good Uſe to ſtop Bleeding.

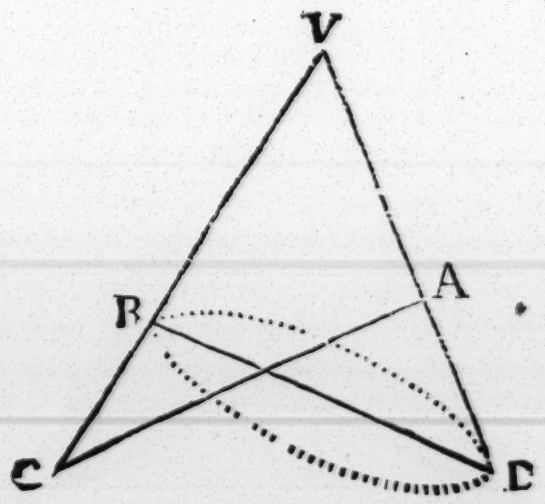
SUBALTERN *Propoſitions*, as ſuch as differ only in Quantity, and agree in Quality; as every Triangle is Right-Angled; ſome Triangles are Right-Angled.

SUBCARTILAGINEUM. See *Hypocondrium*.

SUBCLAVIAN-*Veſſels*, are the Veins and Arteries that paſs under the *Clavicles*.

SUBCLAVIS, is a Muſcle of the *Thorax*, which ariſes from the inferior part of half the *Clavicula*, next its connexion with the *Spina Scapulæ*; hence its Fibres deſcend obliquely forwards to its Inſertion at the ſuperior part of the firſt Rib near the *Sternum*. Its uſe, according to *Spigelius*, who has written a Chapter expreſly about this Muſcle, is to depreſs the *Clavicula*.

SUBCONTRARY *Poſition*, (in Geometry) is when two ſimilar Triangles are ſo placed as to have one common Angle V at the Vertex, and yet their Baſes not parallel.



And therefore if the Scalenous Cone B V D be ſo cut by the Plane C A, as that the Angle at C = D. The Cone is then ſaid to be cut *Subcontrarily* to its Baſe B A. See *Spherick Geometry*, where ſuch a Section of a Cone is demonſtrated to be a Circle.

SUBCONTRARY *Propoſitions*, are ſuch as particularly differ in Quality, and agree in Quantity; as, *ſome Man is a Creature, ſome Man is not a Creature.*

SUBCUTANEUS, a Branch of the *Baſilica*, running towards the inner Condyle of the Arm. It divides into *Ramus Anterior*, and *Poſterior*, which ſee.

SUBDUCTION, the ſame with *Subſtraction*; which ſee.

SUBDUPLE *Proportion*, is when any Number or Quantity is contained in another twice: Thus 3 is ſaid to be *Subduple* of 6, as 6 is double of 3.

SUBETH *Avicennæ*. See *Coma*.

SUBJUNCTIVE *Mood* (in *Grammar*) ſo called, becauſe it has always ſome Condition annexed to what we affirm, and ſo is ſubjoined to, or conjoined with ſome other *Verb*.

SUBLUXATION, a Diſlocation, or putting out of Joint.

SUBLIMATE *Corroſive*, is a Preparation in Chymiſtry, whereby Mercury is impregnated with Acids, and then ſublimed up to the top of the Veſſel: Thus performed.

Pour on a Pound of good running Mercury, 18 Ounces of Spirit of Nitre, ſet the Matraſs in Sand a little warmed, till the Mercury be all diſſolved, evaporate the Diſſolution in a Glaſs, or Earthen Pan, till all the Moiſture be carried off; and then powder the remaining white Maſs in a Glaſs-Mortar, and then mix with it a pound of Vitriol calcined white, and ſo much Salt decrepitated. Put this Mixture into a Matraſs, whoſe 2 Thirds at leaſt remain unfilled; ſet the Veſſel in Sand, and begin with a ſmall Fire for three Hours, after which, that Fire muſt be encreaſed to a good ſtrength: The Sublimate will adhere to the top of the Matraſs, and there will be a pound and three Ounces of it. The Red *Scories* at the Bottom are uſeleſs. 'Tis a more violent Eſcharotick than the *Lapis Infernalis*, and inwardly taken, is one of the ſtrongeſt Poiſons in the World. Of this is made *Mercurius Dulcis*. The Druggiſts ſometimes ſell a ſort of it that is made of *Arſenick*; but you may eaſily diſcover it by rubbing it with a little Salt of Tartar, for then it will turn *Black*, but if it turn *Yellow*, 'tis good.

SUBLIMATION, an Operation in Chymiſtry, whereby the finer and more *ſubtile* Parts of a mixt Body are ſeparated from the reſt, and carried up in the Form of a very fine Powder to the Top of the Veſſel. Theſe Powders they call *Flowers*, as *Flowers of Brimſtone*, of *Benjamin*, &c. the Veſſels that ſerve for theſe Uſes, are called,

SUBLIMING *Pots*, or *Aludels*; (which Word ſee.)

SUBLIMIS, one of the Muſcles that bend the Fingers.

SUBLINGUALES, are Glands, one on each ſide of the Tongue, they have two excretory Ducts (as the *Maxillares*) form'd by the Union of that of each ſmall Gland; they run on each ſide of the Tongue, near its Tip, where they open into the Mouth at a little Diſtance from the Gums; when the *Mylohyoidæus* acteth, it compreſſes them.

SUBLIN-

SUBLINGUINUS, is the ſame with the *Epiglottis* or *Pion*; which ſee.

SUBLUNARY, all things that are in the Earth, or in the Atmoſphere thereof, below the Moon.

SUBMULTIPLY Number, or Quantity, is that which is contained in another Number, a certain Number of Times exactly: Thus, 3 is Submultiply of 21, as being contained in it 7 Times exactly.

SUBMULTIPLY *Proportion*, the Reverſe of *Multiply*; which ſee.

SUBORNATION, is a ſecret or under-hand preparing, inſtructing, or bringing in a falſe Witneſs, or corrupting or alluring to do ſuch a falſe Act. Hence the *Subornation of Perjury*, mention'd in the Act of *General Pardon*, 12 *Car.* 2. *cap.* 8. is the Alluring to Perjury.

SUBPOENA, is a Writ whereby all Perſons, under the Degree of Peerage, are called into *Chancery*, in ſuch Caſe only where the Common Law fails, and hath made no proviſion; ſo as the Party who in Equity hath Wrong, can have no ordinary Remedy by the Rules and Courſe of the Common Law: But Peers of the Realm, in ſuch Caſes, are called by the Lord Chancellor's, or Lork Keeper's Letters, giving notice of the Suit intended againſt them, and requiring them to appear.

There is alſo a *Subpœna ad teſtificandum*, for the ſummoning of Witneſſes, as well in *Chancery*, as other Courts.

There is alſo a *Subpœna* in the *Exchequer*, as well in the Court of Equity there, as in the Office of Pleas.

And theſe Names proceed from the Words in the Writ, which charge the Party ſummoned, to appear at the Day and Place aſſigned; *ſub Pœna centum Librarum.*

SUBSCAPULARIS, or *Immerſus*, is a Muſcle of the Arm, ſo named from its ſituation; by ſome called *Immerſus*. It is a large fleſhy Muſcle filling the Internal Concave, part of the *Scapula*; ariſing fleſhy from its whole *Baſis*, and *Superior* and *Inferior Coſta* Internally, and marcheth forward, leſſening it ſelf according to the Dimenſions of the Bone, and paſſing over the Juncture, is inſerted in a Semicircular manner to the Neck of the *Os Humeri*: When this acteth, the *Os Humeri* is pulled near the Trunk of the Body. The Tendon of this Muſcle, together with the *Supra* and *Infra Spinatus*, and *Teres Minor*, unite near their Inſertions, and environ the Articulation of the *Os Humeri* with the *Scapula* not unlike the *Ligamentum Catum* of the *Coxa*, to prevent frequent Luxations: And by their ſucceſſive alternate acting, the Arm is moved circularly.

SUBSIDY, in Law, ſignifies an Aid, Tax, or Tribute granted by Parliament to the King, for the urgent Occaſions of the Kingdom, to be levied of every Subject, according to the Rate of his Lands or Goods, as the Parliament ſhall think fit.

SUBSTANCE, is whatever ſubſiſts by it ſelf independently from any created Being; and which is the Subject of Accidents and Qualities.

SUBSTANTIA *Corticalis Cerebri*. See *Corticalor Cinentia*.

SUBSTANTIVES (in *Grammar*) are ſuch Words as deſcribe the Abſolute Being of a Thing, and which joined with a Verb, do make a perfect Sentence.

SUBSTYLAR *Line*, in Dialling, is that Line drawn on the Plane of the Dial, over which the Style ſtands at Right Angles with the Plane. This is always the Repreſentation of the Meridian of that place where the Plane of the Dial is Horizontal. The Angle between the Line, and the true Meridian, is the Plane's Difference of Longitude, and is meaſured on the Equinoctial.

SUB-SUPER *particular* Proportion, is contrary to *Super-particular* Proportion; which ſee.

SUBTENSE, or Chord of an Arch, is a Right Line extended from one End of that Arch to the other End thereof.

SUBTERRANEOUS, or *Subterranean*, is whatever is within the Surface, Bowels, or Caverns of the Earth. Thus thoſe Trees, which being left there at the Univerſal Deluge, are ſo plentifully found buried in the Earth, in many Countries, are called *Subterraneous Trees*, and by ſome, *Foſſile-wood.*

SUBTRACTION, in the general, is taking a leſſer Quantity from a greater, to find the Difference between them, which is commonly called the *Remainder*; as the leſſer Quantity to be ſubſtracted is called the *Subtrahend.* The General Sign or Mark of Subſtraction is ——

SUBSTRACTION, in Algebra, or in Species, conjoins the Magnitudes propoſed, changing all the Signs of the *Subtrahend.*

Thus: If from 4 *a*, you ſubſtract *a*, by changing the Sign of the *Subtrahend*, it will ſtand thus:

$$\begin{array}{r} 4\,a \\ -\,a \\ \hline X = 3\,a \end{array}$$

Or thus.

$$4\,a - a = 3\,a.$$

And in Algebra, the Remainder, or Difference is uſually noted by the Letter X, or *d.*

N. B. To ſubſtract +, is the ſame as to add — and to ſubſtract —, is all one as to add +; as is plain from the Reaſons given in Addition in Algebra; which ſee.

Algebraick Subſtraction, in Compound Quantities, will eaſily be performed by only obſerving the General Rule of changing the Signs of the Quantity to be ſubſtracted, and then comparing the ſeveral Members together, and contracting them.

As ſuppoſe from $36\,b + 5\,m\,m - 7\,d\,f$, you would ſubſtract $20\,b + 2\,d\,f + 5\,m\,m$. Write them down one under another, changing all the Signs of the *Subtrahend*; and it will ſtand thus.

$$\begin{array}{r} 36\,b + 5\,m\,m - 7\,d\,f \\ -20\,b - 5\,m\,m - 2\,d\,f \\ \hline 16\,b - 9\,d\,f = X \\ \hline \end{array}$$

Which compared and contracted, will give the Difference or Remainder.

SUBSTRACTION of *Indices*, is done as Algebraical Quantities are, by changing the Sign of the *Subtrahend:* Thus,

From

From 3 take $\overline{2} = 5$, from 3 take $\overline{2} = 5$ from 3 take $\overline{2} = 1$, from 3 take $\overline{2} = 1$.

SUBTRACTION of *Integers*, in *Common Arithmetick*, is performed by ſubſcribing the leſſer Number under the greater, orderly; ſo that Units ſtand under Units, Tens under Tens, *&c.* and then beginning at the place of Units at the Right Hand: Take the leſſer from the greater, writing down the Remainder under the Line: If nothing remain, write down a Cypher, or 0. If the upper Number be in any part (for it cannot be ſo in the whole) leſſer than the Lower, add Ten to it, or call it Ten more than it is, writing down orderly the Exceſs above Ten; and then be ſure to carry that Ten ſo borrowed, to the next Figure, calling it One more than it is, and ſo on, as the following Examples.

	18	756	8254	567438
	15	431	6332	358784
Rem.	3	325	1922	208654

In *Subtraction*, the Number to be ſubtracted, together with the Difference or Remainder, are equal to the Number from which the Subtraction was made, which is a good Proof for Subtraction; as in the third Example, 6332, and the Remainder 1922, makes 8254, the firſt Number.

But if the Numbers be of different Denominations, then 'tis but taking the lower Denomination from that above it, and ſetting down the Remainder: But if any of the upper Denominations be leſſer than their reſpective lower ones, then you muſt borrow one of the former Denominations next to the Left Hand, and ſubtract, remembring to add 1 to the next Denomination below. As in the following Examples.

l.	*s.*	*d.*	*l.*	*s.*	*d.*
375	11	05	1754	11	02
132	09	04	982	13	05
243	02	01	771	17	09

Here the firſt Example has nothing of Difficulty in it; for the Lower is in each Denomination leſſer than its Upper.

In the ſecond Example, ſince 5 *d.* cannot be taken out of 2 *d.* I borrow 12 *d.* and 'twill be 14 *d.* Then I ſay, 5 from 14 leaves 9, which I ſet below: Now the 12 *d.* I borrowed, muſt be added to the 13 *s.* on the left Hand, then 'twill be 14 *s.* which I ſubtract from 31, (borrowing 20) reſts 17: Then, as in whole Numbers, 3 from 4 leaves 1, *&c.*

SUBTRACTION *of Logarithms.* See *Logarithms*, N. 4.

SUBTRACTION *of Vulgar Fractions.* See *Vulgar Fractions.*

SUBTRACTION *of Decimal Fractions.* See in *Decimal Fractions.*

SUBTRIPLE *Proportion*, is when one Number or Quantity is contained in another three times: Thus 2 is ſaid to be *Subtriple* of 6, as 6 is Triple of 2.

SUCCENTURIATI *Renes.* See *Capſulæ attribilaria.*

SUCCESSION *of the Signs*, is that Order in which they are uſually reckoned: As firſt *Aries*, next *Taurus*, then *Gemini*, &c. This is otherwiſe called Conſequence.

SUCCOTRINE *Aloes*, is the fineſt ſort that comes from the Iſland *Succortra*, on the Coaſt of *Arabia*, and from its Colour is called, *Aloes Hepatica*, or Liver-colour'd Aloes.

SUCCUS *Pancreaticus.* See *Ductus Pancreaticus.*

SUCULA or *Succula*, is a Term in Mechanicks for a bare Axis or Cylinder, with Staves in it to move it round, but without any Tympanum, or *Peritrochium.*

SUDAMINA, are little Pimples in the Skin, like Millet Grains; this is frequent in Children and Youths, eſpecially thoſe that are of a hot Temper, and uſe much Exerciſe: They break out in the Neck, Shoulders, Breaſt, Arms and Thighs, *&c. Blanchard.*

SUDOR, Sweat, is a watry Humour which conſiſts of Water chiefly, with a moderate Quantity of Salt and Sulphur; this is driven through the Pores of the Skin by the Heat and Fermentation of the Blood, and ſometimes by its Weakneſs and Colliquation. *Blanchard.*

SUDORIFIKS. See *Hydroticks.*

SUFFITUS, is a thickiſh Powder prepared of Odoriferous Plants, Gums, *&c.* which thrown upon Coals produces a pleaſant Smell. *Blanchard.*

SUFFOCATIO *Uterina.* See *Hiſterica paſſio.*

SUFFRUTEX, is a Name by the Botaniſts, given to a low woody Perennial Plant, ſending out no Leaves from its Root, and beginning to be branched from the very Bottom of the Stalk; ſuch as *Lavender*, *Rue*, *Sage*, &c.

SUFFUSION. See *Hypochyma & Cataract.*

SUGAR *of Lead.* See *Salt of Saturn.*

SUIT, ſignifies a following another, but in divers Senſes.

The firſt, is a Suit in Law, and is divided into *Real* and *Perſonal*, and is all one with *Action Real* and *Perſonal.*

Secondly, *Suit of Court*, or *Suit-ſervice*, is an Attend that Tenants owe to the Court of their Lord.

Thirdly, *Suit-Covenant*, is when your Anceſtor hath covenanted with mine *to Sue* to his Court.

Fourthly, *Suit-cuſtom*, when I and my Anceſtors have been ſeized of their own and their Anceſtors *Suit*, time out of Mind.

Fifthly, *Suit Real* or *Regal*, when Men come to the Sheriffs Turn or Leet.

Sixthly, *Suit* ſignifies the following one in Chace, as *Freſh-ſuit.*

Laſtly, it ſignifies a Petition made to the King, or any great Perſon.

SUIT *of the King's Peace*, is purſuing a Man for Breach of the *King's Peace* by Treaſons, Inſurrections or Treſpaſſes.

SULPHUR, the ſecond Hypoſtatical Principle of the Chymiſts, which we call Oil. See *Oil.*

The

The Conſtituent Character of Sulphur ſeems to be *Inflammability*: And there are three Kinds of Inflammable Bodies obtainable by Chymiſtry.

Firſt, *An Oil.*

Secondly, *An Ardent Spirit.*

Thirdly, *A Conſiſtent Body*, like to common Brimſtone: All which are properly Sulphur.

SULPHUREOUS *Spirit of Vitriol.* After the Spirit and Oil of Vitriol are in Diſtillation of that Mineral, driven out by a moſt violent Fire (for 3 or 4 Days together) into the Receiver, they commonly Rectifie the Matter in a Glaſs-Body; and the firſt Spirit that riſes then with a very gentle degree of Fire, is called the *Sulphureous Spirit of Vitriol.*

SULPHUR *of Antimony.* See *Golden Sulphur of Antimony.*

SUM, in Mathematicks, ſignifies the Quantity that ariſes or reſults from the Addition of two or more Magnitudes, Numbers or Quantities together; this is ſometimes call'd the *Aggregate*: And in Algebra, 'tis uſually denoted by the Letter Z, which ſtands for *Zuma* or *Suma*; and ſometimes by the Initial Letter S.

SUM *of an Equation*, is when the abſolute Number being brought over to the other ſide with a contrary Sign, the whole becomes equal to O. And this *Des Cartes* calls *the Sum of the Equation propoſed.*

SUMMER *Solſtice.* See *Solſtice.*

SUMMONEAS, is a Writ Judicial of great diverſity, according to the divers Caſes wherein it is uſed, which ſee in the Table of the *Regiſter Judicial.*

SUMMONS, in Common Law, is as much as *Vocatio in jus*, or *Citatio* among the *Civilians*: But how *Summons* is divided, and what Circumſtances it has to be obſerved. See *Fleta lib.* 6. *Cap.* 6, 7.

SUMMONS, *in Terra petita*, is that Summons which is made upon the Land, which the Party (at whoſe Suit the *Summons* is ſent forth) ſeeks to have.

SUMMONS *ab Warrantizand.* in Law, is the Proceſs whereby the Vouchee is called.

SUMPTUARY *Laws*, were Laws made to reſtrain Exceſs in Apparel, and to prohibit coſtly Cloaths, of which we had formerly many in *England*, but now are all repealed.

SUN, Our Excellent Sir *Iſaac Newton* ſaith in his *Principia*, That the Denſity of the Sun's Light (which is Proportional to Heat) is ſeven times as great in *Mercury*, as with us; and therefore our Water *there* would be all carried off, and boil away: For he found by Experiments of the *Thermometer*, That an Heat but 7 times as great as that of the Sun-Beams in Summer, will ſerve to make Water boil.

He proves alſo, That the Matter of the Sun to that of *Jupiter*, is nearly as 1100 to 1; and that the Diſtance of that Planet from the Sun, is in the ſame Ratio to the Sun's Semidiameter.

That the Matter of the Sun to that of *Saturn*, is as 2360 to 1; and the Diſtance of *Saturn* from the Sun, is in a Ratio, but a little leſs than that to the Sun's Semidiamiter.

And conſequently that the common Center of Gravity, of the Sun and *Jupiter*, is nearly in the Superficies of the Sun; of *Saturn*, and the Sun a little within it. And by the ſame manner of Calculation it will be found that the common Center of Gravity of all the Planets, cannot be more than the Length of the Solar Diameter diſtant from the Centre of the Sun: This common Centre of Gravity he proves to be at reſt; and therefore tho' the Sun by reaſon of the various Poſition of the Planets may be moved every way, yet it cannot receed far from the common Centre of Gravity. And this he thinks ought to be accounted the Centre of our World. *Book* 3. *Prop.* 12.

By Means of the *Solar Spots* it hath been diſcovered that the Sun revolves round his own Axis, without moving (conſiderably) out of his Place, in about 25 Days. And that the Axis of this Motion is enclined to the Ecliptick, in an Angle of 87 Degrees, 30 Minutes nearly. *Gregor. Aſtronom.*

The Sun's apparent Diameter being ſenſibly ſhorter in *December* than in *June*, as is plain and agreed from Obſervation, the Sun muſt be proportionably nearer to the Earth in Winter than in Summer; in the former of which Seaſons will be the *Perihelion*, in the latter the *Aphelion*: And this is alſo confirmed by the Earth's moving ſwifter in *December*, than it doth in *June*; as it doth about $\frac{5}{115}$.

For ſince, as Sir *Iſaac Newton* hath demonſtrated by a Line drawn to the Sun, the Earth always deſcribes equal Area's in equal Times, when ever it moves ſwifter, it muſt needs be nearer to the Sun. And for this Reaſon there are about 8 Days more from the Sun's Vernal Equinox to the Autumnal, than from the Autumnal to the Vernal.

According to Mr. *Caſſini*, the Sun's greateſt diſtance from the Earth is 22374, his mean Diſtance 2200, and his leaſt Diſtance 8022, Semidiameters of the Earth.

And that the Sun's Diameter is equal to 100 Diameters of the Earth, and therefore the Body of the Sun muſt be 1000000 times greater than that of the Earth.

Mr. *Azout* aſſures us, that he obſerv'd by a very exact Method the Sun's Diameter to be not leſs than 31 Minutes, 45 Seconds in his *Apogee*, and not greater than 32 Minutes, 45 Seconds in his *Perigee.*

The mean Apparent Diameter of the *Sun* according to Sir *Iſaac Newton*, is 32 Minutes 12 Seconds, in his *Theory of the Moon*, 32′ 15″.

If you divide 360 Degrees (*i. e.* the whole Ecliptick) by the Quantity of the Solar Year, it will Quote 59 Minutes 8 Seconds, *&c.* which therefore is the Quantity of the Sun's Diurnal Motion. And if this 59 Minutes, 8 Seconds be divided by 24, you have the Sun's Horary Motion, which is 2 Minutes, 28 Seconds; and if you will divide this laſt by 60, you will have this Motion in a Minute, *&c.* And this way are the Tables of the Sun's mean Motion, which you have in the Books of Aſtronomical Calculation, conſtructed.

The Sun's Horizontal Parallax, Dr. *Gregory* and Sir *Iſaac Newton* makes but 10 Seconds.

The ſame learned Mathematician, at the end of his *Aſtronomiæ Phyſ. & Geometr. Elem.* hath a Comparative Aſtronomy, where among the reſt he conſiders what Phænomina would appear in the Planetary Syſtem, *&c.* to an Eye placed at the Sun, which are ſuch as theſe:

1. That the Fixt Stars would appear in a Concave Sphere, the apparent Centre of which, is the Eye of the Spectator.

2. He would diſtinguiſh the Planets from the Fixt Stars (tho' they would appear to him to be placed among them) by their Periodical Revolutions

ons, and by the Time of thoſe, one Planet from another: And he would judge that Planet to be fartheſt off, whoſe Periodical Revolution was the longeſt; and ſo on in order for the reſt, &c.

3. To this Solar Obſerver's Eye, the Planets would appear always *direct*, and never *Stationary*, nor *Retrograde*, as they do to an Eye at the Earth: And they would be found to return to the ſame Fixt Stars again as Periods of very different lengths; and the Inferior Planets would ſometimes cover the ſuperior ones.

4. If you ſuppoſe the Eye to be moved from the Centre of the Sun to its Surface, then by the Parallax of the Planets ſome better gueſs will be had of their Diſtances, than by the Obſervation of the different Velocity and Tardity of their Motion, could before be obtained: For to the Eye thus placed the Earth's Horizontal Parallax will be 16 Minutes, equal to the Sun's Semidiameter, and conſequently ſenſible enough. That of *Saturn* will be ſomething above one Minute and an half, (that Planet being 10 times the Diſtance of the Earth from the Sun; and the Horizontal Parallax of *Mercury* will be almoſt 50 Minutes: And ſince theſe Parallaxes are ſufficiently ſenſible, the Diſtances of the Planets may be compared with the Sun's Diameter, and with one another.

5. To an Eye thus placed all the Fixt Stars and Planets will ſeem to revolve from Eaſt to Weſt, in the ſpace of 25 of our Natural Days: The North Pole of which Revolution, will be in that part of the Heaven, which we (Inhabitants of the Earth) call the 10th Degree of *Piſces*, with 83 or 84 Degrees of North Latitude: Wherefore the Artick Pole-Star will be at the 2d Flexure of *Draco*, and which will not be above 3 Degrees from the Pole. The South-Pole will be in 10 Degrees of *Virgo*, with 83 or 84 Degrees South Latitude, near a Star of the fourth Magnitude, which in Cap. *Halley*'s Catalogue is in the firſt Oar of the *Argo Navis*.

6. The Planets thus ſeen from the Sun will appear of Different Magnitudes: For the Diameter of *Saturn*, will ſubtend there but an Angle of 18 Seconds: That of *Jupiter* near 40 Seconds: That of *Mars* but 8 Seconds: That of *Venus* 28 Seconds: And the Diameter of *Mercury* 20 Seconds.

But Mr. *Hugens* ſuppoſes the Diameters of the ſuperior Planets will be much larger; as making that of *Jupiter*, to ſubtend an Angle of almoſt 54 Seconds; and that of the Body of *Saturn* without his Ring 27 Seconds.

7. Of theſe ſix Planets thus moving round the Sun, three will appear attended with their Satellites: Of which the Earth will have but one, which is the Moon; and who will appear at the greateſt diſtance, not to be from the Earth above 10 Minutes.

Jupiter will appear with his four Moons, or Satellites; of which the outermoſt will never appear above nine Minutes diſtant from the Primary Planet.

Saturn will appear with his 5 Satellites (if ſo many there be) and the furthermoſt of them will never be above 9 Minutes diſtant from his Body: His Ring alſo will appear compaſſing round the Planet.

The Paths, or Orbits of theſe Satellites being ſeen from the Sun ſometimes more, ſometimes leſs Oblique, will appear accordingly now broader, now narrower Ellipſes; ſometimes the Planes of theſe Orbits being produced, will paſs thro' the Sun: In which Caſe, the former narrow Ellipſes will paſs into Right Lines; which will happen twice in every Revolution of the Orbit round the Sun, if its Plane remain always parallel to its ſelf: Whence the Satellite will now appear to be covered by the primary Planet, and then the Planet by it; and ſometimes will appear round the Planet, without its Disk, in an Ellipſis.

8. The primary Planets, as alſo their Satellites, have not only rough and unpoliſhed Surfaces, but alſo are ſo diſform, that they have their Spots, which are places more or leſs obſcure, (and ſometimes more bright) than the reſt of their Disk: And theſe *Spots*, by the Rotation of the Planet, or Satellite, round its Axis, do deſcribe Circles; and therefore theſe Ways, or Paths of the Spots, being ſeen from the Sun in the Plane of the Planetary Disk, will now appear Elliptical, and now ſtrait Lines, (as before the Paths of the Satellites Disk) according as the Sun is elevated on either ſide, above the Plane of thoſe Circles, or is found in it, as it is when it is in the Equinoctial of that Planet. And if there be a Series or Row, of theſe Spots, (as in the Belts of *Mars* and *Jupiter*) theſe will appear in the Form of Semi-Ellipſes (the one half being behind, or on the other ſide the planes) or will paſs into ſtraight Lines, which will alſo be the Caſe of the outward Edge of the Ring of *Saturn*. But ſome of theſe Spots will now and then be hid, and ſometimes be viſible for a long time, according as they are near to the Planets Pole, which is turned from or towards the Sun.

And this will be moſt obſervable in *Saturn*, and in the Earth, in the others ſcarcely at all, becauſe in them the Illuſtration of the Sun reaches to both their Poles.

9. Beſides theſe ſix primary Planets, and their 10 Satellites, which to our Solar Obſervator, will all appear to move within the Bounds of a Zodiack ſcarce 16 Degrees broad, and not much inclined to the Circle of the firſt Motion, all the ſame way, and in Orbits nearly Concentrical to the Sun: There are alſo another kind of Bodies, whoſe Number is uncertain, which move round the Sun in very Eccentrical Orbits, and which are called *Comets*; and which ſometimes come very near the Sun, and ſometimes are vaſtly remote from him.

Theſe *Comets* do not move all in the ſame Track (altho' each one always keeps his own) but ſome one Way, and ſome another, and moſtly in Orbits very much inclin'd to the Ecliptick, and always in great Circles of the Sphere. Their *Coma* or Tail (to an Eye at the Sun) will not appear oblong, or ſtretch'd out in length, as it doth to us, but every way diffuſed round the Head.

SUNARTHROSIS, is the jointing of Bones, as that of the Ribs with the *Vertebra*, &c.

SUNDAY *Letter*, the ſame with *Dominical Letter*.

SUPERBUS *Muſculus*. See *Attollens Oculorum*.

SUPERCILIUM. See *Cilium*.

SUPERFICIAL *Content*. See *Area*.

SUPERFICIAL *Numbers*; the ſame with *Plain Numbers*.

SUPERFICIES, the ſame with *Surface*; (which ſee) is Length and Breadth only, without Thickneſs.

SUPER-

SUPERFOETATION, is when after one Conception another ſucceeds, ſo that both are in the Womb together: *Sennertus* makes mention of frequent Caſes of this Nature.

SUPER-INSTITUTION, one *Inſtitution* upon another; as where *A.* is admitted and inſtituted to a Benefice upon one Title, and *B.* is *admitted, inſtituted*, &c. by the Preſentment of another.

SUPERONERATIONE *Paſturæ*, is a *Writ Judicial*, that lies againſt him who is impleaded in the County, for the over-burdening of a Common with his Cattle, in caſe where he was formerly impleaded for it in the County, and the Cauſe is removed into the King's Court at *Weſtminſter*.

SUPERPARTICULAR *Proportion*, is when one Number or Quantity, contains another once, and one ſuch Part whoſe Numerator is 1; then the Number ſo contained in the Greater, is ſaid to be to it in *Superparticular Proportion*.

SUPERPARTIENT *Proportion*, is when one Number or Quantity, contains another once, and ſome Number of *Aliquot Parts* remaining; as, $1\frac{2}{3}$, $1\frac{3}{4}$, $1\frac{2}{5}$, &c.

SUPER *Prerogativa Regis*, is a Writ which lay againſt the *King's Widow*, for marrying without his Licence.

SUPER *Statuto*, is a Writ that lay againſt the King's Tenant holding in Chief, which alienateth the King's Land without his Licence.

SUPER *Statuto de Articulo Cleri*, is a Writ againſt the Sheriff, or other Officer, that diſtrains in the King's High-way, or in the Glebe-Lands, anciently given to Rectories.

SUPER *Statuto facto pour Seneſchal & Marſchal de Roy*, &c. is a Writ lying againſt the *Steward*, or *Marſhal*, for holding Plea in the Court of Freehold, or for Treſpaſs, or Contract not made within the King's Houſhold.

SUPERLATIVE Degree, in *Grammar*, is when an *Adjective* hath joyned to its Natural and Ordinary Signification, the Word *moſt* or *very*, as *moſt Wiſe, very Good*.

SUPERPURGATION. See *Hypercatharſis*.

SUPERSCAPULARIS *Superior*. See *Supra-Spinatus*.

SUPERSEDEAS, is a Writ in divers Caſes, and ſignifies in general, a Command to ſtay, or forbear the doing of that which ought not to be done, or in appearance of Law were to be done, were it not for that whereon the Writ is granted.

Thus: A Man regularly, is to have Surety of Peace againſt him of whom he will ſwear he is afraid; and the Juſtice required hereunto cannot deny it him: Yet if the Party be formerly bound to the Peace, either in *Chancery*, or elſewhere, this Writ lies to ſtay the Juſtice from doing that which otherwiſe he ought not to deny.

SUPER *Statutum Edw.* 3. *verſus Servants & Labourers*, is a Writ lying againſt him who keeps my *Servants*, departed out of any Service againſt Law.

SUPER *Statuto de York, quo nul ſera Viteller*, &c. is a Writ that lies againſt him that uſes Victualling either in Groſs, or by Retail in a City, or Borough-Town, during the time he is Mayor, *&c.*

SUPERVISOR, ſignifies a Surveyor, or Overſeer: It was formerly, and is ſtill among ſome a Cuſtom, eſpecially of the better ſort, to make a *Superviſor* of a Will, but it is to little purpoſe: However the firſt might be good, that he ſhould *Superviſe* the Executor, and ſee the Will truly performed.

SUPINATOR *Radii Brevis*, is a Muſcle of the *Radius*, which ariſeth partly Tendinous and Fleſhy from the Superior and external Part of the *Ulna*, next the *Radius*, and paſſing obliquely tranſverſe over that Bone, is ſo inſerted to its ſuperior Part below the Prominence of the *Radius*, where the round Tendon of the *Biceps* endeth: It helps with the *Supinator Longus*, to move the *Radius* outwards.

SUPPEDANEA. See *Supplantalia*.

SUPINATOR *Radii Longus*, is a Muſcle of the *Radius*, which ariſeth broad and fleſhy from the ſuperior and external Part of the *Os Humeri*, three Fingers breadth below the Termination of the *Deltoides*, and deſcending obliquely inwards, it gradually leſſens it ſelf, and becomes a flat, broad Tendon, which likewiſe grows narrower till it is inſerted to the external and inferior Part of the *Radius* near the *Carpus*, it helps with *Supinator Brevis*, to move the *Radius* outwards.

SUPPLANTALIA, are Plaiſters applied to the Feet; theſe for the moſt part are made of Leven, Muſtard, wild Radiſh, Salt, Soap, Gunpowder, Euphorbium, *&c.* they are called alſo *Suppedanea*.

SUPPLEMENT of an Ark, in *Geometry* or *Trigonometry*, is the Number of Degrees that it wants of being an entire Semi-circle; as Complement ſignifies what an Ark wants of being a Quadrant.

SUPPLICAVIT, is a Writ iſſuing out of the *Chancery*, for taking the Surety of Peace againſt a Man: It is directed to the Juſtices of Peace of the County, and the Sheriff, and is grounded upon the Statute, *Anno* 1 *E.* 3. *Cap.* 16. which ordains, That certain Perſons in *Chancery* ſhall be aſſigned to take care of the Peace. This Writ was formerly called *Breve de minis*.

SUPPORTERS, in *Heraldry*, are ſome kind of *Beaſts, Birds*, &c. which in an Atchievement, are drawn ſtanding on each ſide of, and ſupporting the Shield, or Eſcutcheon. No one under the Degree of a *Knight Banneret*, can have his Arms drawn with *Supporters*.

SUPPOSITORY, is an oblong piece of a kind of Paſte, of about a Finger's length, which in ſome Caſes is put up into the Fundament, to purge the Patient; 'tis uſually compounded of Honey, Salt, purging Powders, *&c. Blanchard.*

SUPPURATION. See *Abſceſſus*.

SUPRA *Spinatus*, or *Supra Scapularis*, is a Muſcle ſo called, becauſe it is placed above the Spine of the Shoulder-blade: It ariſeth fleſhy from the ſuperior part of the *Baſis Scapulæ*, that is above its Spine; as alſo from the ſaid Spine and *Coſta ſuperior* of the *Scapula*; from thence paſſing between the *Proceſſus Coracoides*, and *Anchoreformis*, it grows leſs, and becoming Tendinous, marches over the Articulations of the *Humerus*, joining its Tendons with the *Infra-ſpinatus*, is inſerted to the Head of the *Os Humeri*. The proper Uſe of this *Muſcle*, is to lift the Arm upwards towards the *Occiput*.

SURA, the ſame with *Os Fibulæ*.

SURALIS, is a Branch of the *Vena Cruralis*, it divides into two Branches, the one External, and the other Internal, which is the biggeſt; and each of thoſe Branches divide again into two more: This Vein diſtributes its Branches upon the Fat of

the Leg, and makes with the Branches of the *Poplitea*, all thoſe *Plexus* of Veins which are conſpicuous on the upper Part of the Foot.

SURAL *Vein*, is a Vein which runs down on the Calf of the Leg,

SUR *cui in Vita*, is a Writ that lies for the Heir of that Woman, whoſe Husband has alienated her Land in Fee, and ſhe brings not the Writ *Cui in Vita*, for the Recovery of her own Land: In this Caſe her Heir may have this Writ againſt the Tenant after her Deceaſe.

SURD *Roots, or Numbers.*

When any Number or Quantity, hath its Root propoſed to be Extracted, and yet is not a *true Figurate Number of that kind*: That is, if its Square Root being demanded, it is not a *true Square*: If its Cube Root being required, it ſelf be not a *true Cube*, &c. Then 'tis impoſſible to aſſign, either in whole Numbers or Fractions, any exact Root of ſuch Number propoſed. And whenever this happens, 'tis uſual in Mathematicks to mark the required Root of ſuch Numbers or Quantities, by prefixing before it the proper Mark of Radicality, which is $\surd$: Thus $\surd$: 2 ſignifies the Square Root of 2, and $\sqrt[3]{}$: 16. or $\surd$: (3) 16. ſignifies the Cubick Root of 16: Which Roots, becauſe they are impoſſible to be expreſſed in Numbers exactly (for no effable Number, either Integer or Fraction multiplied into it ſelf can ever produce 2; or being multiplied Cubically can ever produce 16) are very properly call'd *Surd Roots*.

There is alſo another way of *Notation* now much in Uſe, whereby Roots are expreſſed, without the Radical Sign, by their *Indexes*: Thus, as x^2. x^3. x^5. &c. ſignifie the Square, Cube, and 5th Power of x; ſo $x^{\frac{1}{2}}$. $x^{\frac{1}{3}}$. $x^{\frac{1}{5}}$. &c. ſignifie the Square Root, Cube Root, &c. of x. The Reaſon of which is plain enough, for ſince $\surd$: x is a Geometrical mean Proportional between 1. and x. So $\frac{1}{2}$ is an Arithmetical mean Proportional between 0 and 1. and therefore as 2 is the Index of the Square of x, $\frac{1}{2}$ will be the proper Index of its Square Root, &c.

Obſerve alſo, that for Convenience or Brevity-ſake, Quantities or Numbers which are not *Surds*, are often expreſſed in the Form of *Surd Roots*, Thus $\surd$: 4 $\surd$: $\frac{9}{4}$ $\sqrt[3]{}$: 27, &c. ſignifie, 2, $\frac{3}{2}$ 3, &c.

But altho' theſe Surd Roots (when truly ſuch) are inexpreſſible in Numbers, they are yet capable of Arithmetical Operations (ſuch as Addition, Subſtraction, Multiplication, Diviſion, &c. which how readily to perform the Algebraiſt ought not to be Ignorant.

Surds are either *Simple*, which are expreſſed by one ſingle Term; or elſe *Compound*, which are formed by the Addition or Subſtraction of ſimple Surds: As $\surd$: 5 + $\surd$: 2: $\surd$: 5 − $\surd$: 2. or $\sqrt[3]{\surd: 7 + \surd: 2}$: Which laſt is called, an *Univerſal Root*: And ſignifies the Cubick Root of that *Number, which is the Reſult of adding 7 to the Square Root of 2.*

The Arithmetick of Surds conſiſts of theſe principal Parts.

I. *To reduce Rational Quantities to the Form of any Surd Roots aſſigned:*

Which is perform'd by Involving the Rational Quantity according to the Index of the Power of the Surd, and then prefixing before it the Radical Sign of the Surd propoſed.

Thus to reduce $a = 10$ to the Form of $\surd$: 15. = $\surd$: b. you muſt ſquare $a = 10$; and prefixing the Sign, it will ſtand thus, $\surd$: $a\,a = \surd$: 100. which is in the Form of the Surd deſired. So alſo if 3. were to be brought to the Form of $\sqrt[4]{}$: 12, you muſt raiſe 3 up to its fourth Power, and then prefixing the Note of Radicality to it, it will be $\sqrt[4]{}$: 81. or $81^{\frac{1}{4}}$, which is in the ſame Form with $\sqrt[4]{}$: 12.

And this way may a ſimple Surd Fraction, whoſe Radical Sign refers only to one of its Terms, be changed into another, which ſhall reſpect both Numerator and Denominator. Thus, $\frac{\surd: 2}{5}$ is reduced to $\surd$: $\frac{2}{25}$ and $\frac{5}{\surd: 4}$, to $\sqrt[3]{}$: $\frac{125}{4}$: Where the Radical Sign affects both Numerator and Denominator alike.

II. *To reduce Simple Surds, having different Radical Signs,* (which are called *Heterogeneal Surds, to others that may have one common Radical Sign, or which are Homogeneal.*

Divide the Indexes of the Powers of the Surds by their greateſt common Diviſor, and ſet the Quotients under the Dividends; then multiply thoſe Indexes croſs-ways by each others Quotients, and before the Products, ſet the common Radical Sign $\surd$: with its proper Index: Then Involve the Powers of the given Roots Alternately, according to the Index of each others Quotient, and before thoſe Products, prefix the common Radical Sign before found.

To Reduce $\sqrt[2]{}$: $a\,a$ and $\sqrt[4]{}$: $b\,b$

2) $\sqrt[2]{}$: $a\,a$ 2) $\sqrt[4]{}$: $b\,b$

1 X 2

$\sqrt[4]{}$: $b\,b$ $\sqrt[4]{}$: $a\,a\,a\,a$

To Reduce $\surd$: 5 and $\sqrt[4]{}$: 7

$\sqrt[2]{}$: 5 $\sqrt[4]{}$: 7.

1 X 2

$\sqrt[4]{}$: 25 $\sqrt[4]{}$: 2401.

III. *To*

III. *To reduce Surds to the loweſt Terms poſſible.*

Divide the Surd by the greateſt Square, Cube, Biquadrate, &c. or any other higher Power, which you can diſcover is contained in it, and will meaſure it without any Remainder, and then prefix the Root of that Power before the Quotient, or Surd ſo divided, and this will produce a new Surd of the ſame Value with the former, but in more ſimple Terms. Thus, $\surd : 16\,a\,a\,b$, by dividing by $16\,a\,a$ and prefixing the Root $4\,a$, will be reduced to this $4\,a\surd : b$ and $\surd : 12$, will be depreſſed to $2\surd : 3$. Alſo $\sqrt[3]{} : c\,b^3\,r$, will be brought down to $b\sqrt[3]{} : c\,r$. And this Reduction is of great Uſe whenever it can be performed: But if no ſuch Square, Cube, Biquadrate, &c. can be found for a Diviſor, then you muſt find out all the Diviſors of the Power of the Surd propos'd; and then ſee whether any of them be a Square, Cube, &c. or ſuch a Power as the Radical Sign denotes; and if any ſuch can be found, let that be uſed in the ſame manner as is above ſaid, to free the Surd Quantity in part from the Radical Sign. Thus, if $\surd : 288$ be propos'd; among its Diviſors will be found the Squares 4. 9. 16. 36. and 144. by which if 288 be divided, there will ariſe the Quotients 72. 32. 18. 8. and 2. wherefore inſtead of $\surd : 288$, you may put $2\surd : 72$, or $3\surd : 32$. or $4\surd : 18$. or $6\surd : 8$. or laſtly: $12\surd : 2$. and the ſame may be done in Species.

IV. *To find whether two Surd Roots given, are Commenſurable or not.*

Thoſe are called *Commenſurable Surds*, which are to one another as Number to Number, as one Rational Quantity to another; or which are, when reduced to their leaſt Terms, true Figurate Quantities of their own kind.

To diſcover therefore, whether they are ſuch or not: If the Surds are of different kinds, (or *Heterogeneal Surds* as ſome call them) they muſt firſt be reduced to one kind, and then divided ſeverally by their greateſt common Meaſure, for if then there will come out Rational Quotients, the firſt Surds are *Commenſurable*; but if the Quotients are Irrational, or Surd Numbers or Quantities, then the propoſed Surds are Incommenſurable.

V. gr. To Examine whether $\surd : 12$. and $\surd : 3$. are Commenſurable Surds, they being Homogeneal, I divide them ſeverally by their greateſt Common Diviſor, which is $\surd : 3$; and the Quotients are $\surd : 4$. and $\surd : 1$. that is 2 and 1. Wherefore, ſince 2 and 1. are Rational Numbers, I ſay that $\surd : 12$ and $\surd : 3$ are Commenſurable Surds; or are to one another as 2 to 1. which is very plain; for no doubt 12, 3 :: as 4 1. and 'tis plain that as Squares are to one another, ſo are their Roots; wherefore 12. 3. as $\surd : 12\surd : 3$. that is, as $\surd : 4.\surd : 1$. or as 2 to 1.

Whenever two Surds are divided by one common Diviſor, (tho' not the greateſt, if their Quotients come out Rational, or are to one another as Number to Number, thoſe Surds are certainly Commenſurable.

If Fractional Surds were given, not having a common Denominator, they muſt firſt be reduced to their ſmalleſt common Denominator, and then if their Numerators are Commenſurable, you may conclude the firſt Surd Fractions were ſo.

But if either the Numerators or Denominators of two Surds, proper Fractions, or mixt Numbers in the Form of Fractions (neglecting the Radical Sign) be Powers of that kind which the Radical Sign expreſſes, then they will need no Reduction: For if their Numerators or Denominators are Commenſurable, the whole Surd Fractions propoſed are certainly ſo. Thus, if it were enquired whether $\surd : \frac{50}{16}$ and $\surd : \frac{72}{25}$ are Commenſurable Surds; becauſe 16 and 25 are Squares, or ſuch Powers as the Radical Sign expreſſes or denotes, omitting the Sign $\surd :$ you need only compare the Numerators $\surd : 50$ and $\surd : 72$; which being divided by their greateſt common Diviſor, $\surd : 2$, the Quotients will be 5 and 6 (*i. e.* $\surd : 25$ and $\surd : 36$) Wherefore the given Surds are Commenſurable, and are to one another, as $\frac{5}{4}$ to $\frac{6}{5}$ and conſequently, by the precedent Rule may be expreſſed thus, $\frac{5}{4}\surd :$ 2 and $\frac{6}{5}\surd : 2$.

For an Inſtance in *Species*; ſuppoſe that it were enquired whether $\surd : 27\,a\,a$ and $\surd : 12\,a\,a$ were Commenſurable Surds; Divide each by the greateſt common Diviſor $\surd : 3\,a\,a$: And the Quotients $\surd : 9$ and $\surd : 4$. that is, 3 and 2. are Rational Numbers; and conſequently, the propoſed Surds are Commenſurable.

Multiplication of ſimple Surd Roots.

If the Surds propoſed be of the ſame kind, Multiply them one by another, and prefix the common Radical Sign to the Product; but if the Surds are Heterogeneal, or of different kinds, they muſt be reduced firſt (according to Rule 2.) to Surds, having the ſame radical Sign.

Thus to multiply $\surd : 7$ by $\surd : 8$. the Product will be $\surd : 56$.

For ſince in all Multiplication, as 1. is to one Factor, ſo is the other to the Product; therefore here $\surd : 1.\surd : 7 :: \surd : 8.\surd : 56$. But if 4 Terms are Proportionable, their Squares will be ſo too; wherefore 1. 7. :: 8. 56. that is, 56 is the true Square of $\surd : 56$ and $\surd : 56$. the true Root of $7 \times 8 = 56$.

Other Examples.

I. If $\surd : 8$ were to be multiplied into $\sqrt[3]{} : 4$. becauſe they are not Homogeneal Surds, they muſt be reduced to ſuch by *Rule* 2. and then they will ſtand thus, $\sqrt[6]{} : 512\ \sqrt[6]{} : 16$, which being multiplied into each other, and the common Radical Sign prefix'd, will make $\sqrt[6]{} : 8193$; and thus the $\sqrt[3]{} : 27$ multiplied by $\surd : 9$. when reduced, and rightly multiplied, produces $\sqrt[6]{} : 531441$.

II. When a Surd is to be multiplied by a Rational Quantity, that Rational Quantity ought firſt to be reduced to a Surd of like Nature with the true Surd. But 'tis oftentimes convenient only to connect them together, by prefixing the Rational Quantity to the Left-hand of the Surd. As ſuppoſe $\surd$ 27 were to be multiplied by 6, the Product may commodiouſly be expreſſed thus, $6 \surd : 27$, and ſo if $\sqrt[4]{} : 9$ were to be multiplied by 10, it will ſtand thus, $10 \sqrt[4]{} : 9$.

III. And when two Rational Quantities are thus prefix'd to two Surds of the ſame kind, you may find the Product of them, by multiplying the Rational Part by the Rational, and the Surd Part by the Surd, then thoſe joyned together, will be the Product required. Thus, $6 \sqrt[3]{} : 7$ multiplied by $5 \sqrt[3]{} : 3$ produces $30 \sqrt[3]{} : 21$.

IV. If any Surd Root be to be multiplied into it ſelf, or *Involved*, according to the Index of its proper Power, you need only caſt away the Radical Sign, and then the Quantity, or Number remaining, is always the Square, Cube, or other Power required; and will always be Rational.

Thus the Square of $\surd : 11$, is 11.

The Cube of $\sqrt[3]{} : 30$, is 30.

Alſo $2 \surd : 3$ multiplied by $8 \surd : 3 = 48$. and $3 \surd : 5$ multiplied by $2 \surd : 5 = 30$.

V. And if the Index of the Power be any even compound Number greater than two, and 'tis required to ſquare ſuch a Surd: There need only a Radical Sign, whoſe Index is half the former, be prefix'd to the Quantity, inſtead of the former Compound one, and it is done.

V. gr. Suppoſe you would *Square* this Surd, $\sqrt[4]{} : 12$; becauſe the Index 4, is compounded of 2 and 2; $\surd : 12$. is the true Product, or the true Square of the *Surd Root* $\sqrt[4]{} : 12$. ſo alſo the *Square* of $\sqrt[6]{} : 10$, is $\sqrt[3]{} : 10$.

The Reaſon of which, is plain: For ſuppoſe the $\sqrt[4]{} : 16 = 2$ were to be ſquared; its *Square in Surds* will be expreſſed thus, $\surd : 16 = 4$.

But when a ſimple Surd Quantity, whoſe Radical Sign hath for its Index ſome Ternary Number greater than 3, as 6, 9, &c. And 'tis required to Involve this Surd Cubically. Then only prefix before the Quantity a Radical Sign, with an Index, which is one third of the former, and 'tis done.

Thus, if $\sqrt[6]{} : 64$, were to be Cubed, it will be $\sqrt[2]{} : 64$, and the Cube of $\sqrt[9]{} : 512$, is $\sqrt[3]{} : 512$, &c. alſo the Biquadrate of $\surd : 5$. is 25 (as being the Square of the Square of $\surd : 5$.) and the Cube of $\sqrt[6]{} : 81$, will be $\surd : 81$ or 9.

In the general, to *Square*, *Cube*, &c. any *Surd Root*, is only to Square or Cube the Power, retaining the ſame Note of Radicality; but 'tis beter where it can be done, to take one half, $\frac{1}{3}$ Part, &c. of the Exponent of the Root, as is above ſhewn in the laſt particular Rules.

On the contrary, if you would extract the *Square*, *Cube*, or other Root of any Surd, you muſt double or triple, &c. the Exponent of the Radicality. Thus the *Square Root* of $\surd : 16$ is $\sqrt[4]{} : 16$. the *Square Root* of $\sqrt[3]{} : 27$ is $\sqrt[6]{} : 27$, &c.

Diviſion of ſimple Surd Roots.

I. If the Surds are Similar, Homogeneal, or of the ſame kind, divide one Number, or Quantity, by another, and prefix the common Radical Sign to the Quotient: But if they are Heterogeneal, or not of the ſame kind, they muſt be *reduced* before they can be divided.

Thus, $\surd : 9) \surd : 576 (\surd : 64 = 8$. And $\sqrt[4]{} : 5 (\sqrt[4]{} : 35 (\sqrt[4]{} : 7$.

The Demonſtration of which General Rule, is the ſame as that in Multiplication; for from the Nature of Diviſion, the Diviſor is to Unity :: as the Dividend to the Quotient. Therefore in our firſt Inſtance, $\surd : 9. \surd : 1 :: \surd : 576. \surd : 64$. but as theſe Roots are, ſo will their Squares be: That is, 9. 1 :: 576. 64. and that theſe Numbers are truly Proportional, is apparent; becauſe the Rectangles of the Extremes and Means are equal: Wherefore, $\surd : 9. \surd : 1 :: \surd : 576. \surd : 64$. and conſequently 64 is the true Quotient.

II. If any Rational Quantity to be divided by its Square Root, the Square Root will be the Quotient: For if $a\,b$ be divided by $\surd : a\,b$, the Quotient muſt be $\surd : a\,b$: And if 50 be divided by $\surd : 50$, the Quotient will alſo be $\surd : 50$. Alſo if any Rational Quantity be to be divided by a Surd, that Rational Quantity muſt firſt be reduced to the Form of a Surd, by *Rule* 1.

III. When a Surd Root having a Rational Quantity prefix'd before it, is to be divided by the Surd Part of it, the Quotient will be the Rational Quantity. Thus, if $5 \surd : 9$, be to be divided by $\surd : 9$, the Quotient muſt be 5: As if $5 \surd : 9$ had been divided by 5, the Quotient would be $\surd : 9$.

IV. When the Dividend and Diviſor are the Products of two Rational Quantities multiplied ſeverally into one common Surd; or when they are Rational Quantities prefix'd before one common Surd; then divide the Rational Part of the Dividend, by the Rational Part of the Diviſor, and what reſults, is the true Quotient.

Thus, if $8 \surd : 5$ be divided by $2 \surd : 5$, the Quotient will be 4, and if $8 \sqrt[3]{} : 7$, be divided by $4 \sqrt[3]{} : 7$, the Quotient will be only 2.

V. But when the Dividend and Diviſor are two Rational Quantities, or Numbers prefix'd to two unequal Surds; then you muſt divide, not only as before, the Rational Part of the Dividend by that of the Diviſor, but alſo the Surd Part; and thoſe two Quotients connected together, ſo as the Rational Part ſtand on the Left-hand, are the true Quotient ſought.

Thus, if $4 \surd : 15$ were to be divided by $3 \surd : 5$, the Quotient will be $2 \surd : 3$ ($= \surd : 12$.) and if $4 \surd : 12$, were to be divided by $3 \surd : 2$, the Quotient will be $\frac{4}{3} \surd : 6$.

Addition and Subſtraction of Surd Roots.

I. When two or more Simple and *Equal Surds* are to be added, multiply one of them by the Number of them all, and the Product is the Sum required.

Thus, The Sum of $\surd : 5$, and $\surd : 5$, is the $\surd : 20$; becauſe $\surd : 5$ multiplied by 2, the Number of the Surds, that is by $\surd : 4$, gives $\surd : 20$ their Sum. Alſo the Sum of $\sqrt[3]{} : 7 + \sqrt[3]{} : 7$, $+ \sqrt[3]{} : 7$; becauſe the Surds are 3 in Number, is $\sqrt[3]{} : 189$; becauſe $\sqrt[3]{} : 7$ multiplied by 3 (*i. e.*) the $\sqrt[3]{}$: of 27 makes $\surd : 189$.

II. But if *Unequal* Simple Surds of the ſame kind are to be added together, or if one to be ſubſtracted from the other, you muſt firſt try whether they are Commenſurable; and if they be, that is, if when they have been divided by their greateſt common Diviſor, their Quotients are Rational Quantities, then you muſt multiply the Sum of thoſe Rational Quantities by the ſaid Common Diviſor, and the Product will be the Sum of the Surds propoſed: Or if the Difference of thoſe Rational Quotients be multiplied by the Common Diviſor, then the Product will be the Difference of the given Surds, when the leſs is taken from the greater.

Thus, if the Sum or Difference of theſe two Surds, $\surd : 50$, and $\surd : 8$. were required; becauſe they are unequal, I try firſt, Whether they are Commenſurable or not, by dividing each by the greateſt common Diviſor $\surd : 2$. And the Quotients are $\surd : 25$ and $\surd : 4$; that is 5 and 2, which are Rational Numbers; and therefore the Surds are Commenſurable: Then their Sum 7, or their Difference 3, multiplied by the common Diviſor $\surd : 2$, produces $7 \surd : 2$ for the Sum, and $3 \surd : 2$ for the Difference of the Surds required.

III. If the Commenſurable Surds propoſed, had been Fractions, or Mixt Numbers, reduced to the Form of Fractions; they muſt (if they have not one) be reduced to a common Denominator in the leaſt Terms; and then to find out the Rational Quotients, you need only divide the two New Numerators, by their greateſt common Diviſor; and then you muſt go on as above, in *Integral Surds.*

Thus, If the Sum and Difference of $\surd : \frac{24}{25}$ and $\surd : \frac{2}{3}$ were required: When reduced to a common Denominator, they will be $\surd : \frac{72}{75}$ and $\surd : \frac{50}{75}$ and theſe divided by their greateſt common Diviſor: $\surd : \frac{2}{75}$ the Quotes are $\surd : \frac{36}{75}$ and $\surd : \frac{25}{75}$ or $6 \surd : \frac{2}{75}$, and $5 \surd : \frac{2}{75}$, whoſe Sum is $\surd : 11 \frac{2}{75}$ and their Difference $1 \surd : \frac{2}{75}$.

IV. If the *Simple Surds* given to be added, or ſubſtracted, are *Incommenſurable*, then they can only (generally ſpeaking) be added or ſubſtracted by the Signs + and −: For neither Sum nor Difference can be expreſſed by any ſingle Root. And from this Addition or Subſtraction of ſimple Surds only by the Signs, ariſes what they call a *Surd Binomial*, or *Reſidual Root.*

Thus, $\surd : 6 + \surd : 7$, is a *Binomial Surd*, and $\surd : 7 - \surd : 6$ is a *Reſidual Surd.*

But from *Prop.* 4. and 7 of *Euclid's ſecond Book*, there ariſes a Rule which helps us to find the Sum or Difference of *Incommenſurable Square Roots*: Which is this.

To or from the Sum of the Squares of the given Surd Roots, add, or ſubſtract, their double Rectangle, and the Square Root of the Sum, or Remainder, is the Sum or Difference ſought, (e. gr.)

To find the Sum and Difference of $\surd : 14$, and $\surd : 12$, their Squares being 14 and 12, their Sum will be 26, and the *Double Rectangle* of $\surd : 14$, into $\surd : 12$, is $2 \surd : 168$. Wherefore $\surd : 26 \pm 2 \surd : 168$ is the $\left\{\begin{matrix}\text{Sum}\\\text{Difference}\end{matrix}\right\}$ required.

Of Compound Surds.

The Arithmetick of *Compound Surds*, depends on the Rules above given about *Simple Surds*, and on the true Knowledge of the Signs + and − in Algebraick Addition, Subſtraction, Multiplication, and Diviſion; only ſome particular Directions may be given as to *Binomials* and *Reſiduals*: As,

I. If any *Binomial* be to be multiplied by its correſponding Reſidual, the Difference of their Squares is the true Product; and therefore will come out a Rational Quantity, as if $\surd : a + e$ be multiplied by $\surd : a - e$, the Product will be a Rational Quantity, *viz.* $aa - ee$.

II. Involution in *Binomials* and *Reſiduals*, is beſt and moſt eaſily performed by a Table of Powers: As becauſe we ſee that $aa + 2ae + ee = \square \overline{a + e}$. We may conclude, That to ſquare any Binomial whatſoever, you need only add the double Rectangle of the Parts, to the Sum of the Squares of thoſe Parts; or take the double Rectangle from that Sum, if it be a Reſidual.

III. For Diviſion in *Compound Surds*, 'tis convenient, if not neceſſary, to reduce them firſt to ſome better, and when it can be done, to a Rational Form. And,

(1.) If a Binomial, conſiſting of two ſimple Square Roots, or of one Square Root, and a Rational Quantity, be multiplied by its correſponding Reſidual, the Product will always be a Rational Quantity.

(2.) If a Binomial, conſiſting of two Biquadratick Simple Roots, or of one *ſuch*, and a Rational Quantity; if this be multiplied by its correſponding Reſidual, the Product will be a Reſidual conſiſting of either two Square Roots, or elſe of one Square

Square Root a Rational Quantity; which Reſidual being multiplied, as is before ſaid, by its Binomial, it produces a Rational Quantity.

(3.) If a Trinomial, having three ſimple Square Roots, be multiplied by it ſelf, with one of the Signs changed; the Product will be either a Binomial, or Reſidual, which being multiplied by its correſpondent Reſidual, or Binomial, will give in the Product, a Quantity entirely Rational.

IV. If a Binomial or Reſidual, conſiſting of two Simple Cubick or Biquadratick Roots, *&c.* or of one Cubick or Biquadratick Root, *&c.* and a Rational Quantity is propoſed for a Diviſor; find ſo many continual Proportionals in the Proportion of the Parts of the Binomial or Reſidual propoſed, as there be Unites in the Index of the Radical Sign, and ſuch whoſe Radical Sign may be the ſame with that of the Parts of the Binomial or Reſidual; but conjoyned in the Binomial by +, and in the Proportionals by + and − alternately; or contrarily, in the Proportionals by +, and in the Reſidual by + and −; the Product of the ſaid Proportionals ſo connexed, multiplied into the Binomial or Reſidual, will be a Quantity entirely Rational. After the ſame manner may a Binomial or Reſidual, having 5 or 6, *&c.* for the Index of a common Radical Sign of the Roots, be reduced to a Quantity entirely Rational.

And *Note*, That when the Roots are of Different Kinds, they muſt firſt be reduced to a common Radical Sign.

V. If the Diviſor be a Simple Quantity, divide each Part of the Dividend by the Diviſor, and connect thoſe particular Products together by their Signs; but if the Diviſor be a Binomial, Trinomial, or Quadrinomial, *&c.* of ſuch Kind as before is ſpecified, reduce that given Diviſor to a new Diviſor that may be a Simple Rational Quantity. Reduce alſo the given Dividend to a new Dividend, by multiplying the former by the Quantities that were Multiplicators, in reducing the given Diviſor to a Rational Quantity; then divide the new Dividend by the new Diviſor: But when the Diviſor cannot be reduced to a Simple Rational Quantity, ſet the Dividend as a Numerator, over the Diviſor as a Denominator.

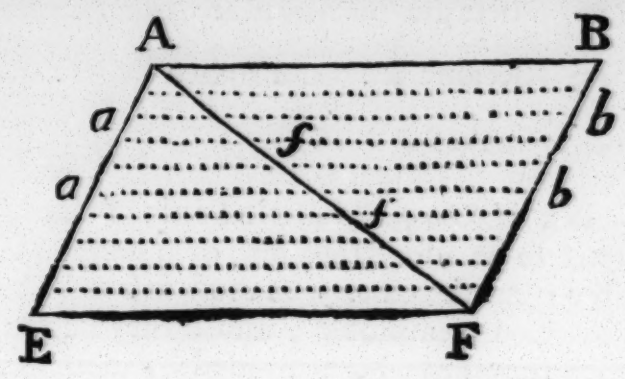
Thus, $12 + \sqrt{} : 63$ divided by 3, the Quotient is $4 + \sqrt{} : 7$; and $8 - \sqrt{} : 12$ divided by 2, the Quotient is $4 - \sqrt{} : 3$; $\sqrt{} : 21 + \sqrt{} : 15$ divided by $\sqrt{} : 3$, the Quotient is $\sqrt{} : 7 + \sqrt{} : 5$; $\sqrt{} : 56 + \sqrt{} : 24$ divided by $\sqrt{} : 6$, the Quotient is $\sqrt{} : 9\frac{1}{6} + 2$: and $\sqrt[3]{} : 28 - \sqrt[3]{} : 14$ divided by $\sqrt[3]{} : 7$, the Quotient is $\sqrt[3]{} : 4 - \sqrt[3]{} : 2$.

SURETY *of the Peace*, (ſo called, becauſe the Party that was in fear, is thereby ſecured) is an acknowledging of a Bond to the Prince taken by a competent Judge of Record, for the *Keeping of the Peace*. This *Peace* may a *Juſtice of the Peace* command, either as a Miniſter, when he is commanded thereto by a higher Authority; or as a Judge, when he doth it of his own Power, derived from his Commiſſion. *Surety of the good adhering*, differs from this, That whereas the *Peace* is not broken without an Affray, or ſuch like; the Surety *de bono geſtu* may be broken by the Number of a Man's Company, or by his or their Weapon and Hardneſs.

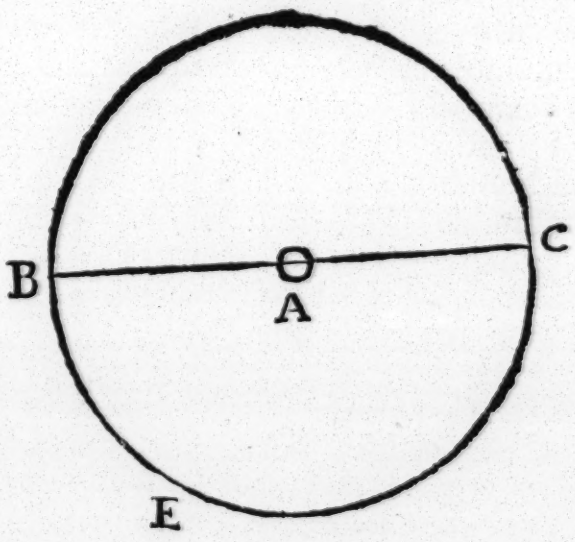
SURFACE, (the ſame with *Superficies*) is the bare outſide of any Body; and conſidered by it ſelf, is Quantity extended in Length and Breadth only, without Thickneſs.

There are *Plane Surfaces*, and there are *Crooked* or *Curved* ones.

A Plane Surface or *Superficies*, is made by the Motion of a *Right Line* always keeping in the ſame Plane.

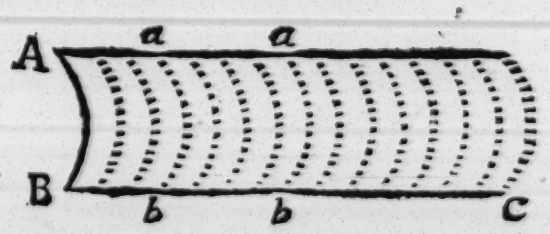


Thus, if the Line A B be conceived to move (with a Motion parallel to it ſelf in its firſt ſituation) in the ſame Plane downward, and at laſt to ſtop in the Poſition E F, it will deſcribe the Plane Figure or Surface A B F E, which is called a *Parallelogram*: As alſo the Two Plane Figures or Surfaces A B F and A E F, which are called *Triangles*.

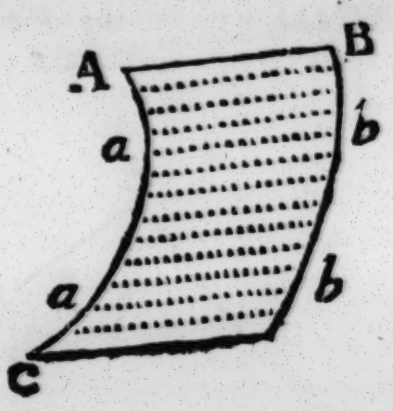


Alſo, if the Right Line C A having one end as A fix'd as on a Center, be moved quite round in the ſame Plane, till the Point C come to C again; this Line will by its Motion deſcribe a *Plane Figure* or *Surface*, which is called a *Circle*, as C E B A.

Curved Surfaces, are *Convex* above or without, and *Concave* below or within; You may conceive them like the *Tilt* of a *Boat* or *Waggon*; And ſuch Surfaces may be generated either by the Motion of a Right Line on a Curve, or a Curve Line on a Right one, *v. gr.* In the Figure.



Let



Let the Curve Line *A a a* C repreſent the Hoop keeping up the Cloth of a Waggon or Boat; and let the Line A B repreſent the Gunnel or the upper Edge of the Boat's-ſide, or the upper Rail of the Waggon. 'Tis plain that if you conceive either the Right Line A B to move up along the Hoop A *a* C till it come to the Top, and then down again on the other ſide till it come to the Bottom, it will by its Motion deſcribe the Figure of the Tilt or curved Surface A *b b* C *a a* A. And the very ſame Figure would be produced by the Motion of one of the Hoops or crooked Line A *a* C, carried (in a Poſition parallel to it ſelf) along the Edges of the Boat or Waggon.

SURGE, the Sailors call a Wave or Billow of the Sea a *Surge*; alſo when they are Heaving at the Capſtan, if the Cable happen to ſlip back a little they ſay the *Cable Surges*.

SURMOUNTED. The Heralds term for Bearing of one Ordinary upon another. A Pile ſurmounted of a Chevron.

SURPLUSAGE, in common Law, ſignifies a Superfluity or Addition more than needeth, which ſometimes is the cauſe that a Writ abateth. It is ſometimes alſo applied to matter of Account, and denotes a greater Disburſement than the Charge of the Accountant amounteth unto.

SURREJOYNDER, is a ſecond Defence of the Plaintiff's Action, oppoſite to the Defendant's *Rejoynder*.

SURRE-BUTTER, is a ſecond *Rebutter*, or a *Rebutting* more than once.

SURRENDER, is an Inſtrument in Writing, teſtifying with apt Words, That the particular Tenant of Lands or Tenements for Life or Years, doth ſufficiently conſent and agree, That he which has the next or immediate Remainder or Reverſion thereof, ſhall alſo have the preſent Eſtate of the ſame in Poſſeſſion, and that he yields and gives up the ſame unto him; for every *Surrender* ought forthwith to give Poſſeſſion of the things *ſurrendred*. There may be alſo a *Surrender* without Writing; and therefore there is ſaid to be a *Surrender in Deed*, and a *Surrender in Law*: ⊙ *Surrender in Deed*, is that which is really and ſenſibly performed: A *Surrender in Law*, is Intendment of Law by way of Conſequent, and not Actual. As if a Man have a Leaſe of a Farm, and during the Term he accept of a new Leaſe; this Act is in Law a *Surrender* of the former: There is alſo a *Cuſtomary Surrender* of the Copyhold Land, as may be ſeen in *Cooke ſup. Littleton*, Sect. 74.

SURROGATE, ſignifies one that is ſubſtituted or appointed in the room of another, moſt commonly of a Biſhop, or of a Biſhop's Chancellor.

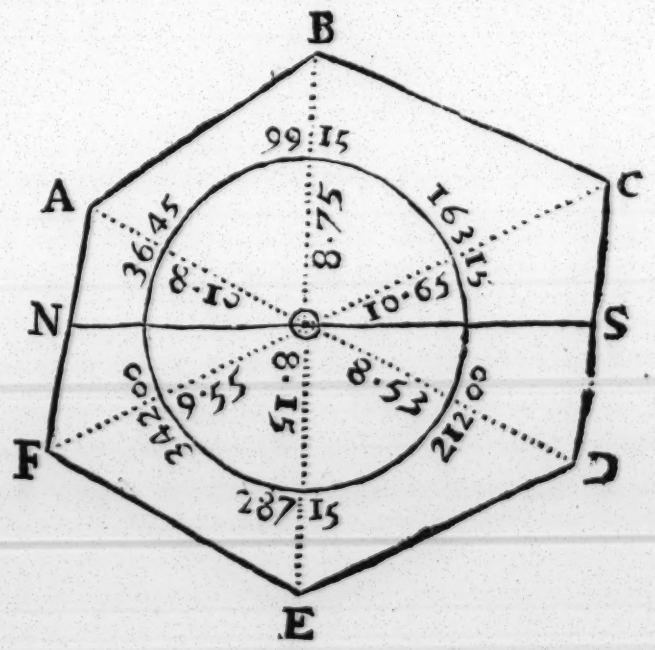
SURSOLID-*Place*. See *Place-ſolid*.

SURSOLID-*Problem*, in Mathematicks, is that which cannot be reſolved, but by Curves of a higher Nature than a Conick-Section, *v. gr.* In order to deſcribe a *Regular Endecagon*, or Figure of eleven Sides in a Circle, 'tis required to deſcribe an Iſoſceles Triangle on a Right Line given, whoſe Angles at the Baſe ſhall be Quintuple to that at the Vertex, which may eaſily be done by the Interſection of a Quadratrix, or any other Curve of the ſecond Gender, as they are called by ſome.

SURVEYING *of Land*, or *Planometria*, is the Art of Meaſuring all manner of Plain Figures, in order to know their ſuperficial Content; which how to do Geometrically, I have ſhewed all along under the particular Name of each Plane Figure. But how to bring this to Practice, ſo as to Meaſure the Area's of Real Lands, Fields, Grounds, *&c.* by the help of proper Inſtruments, is what we uſually call *Surveying*; and this is what is deſign'd to be taught under this Word. The Surveyor being furniſhed with a good Inſtrument to take Angles, as a well made Theodolite, or entire Braſs Circle, with a well graduated Limb, and Teleſcope Sights, as alſo with a well divided Pole-Chain, an Off-ſet Rod, Station-Staves, *&c.* He may proceed after theſe or ſuch like Methods, which a little Practice will familiarize to him.

1. *To take the* Plot of a Field *at* one Station *in any Place thereof, from whence you may ſee all the Angles.*

Suppoſe A B C D E F to be a *Field*, of which you are to take the *Plot*: Having ſet your Inſtrument in any convenient Place thereof, as at ⊙; and let Marks or Station-ſtaves with Paper be ſet up in every Angle: Then ſet your Inſtrument ſo that the Needle hang directly over the *Meridian-Line* of the *Cord*, and there ſcrew faſt the Inſtrument.



Then direct your *Sights* to A, and you will find the *Index* cutting 36° 45′, which note down in your *Field-Book* in the ſecond Column thereof, and meaſure the Diſtance from ⊙ to A, containing ſuppoſe

ſuppoſe 8 *Chains* and 10 *Links*, which ſet down alſo in the third Column of your *Field-Book*.

Then direct your *Sights* to B, the *Index* cutting 99 Deg. 15 Min. and the Diſtance from ⊙ to B, is 8 *Chains* and 75 *Links*, both which ſet down in your *Field-Book*, as before.

Do the like for the reſt of the *Angles* from ⊙ to C, D, E, and F, and ſet them down, as you obſerve them with their Diſtances meaſured from the Station, as you ſee done in this following Table, which is a Copy of the *Field-Book*, and will ſhew you the Method how to Note down your Obſervations.

	D.	M.	*Ch.*	*Lin.*
A	36	45	8	10
B	99	15	8	75
C	163	15	10	65
D	212	00	8	53
E	287	15	8	15
F	342	00	9	55

Having thus finiſhed your Work in the *Field*, the next Buſineſs muſt be to *Protract* the ſame; that is, to lay down a *Plot* thereof upon Paper or Parchment, which is done thus.

Draw a Line as N S, repreſenting the *Meridian-Line*; then in part of that Line, as at ⊙ make a Point, repreſenting your Place of ſtanding in the *Field*; upon this Point place the Center of your *Protractor*, ſo that the Diameter thereof may be directly upon the Line N S.

Then againſt 36° 45′ on the Limb of the *Protractor*, ſet a Point repreſenting the Degrees of your firſt obſerved Angle, and let the ſame be done with the ſecond and third Obſervations.

To prick off the 4th, *viz.* 212. the *Protractor* muſt be turned downwards, becauſe the Degrees are greater than a Semicircle. Then proceed to *protract* the reſt of the Angles.

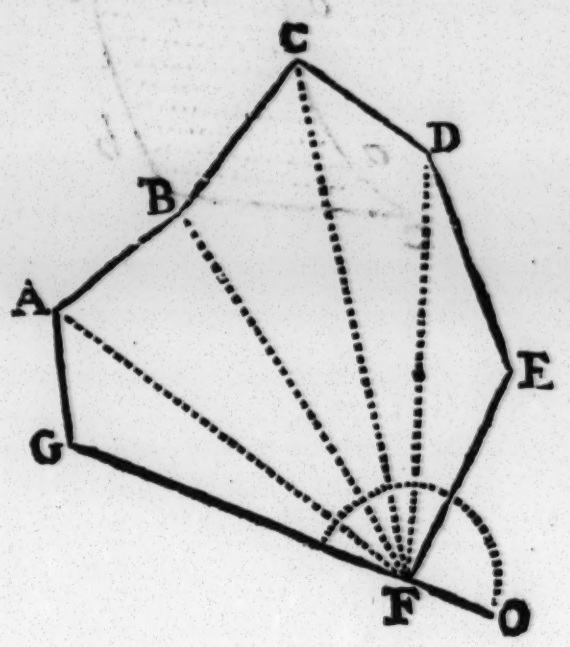
Then take away the *Protractor*, and laying a Ruler to the Station-point ⊙, draw obſcure Lines from thence to thoſe Points, on which Lines ſet their reſpective Meaſures from your Scale; as 8 *Chains* 10 *Links* from ⊙ to A, and 8 *Chains* 75 *Links* from ⊙ to B, and ſo of the reſt, as you have them down in your *Field-Book*.

Then connect theſe Points by the Lines AB, BC, C D, DE, E F, and F A, ſo ſhall you have the true Figure of the Field.

But this way obliges you to more Meaſuring with the Chain than is needful, and therefore is not ſo good for Practice in moſt Caſes as another I ſhall by and by ſhew you; only it hath this Advantage, That you may ſoon know whether you have taken your Angles truly; for all about the Point ⊙ = 36°.

2. *To take the* Plot *of a* Field *at one Station, in any Angle thereof, from whence the other Angles may be ſeen.*

Let A B C D E F G be the *Field*, and F the Angle, at which you would take your Obſervations.



Having placed your Inſtrument at F, turn it about (the North-Point of the Card from you) till through the *Sights* you eſpy the Mark at G; then faſten the Inſtrument, and move the Index till you ſee the Mark at A, the Deg. cut on the Limb being 20; then move it till you ſee B, where it cuts 40 Degrees: Do the ſame at C, and there it cuts 60 Degrees; likewiſe at D 77 Degr. and at E 100 Degr. All theſe Angles note down in your *Field-Book*; next with the Chain, meaſure all the Lines running from the Station, as from F to G 14 *Chains*, 60 *Links*, and from F to A. 18 *Ch.* 20 *Links*, and ſo of the reſt, as you ſee them in this Table.

Ang.	D.	M.	*Ch.*	*Lin.*
G	00	00	14	60
A	20	00	18	20
B	40	00	16	80
C	60	00	23	20
D	77	00	16	95
E	100	00	8	50

To protract theſe Obſervations.

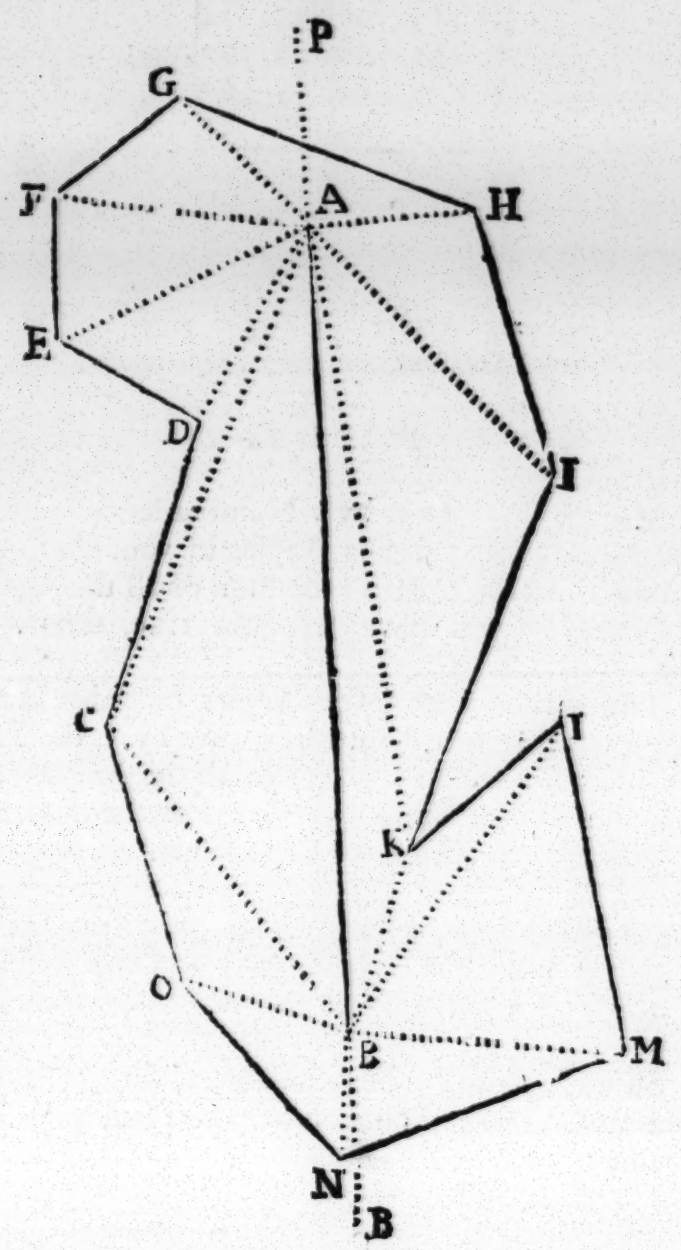
Draw a Line at pleaſure as G F, upon which lay the Diameter of your *Protractor*, with the Center in F; then make Marks at every Angle round the *Protractor*, as you find them in your *Field-Book*, *viz.* againſt 20, 40, 60, 77, 100; which done, take away the *Protractor*, and draw Lines F A, F B, F C, F D, and F E, through each of theſe Marks; on which Lines ſet off the Diſtances by a Scale, as you find them in your *Field-Book*; and where the End of thoſe Diſtances fall, let there be Lines drawn to connect them, as G A, A B, B C, C D, DE, E F, and F G, and you have your *Field* compleat.

Note, That you may as well take the Plot of a Field at one Station, ſtanding on any Side thereof, as in an Angle.

3. *To take the* Plot *of a* Field *at two Stations, when the* Field *is ſo Irregular, that from one Station you cannot ſee all the Angles.*

Let

Let C D E F G H I K L M N O be the *Field*, in which from no one Place thereof all the Angles may be ſeen. Therefore chuſe two Places for your Stations, as A and B.



Set your Inſtrument at A, and look through the *Sights* towards your 2d Station B, and then fix your Inſtrument. And, as before taught, with the Index take all the *Angles* at that end of the *Field*, as C D E F G H I K, and meaſure the Diſtance between your Inſtrument and each Angle, as alſo the Diſtance between the two Stations.

Then remove your Inſtrument to the ſecond Station B, and having made it faſt, ſo as through the *Back-Sights* you may ſee the firſt Station A: Take that Angles at the end of the *Field*, as N O C K L M, and meaſure their Diſtances, as before: All which being done, your *Field-Book* will ſtand thus.

Firſt Station.

	D.	M.	Ch.	Lin.
Ang.	25	00	20	75
C	31	00	8	10
D	67	00	9	85
F	101	00	10	80
G	137	00	7	00
H	262	00	6	70
I	316	00	13	70
K	354	00	24	50

The Diſtance between the two Stations A and B is 31 *Ch.* 60 *Lin.*

Second Station.

Ang.	D.	M.	Ch.	Lin
N	3	30	4	20
O	111	00	7	00
C	145	00	15	60
K	205	00	8	40
L	220	00	15	00
M	274	00	11	20

To *Protract* this, draw a Right Line at adventure, as P A B B, whereon ſet from your Scale 31 *Ch.* and 60 *Links* (the Diſtance between the two Stations) making Marks with the Compaſſes, as A and B for your firſt and ſecond Station.

Lay the *Protractor* to A, the North-end of the Diameter being towards B, and mark out the ſeveral Angles obſerved at your firſt Station, draw Lines, and ſet off the Diſtances meaſured.

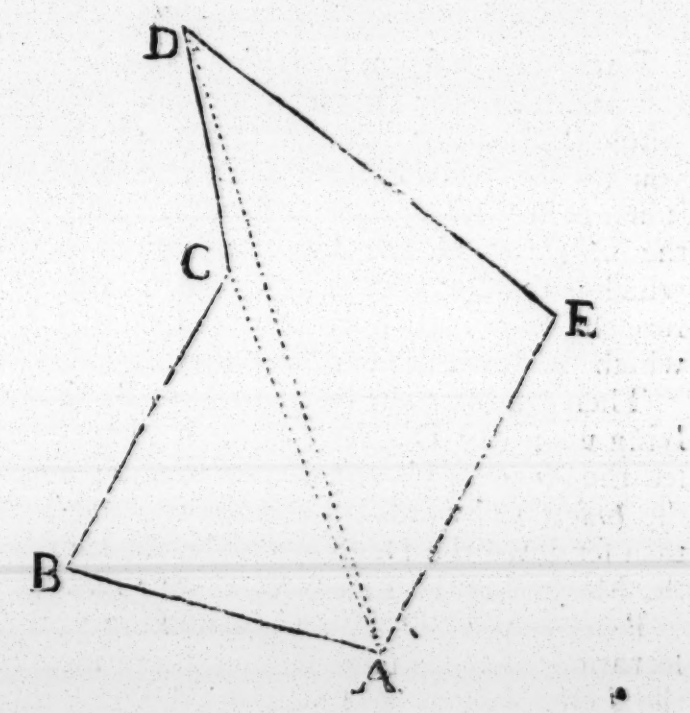
Do the ſame at B, the ſecond Station; and when you have marked out all the Diſtances between thoſe Marks, draw the Bound-lines.

Note, If a *Field* be very irregular, you may after the ſame manner make 3, 4, or 5 Stations, if you pleaſe: Tho' 'tis much better to go round ſuch a Field, and meaſure the Bounding-Lines.

4. *To take the* Plot *of a* Field *at one Station, in an Angle (ſo that from that Angle you may ſee all the other Angles) by Meaſuring round about the ſaid* Field.

Suppoſe A B C D E the *Field*, and A the Angle appointed for the Station.

Place your Inſtrument in A, and turn it round till you ſee (through the *fixed Sights*) the Mark at B; then ſcrew it faſt, and turn the Index to C, obſerving what Degrees are there cut on the Limb, which ſuppoſe to be 68 Degrees; turn it further,



till you ſee D, and Note down the Degrees there cut, *viz.* 76 Degrees; do the like at E, and the Index will cut 124 Degrees: This done, meaſure round the *Field*, Noting down the Length of the Side-Lines between Angle and Angle.

Then your Field-Book *will ſtand thus.*

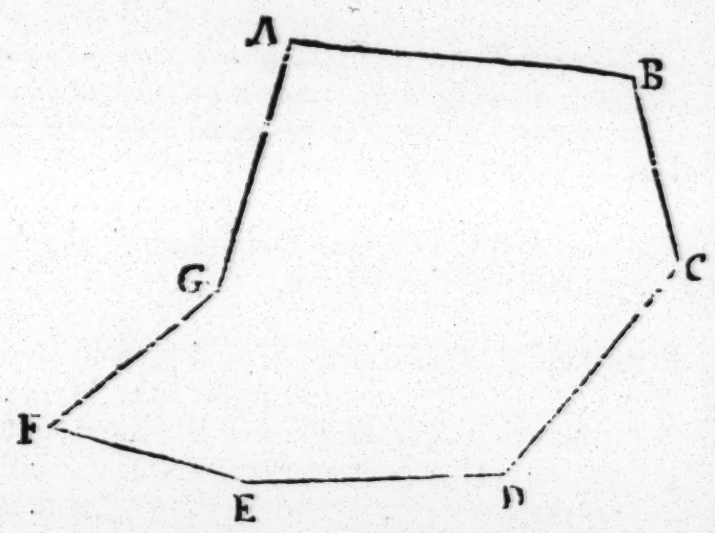
Ang.	D.	M.
C	68	00
D	76	00
E	124	00

Lines	Ch.	Lin.
A B	14	00
B B	15	00
C D	7	00
D E	14	40
E A	14	05

To Protract which, draw the Line A B as you pleaſe, and applying the Center of the Protractor to A, (the Diameter lying upon the Line A B) prick off the Angles, and make Marks, through which draw Lines A C, A D, and A E, in which you may find the Points C, D, E, by the Meaſures taken, as you have them in your *Field-Book*, and taken of a Scale; then draw the Bounding-Lines, and you have done.

5. *To take the* Plot *of a* Park Wood, *a very great* Common, *or a large* Champian Field, *by going round about the ſame, and making Obſervations at every Angle thereof.*

Let A B C D E F G be a large *Field* or *Wood*, through which you cannot ſee to take the Angles, but muſt be forced to go round the ſame.



Place your Inſtrument at the Angle A, and lay the Index on the Diameter thereof, moving the whole Inſtrument about, till through the Sights you ſee the ſecond *Angle* at B, and there fix it: Then turn the *Index* about backwards till you ſee the *Angle* at G, the *Index* cutting 97 Degrees, which is the Quantity of the *Angle* G A B; Meaſure the Line A B, it contains 12 *Chains*, 5 *Links*, which ſet down in your *Field-Book*.

Then remove your Inſtrument to B, the *Index* lying upon the Diameter, turn it about till you ſee the *Angle* at C, and there faſten it; and turn the *Index* backwards till you ſee the *Angle* at A; then ſet down the Degrees cut on the Limb, and the Meaſure of the Line B C in your *Field-Book*.

Remove to C, D, F, and G, making your Obſervations after the ſame manner; and meaſuring the Length of every Line, they'll ſtand thus in the *Field-Book*.

	D.	M.	Ch.	Lin.
A	97	00	12	5
B	120	30	4	45
C	132	00	8	85
D	125	00	13	4
E	121	30	7	70
F	80	00	5	67
G	227	00	7	87

The manner of *Protracting* this, is nearly the ſame as before.

How to diſcover whether the Angles made at their ſeveral Stations, be truly taken or not.

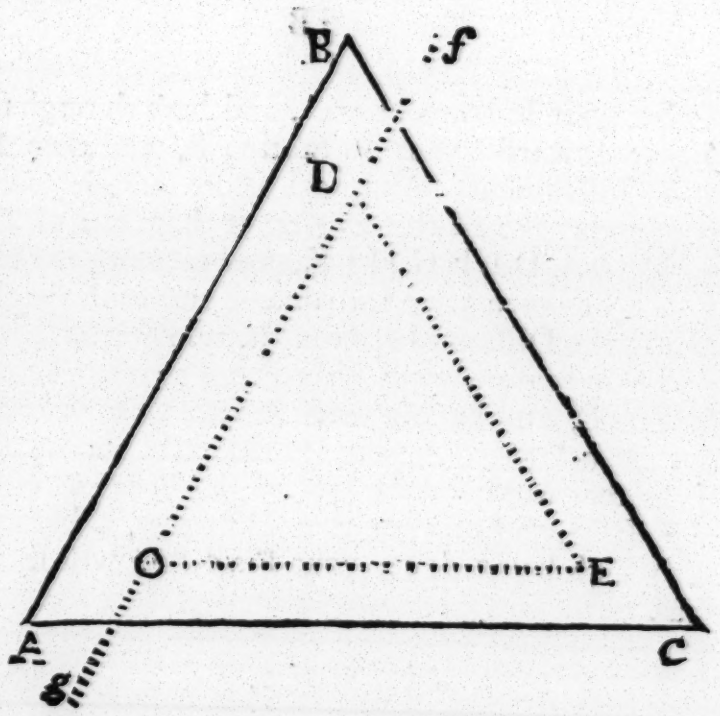
RULE.

Multiply 180 Deg. by a Number leſs by 2 than the Number of Sides or Angles in your *Plot*, the Product ſhall be equal to the Sum of all the Angles obſerved, if you have wrought true, otherwiſe not.

Thus, there were ſeven Angles or Sides in the laſt *Plot*, therefore I multiply 180 by 5, the Product is 900, which is equal to all the Angles reckoned in the inſide of the *Plot*: For the outward Angles are not included in the Rule.

6. *To meaſure parallel to a Hedge (when you cannot go cloſe along the Hedge it ſelf) and alſo in ſuch a caſe, how to take your Angles.*

Suppoſe A B C to be a Field, and for the Buſhes you cannot come nigher than ⊖ to plant your Inſtrument.

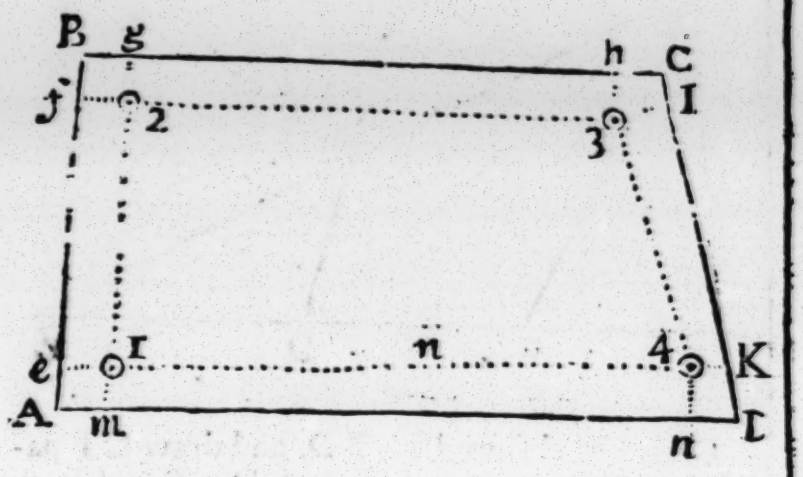


Then ſet up Marks, and with your Off-ſet Rod or Chain, if the Diſtance be large, take the Diſtance between the Inſtrument ⊖, and the Hedge A B; which Diſtance ſet off again nigh B, and ſet up Marks at D: Likewiſe take the Diſtance between ⊖ and the Hedge A C, and accordingly ſet up Marks at E. Then take the Angle D ⊖ E, which will be the ſame as the Angle B A C: Do thus for the reſt of the Angles. But when the Lines are meaſured, they muſt be meaſured of the ſame Length with the outſide Lines, as the Line ⊖ D, meaſured from *g* to *f*.

7. To

7. *To take the Plot of a Field or Wood, by obſerving near every Angle, and meaſuring the Diſtance between the Marks of Obſervation, by taking in every Line, two Off-ſett to the Hedge.*

Suppoſe A B C D to be a Wood or a Field to be thus meaſured.



Let Marks be ſet up in every Angle, not regarding the Diſtance from the Hedges, ſo much as the Convenience for planting the Inſtrument, ſo as you may ſee from one Mark to another. Then beginning at ⊖ 1, take the Quantity of that Angle, and meaſure the Diſtance 1, 2. But before you begin to meaſure the Line, take the Off-ſet to the Hedge, *viz.* the Diſtance ⊖ *e*; and in taking of it, you muſt make that Line ⊖ *e* perpendicular to 1, 2, by directing the Diameter of your Inſtrument towards 2, and turning the Index till it lie upon 90 *Degrees*, which then will point to what place of the Hedge to meaſure to, as *e*: Then ſet the Meaſure of the Line ⊖ *e* in your Field-Book under Title *Off-ſet*. So likewiſe when you come to 2, meaſure the Line 2, 3, and the *Off-ſets* 2 *g*, 3 *h*: Do the like by all the reſt of the Lines and Angles in the Field, how many ſoever they be.

And when you come to lay this down upon Paper; firſt (as before directed) protract the Figure 1, 2, 3, 4. That done, ſet off your *Off-ſets*, as you find them in your *Field-Book*, *viz.* ⊖ *e*, and ⊖ *f* perpendicular to the Line 1, 2; alſo ⊖ *g* and ⊖ *h* perpendicular to the Line 2, 3; making Marks at *e*, *f*, *g*, *h*, &c. through which draw Lines, which ſhall interſect each other at the true Angles, and deſcribe the true Bound-Lines of the Field or Wood. And then if many intermediate Off-ſets between Angle and Angle be taken, when neceſſary, is the very beſt and moſt expeditious Method of Surveying.

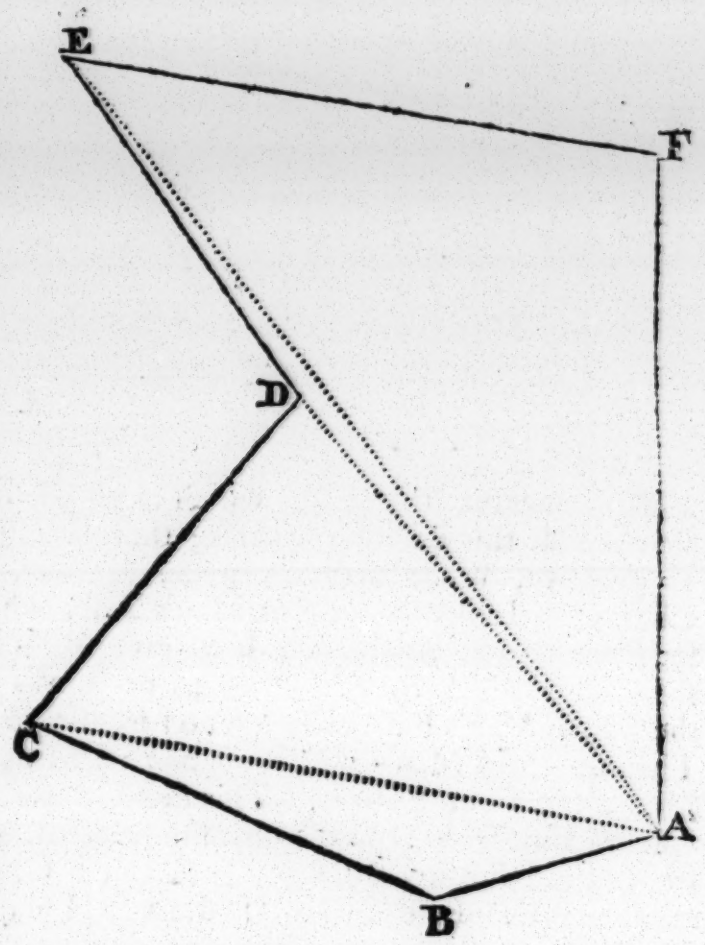
In working after this manner, obſerve,

1. If the Wood be ſo thick, that you cannot work within it, you may then perform the ſame thing by going on the outſide round the Wood.

2. If the Diſtances are ſo far, that you cannot ſee from Angle to Angle, cauſe your Aſſiſtant to ſet up a Mark ſo far from you as you can conveniently ſee it, as at *n*; meaſure the Diſtance ⊖ *n*, and take the *Off-ſets* from *n* to the Hedge; and proceed on the Line till you come to an Angle.

8. *The common Way uſed by Surveyors for taking the Plot of a Field by a Chain only.*

Suppoſe A B C D E F to be the Field, whoſe Plot is required.



1. Meaſure round the Field, and note down in your *Field-Book* every Side thereof.

2. Reduce your *Field* into Triangles, by the Diagonals A C, A D, A E, which meaſure and ſet down in your *Field-Book*; as ſuppoſe them to ſtand thus.

Diagonals.

		Ch.	*Lin.*
A	C	33	70
A	D	25	70
A	E	45	40

Sides

		Ch.	*Lin.*
A	B	12	50
B	C	23	37
C	D	19	30
D	E	20	00
E	F	29	00
F	A	31	50

To Plot which, draw a Line at Pleaſure, as A C, whereon ſet off 33 *Ch.* 70 *Links*; then with the Meaſures of the Sides A B, C B, compleat the Triangle A B C.

Alſo, with the Meaſures of the Diagonal A D, and the Side C D, compleat the Triangle A D C, upon the ſame Baſe C A.

Then with the Meaſures of the Diagonal A E, and the Side D E, make up the Triangle A D E.

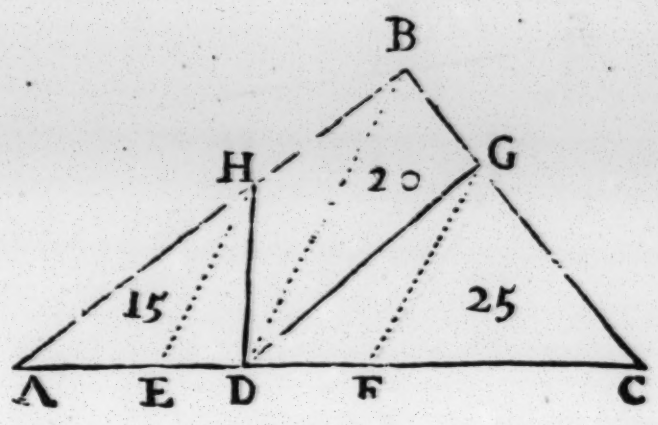
Laſtly, Upon the Baſe A E, with the Meaſures of the Sides A F, E F, compleat the Triangle A F E. So you have the true Figure of the Field, conſiſting of four Triangles, which are to be meaſured by the Direction given under the Word *Chain*.

3. *The Practice of Surveying, as it relates to dividing of Lands.*

To divide a Triangular piece of Land into any Number of equal and unequal Parts, by Lines proceeding

ceeding from any Point aſſigned in any Side thereof.

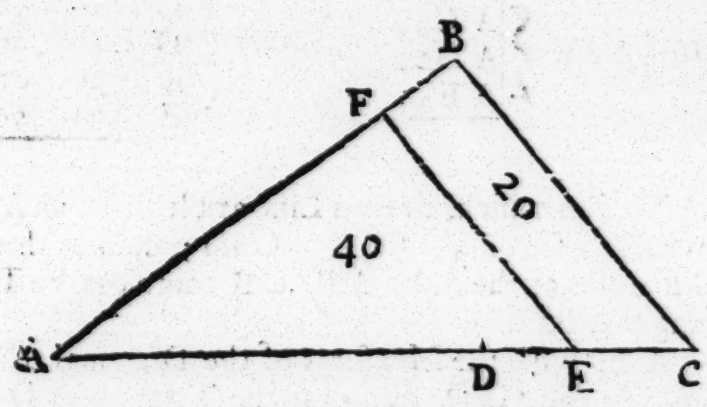
Let A B C be the Triangular piece of Land, containing 60 Acres, to be divided between three Men: The firſt to have 15 Acres, the ſecond 20, and the third 25 Acres; and the Lines of Diviſion to proceed from D.



Firſt, meaſure the Baſe, which is 50 Chains; then divide this Baſe into 3 parts; thus, ſaying, If 60 give 50, What ſhall 15 give? Anſwer, 12 Chains 50 Links for the firſt Man's Baſe, which ſet from A to E. Again, ſay, If 60 give 50, What ſhall 20 give? Anſwer, 16 Chains 66 Links for the ſecond Man's Baſe, which ſet off from E to F; Then the third Man's Baſe muſt be 20 Chains 84 Links, *viz.* from F to C. This done, draw an obſcure Line from D to the oppoſite Angle B, and from E and F draw the Lines E H and F G, parallel to B D. Laſtly, from D, draw D H and D G, which ſhall divide the Triangle into three ſuch parts as were required.

10. *To divide a Triangular Piece of Land, according to any Proportion given, by a Line drawn parallel to one of the Sides.*

A B C is the Triangular Piece of Land, containing 60 Acres, the Baſe A C is 50 Chains: This Piece of Land is to be divided between two Men, by a Line drawn parallel to B C, in ſuch Proportion, that one have 40 Acres, the other 20.

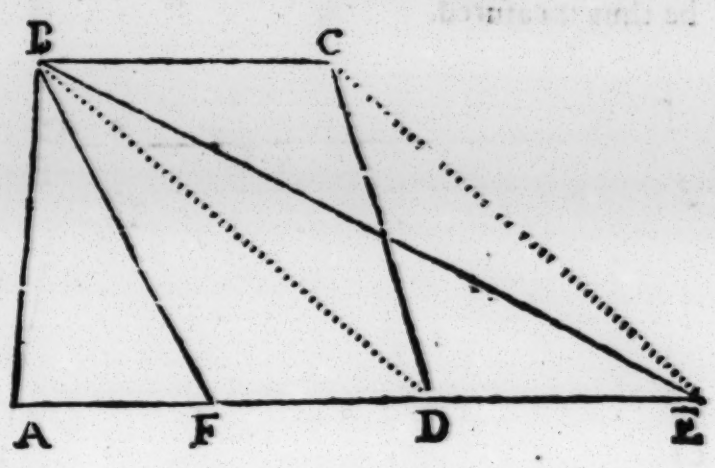


1. Divide the Baſe, as has been before taught, and the Point of Diviſion ſhall fall in D. A D is 33 Chains 33 Links; D C 16 Chains 67 Links.

2. Find a mean Proportion between A D and A C, by multiplying the whole Baſe 50 by A D 33, 33, the Product is 16665000, of which Sum extract the Square Root, 'twill be 40 Ch. 82 Lin. which ſet from A to E; then draw E T parallel to B C, ſo the Triangle is divided as required.

11. *To reduce a Trapezia into a Triangle, by Lines drawn from any Angle thereof.*

Let A B C D be the Trapezia to be reduced into a Triangle, and B the Angle aſſigned.



Draw the obſcure Line B D, and draw C E parallel to D B, produce the Baſe A D to E, and draw B E, which ſhall make the Triangle B A E equal to the *Trapezia* A B C D.

Now to divide this *Trapezia* according to any aſſigned Proportion, is no more but to divide the Triangle A B E, as before taught, which will alſo divide the *Trapezia*.

Example.

Suppoſe the *Trapezia* A B C D, containing 124 Acres, 3 Rods, and 8 Perches, is to be divided between two Men; the firſt to have 50 Acres, 2 Rods, and 3 Perches; the other 74 Acres, 1 Rod, and 5 Perches, and the Line of Diviſion to proceed from B.

Firſt, Reduce the Shares into Perches, and 'twill be 8083 for the firſt Man, and 11885 Perches for the ſecond Man's Share.

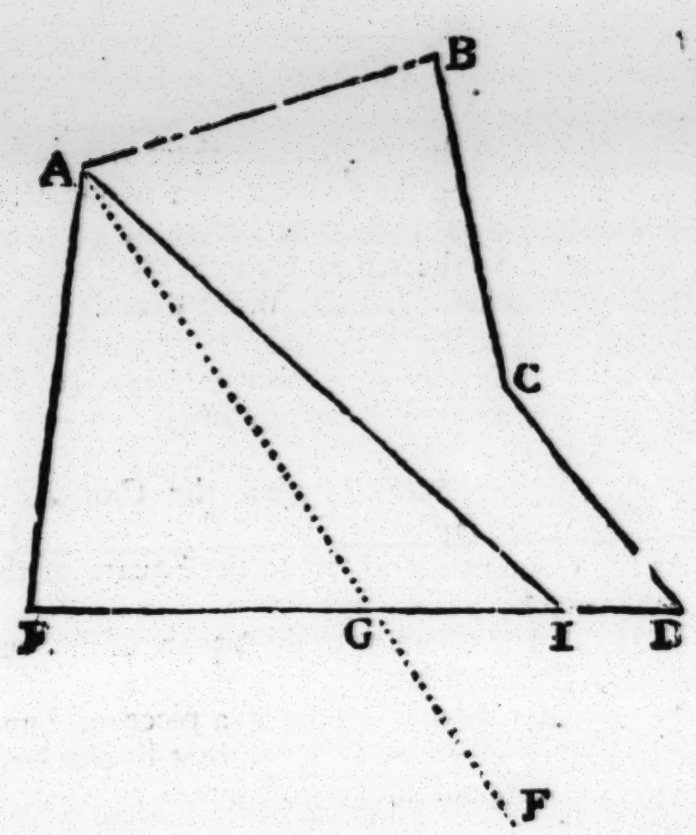
Secondly, Meaſure the Baſe of the Triangle, *viz.* A E, 78 *Chains* 00 *Links*.

Then ſay, If 19968, the whole Content, give for its Baſe 78 *Ch.* What ſhall 8083, the firſt Man's Part, give; Anſwer, 31 *Ch.* 52 *Links*; which ſet off from A to F, draw the Line F B, ſo you divide the *Trapezia* as deſired: The Triangle A B F being the firſt Man's Portion, and the *Trapezia* B C F D, the ſecond's.

12. *To*

12. *To divide an irregular Plot of any Number of Sides, according to any Proportion given, by a ſtrait Line drawn through it.*

As ſuppoſe the Field A B C D E contain 46 Acres to be divided in Halfs between two Men, by a Line proceeding from A.



Firſt draw a Line at pleaſure through the Figure as A F; then caſt up the Content of either Half, and ſee what it wants, or what it is more than the true Half ſhould be.

Thus I caſt up the Content of A E G, and find it to be but 15 Acres; whereas the true Half is 23 Acres; 8 Acres being in the Part A B C D G more than in A E G; therefore I make a Triangle containing 8 Acres, and add it to A E G, as the Triangle A G I; then the Line A I parts the Figure into equal Halfs.

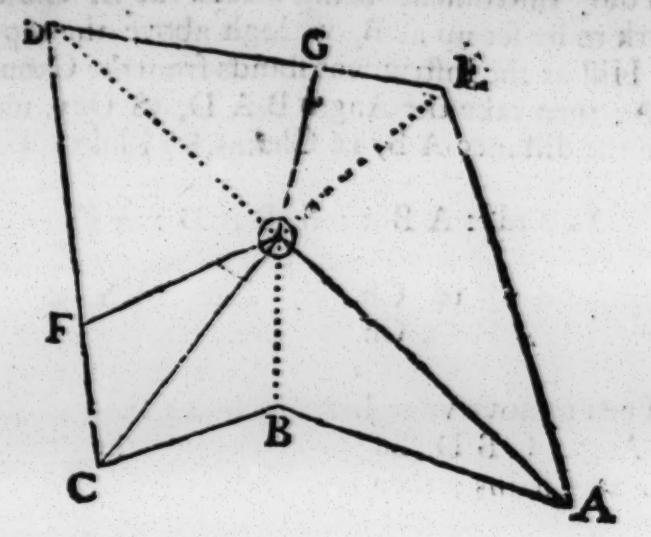
Thus you may divide any piece of Land of never ſo many Sides and Angles, according to any Proportion, by ſtreight Lines drawn through it, with as much Certainty, and more expeditiouſly than by any other way yet known.

Another Example will make all plain.

Suppoſe the following Field, containing 27 Acres, is to be divided between three Men, each to have 9 Acres, and the Lines of Diviſion to run from a Pond to a Field, ſo every one may have the Benefit of the Water, without going over one another's Land.

Firſt, from the Pond ⊖ draw Lines to every Angle, as ⊖ A, ⊖ B, ⊖ C, ⊖ D, ⊖ E; and then the Figure is divided into 5 Triangles, each of which Meaſure, and put the Contents down ſeverally; which Contents reduce into all Perches, and ſo will the Triangle,

A ⊖ B	be	390	Perches.
B ⊖ C		1238	
C ⊖ D		911	
D ⊖ E		1107	
E ⊖ F			



The whole Content being 4320 Perches, or 27 Acres, each Man's Proportion being 1440 Perches.

From ⊙ to any Angle draw a Line for the Diviſion Line, as ⊙ A: Then conſider that the firſt Triangle A ⊙ B is but 674 Perches, and the ſecond Triangle B ⊙ C 390, both together but 1064 Perches, leſs by 376 than 1440, one Man's Portion. You muſt therefore cut off from the third Triangle C ⊙ D, 376 Perches for the firſt Man's dividing Line, which thus you do: The Baſe D C is 18 Chains, the Content of the Triangle 1238; ſay then, If 1238 Perches give bare 18 Chains, What ſhall 376 Perches give? Anſwer, 5 Chains, 45 Links; which ſet from C to F, and drawing ⊙ F, you have the firſt Man's Part, *viz.* A ⊙ F.

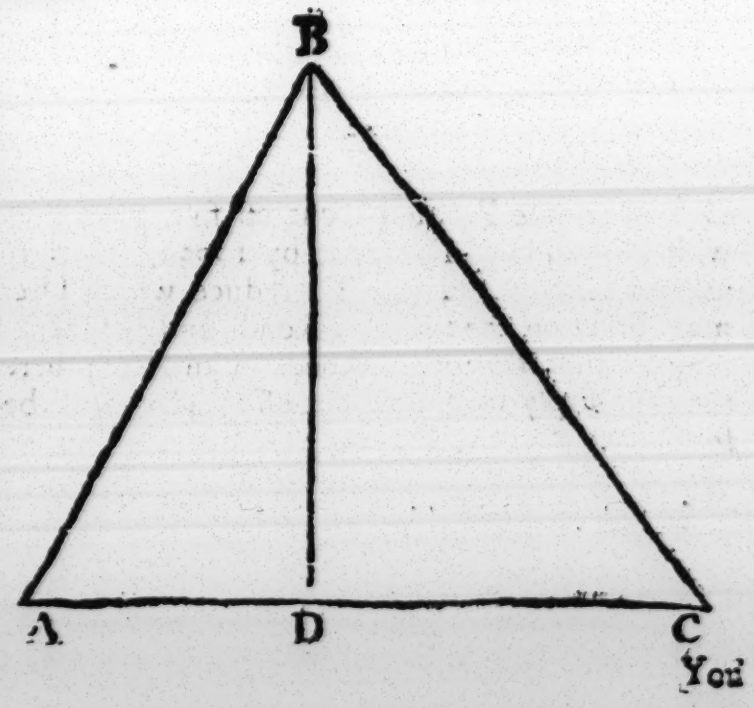
Then ſee what remains of the Triangle C ⊙ D 376, being taken out, and you'll find it to be 862 Perches, which is leſs by 578 than 1440.

Therefore from the Triangle D ⊙ E cut off 578 Perches, and the Point of Diviſion will fall in G. Draw the Line ⊙ G, which with ⊙ A and ⊙ F, divides the Figure into three equal Parts.

13. *To take the Horizontal-Line of a Hill.*

When you meaſure a Hill, you muſt meaſure the Superficies thereof, and accordingly caſt up the Contents. But when you *Plot* it down, becauſe you cannot make a Convex Superficies upon the Paper, you muſt only *Plot* the *Horizontal-Line* or *Baſe* thereof, which you muſt ſhadow over with the Reſemblance of a Hill. That *Horizontal* or *Baſe-Line* is found after this manner.

Suppoſe A B C D a Hill, whoſe Baſe you would know.



You

Your Inſtrument being placed at A, cauſe a Mark to be ſet up at B, ſo high above the top of the Hill as the Inſtrument ſtands from the Ground at A; then take the Angle B A D, 58 Deg. meaſure the diſtance A B, 16 Chains, 80 Links: Then ſay,

As Rad. : A B :: S, B A D : A D.

S, 90°, 00′ : 16 Ch. 80 Lin. :: S, 32°, 00 : 8 Ch. 90 Lin.

Then remove your Inſtrument to B, and take the Angle C B D, 46 Deg. meaſure the diſtance B C 21 Chains; then ſay,

As Rad. : B C :: S, C B D : D C.

S, 90d, : 21 Ch. :: S, 46d : 15 Ch. 12 Links.

The 15, 12 added to 8, 90, makes 24 Chains 2 Links, for the whole Baſe A C.

Otherwiſe thus.

Take the Angles B A C 58d. and ABC 78 deg. ſubtract theſe two from 180 deg. there will remain the Angle C 44 deg. meaſure A B, then ſay,

As S, C : A B :: S, B : A C.

14. *To find the Content of your Field in Acres and Parts of an Acre.*

Since Mr. *Gunter*'s 4 Pole Chain, all along here uſed, is ſuppoſed to be divided into 100 equal Parts or Links; and that every Acre contains 160 Square Perches or Poles. Therefore 160 Perches × into 160 Perches, = a Square Acre. But the Chain being Decimally divided, ſo that in one 4 Pole Chain, there are 100 Links; therefore 10 Square Chains muſt make an Acre; that is, an Acre will contain 10000 Links.

Suppoſe therefore the Baſe of any Triangle in my Plot were 27 Chains 53 Links, whoſe Area in Acres and Parts of an Acre I would find by multiplying its half Altitude 8 Chains 25 Links, into that Baſe or Side; work juſt as in Decimals, thus:

C. L.
27 53
8 25

13765
5506
22024

22|71225

Only from the Product I cut off five places, (or which is all one, Divide it by 10000) there remains 22 Acres .71225. To reduce which Decimal Fraction .71225 into Roods and Perches, I conſider that there are 4 Roods in an Acre; therefore I multiply by 4, and cut off 5 places as before.

.71225
4

2|84900

This gives me 2 Rod and this Fraction;

84900
40

33|96000

which I multiply by 40, becauſe there are 40 Perches in a Rod, and the Product is 33 96000, from whence cutting off 5 places as before, it gives me 33 Perches. So the whole Content is 22 Acres, 2 Rod, 33 Perches. See the Word *Chain*.

Knowing the Content of a Piece of Land, to find what Scale it was plotted by.

Firſt, By any *Scale* meaſure the Content of the *Plot*; then ſay,

As the Content found, is to the Square of the *Scale* I tried by;

So is the true Content to the Square of the true *Scale* it was plotted by.

As ſuppoſe there is a Plot of a piece of Land containing 10 *Acres*, and I meaſure it by the *Scale* of 11 in an *Inch*, and find it to contain 12 *Acres* $\frac{1}{10}$ of *Acre*.

Then ſay,

As 12 $\frac{1}{10}$: 121 (=) Sq.) :: 10 : 100.

And the Square Root of 100 is 10; therefore I conclude that Plot to be made by a *Scale* of 10 in an Inch.

How to change Cuſtomary Meaſure into Statute-Meaſure, and the contrary.

Say, As the Square of one ſort of Meaſure, is to the Square of the other:

So is the Content of the one, to the Content of the other.

Thus: Suppoſe a *Field* meaſured by a Perch of 18 Foot contain 100 *Acres*, How many *Acres* ſhall the ſame *Field* contain by a Perch of 16 Foot $\frac{1}{2}$?

Say, If the Square of 16 $\frac{1}{2}$ Foot, *viz.* 272, 25, give the Square of 18, *viz.* 324, What ſhall 100 Acres *Cuſtomary* give? Anſwer, 119 $\frac{9}{10}$ *Statute-Acres*.

SURVEYING-*Scale*, the ſame with *Reducing-Scale*.

SURVIVOR, in Law, ſignifies the longer Liver of two *Joint-Tenants*, or of any two joined in the Right of any thing.

SUSPENSION, or *Suſpenſe*, is a Temporal ſtop of a Man's Right; as when a Seignory, Rent, &c. by reaſon of the Unity of Poſſeſſion thereof, and of the Land out of which they iſſue, are not *in eſſe* for a time, and *tunc dormiunt*, but may be revived or awaked, and ſo differs from Extinguiſhment, which dies for ever. And ſometimes this Word Suſpenſion is uſed in Common Law, as it is in the Canon Law, *pro minori Excommunicatione*.

SUSPENSOR *Teſticuli*, the Name of a Muſcle otherwiſe call'd *Cremaſter*; which ſee.

SUSPENSOKIUM, is a Ligament of the *Penis* firſt diſcover'd by our Accurate Mr. *Cowper* the Surgeon

geon. It ariſeth from the Anterior Part of the *Oſſa Pubis*, and fix'd to the upper part of the *Dorſum Penis*, on each ſide its great Vein. Its Uſe is to aſſiſt the *Muſculi Erigentes* in their Action.

SUTURA alſo, is a Connexion of the Sides or Lips of a Wound. This is of two ſorts: Actual, which is done with a Needle of a triangular Point, a Pipe, or Cane, and waxed Thread: Firſt in the middle of the Wound you muſt ſew it together with a double Thread, and having made a Knot, cut it off; the reſt of the Wound muſt be ſewed up with ſingle Thread; Care muſt be taken that the Stitches are not ſet too wide, nor too cloſe, eſpecially not too cloſe, that there may be room for any corrupt Matter bred in the Wound to work out. The other ſort of Suture is much like the way that the Skinners uſe to ſew Skins together: This is proper in Wounds of the Inteſtines, and in Cuts of the Veins and Arteries.

Alſo the *Junctures* of the Parts of the Shells of Fiſhes to one another, are called *Sutures*.

SUTURA *Oſſium*, a Suture in the Juncture of the Bones of the Skull, like the Teeth of Saws meeting together. Thoſe which join the Parts of the Scull to the Bones of the upper Jaw, are of 3 ſorts; the *Tranſverſalis*, the *Ethmoidalis*, and the *Sphænoidalis*; which ſee under thoſe Words. The Sutures joining the parts of the Scull are 4: The *Coronalis*, *Lambdoidalis*, *Sagittalis*, and *Squammoſa*; which ſee.

SWABBER, the Title of an inferior Officer aboard a Man of War, whoſe Office it is to ſee that the Ship be kept neat and clean; in order to which, he is to ſee her waſhed well once or twice a Week at leaſt, eſpecially about the Gun-walls and Chains. He ought to burn Pitch or ſome ſuch thing now and then between Decks, to prevent Infection; and to acquaint the Captain of ſuch as are Naſty and Offenſive.

SWAINMOTE, or *Swainimote*, ſignifies a Court touching Matters of Foreſt, and held by the Charter of the Foreſt thrice in the Year, before the *Verdorors* as Judges. And it is as incident to a Foreſt, as Court of Pye-powder to a Fair.

SWALLOW-*Tail*, in Fortification, is a *ſingle Tenaille*, that is narrower towards the *Place* than towards the Country. See *Queue a'yronde*.

SWEEP. The Seamen call the Mold of a Ship when ſhe begins to compaſs in at the Rungheads, the *Sweep* of her; or the Sweep of the Futtock.

SWEEPING, at Sea, ſignifies dragging along the Ground, at the Bottom of the Sea, or Channel, with a Tree-fluked Grapnel, to find ſome *Hawſer* or *Cable*, which is ſlipped from an Anchor.

SWEETBREAD. See *Pancreas*.

SWIFT *in Motion*, a Planet is ſaid to be ſo, when by its own proper Diurnal Motion, he exceeds, or moves further than his mean Diurnal Motion: *Slow in Motion*, is when his Motion happens to be leſs than his *mean Motion*.

SWIFTERS, in a Ship, are Ropes belonging to the Main-maſts, and Fore-maſts, and help to ſuccour or ſtrengthen the Shrowds, and to keep the Maſts ſtiff: They have Pendants faſtened under the Shrowds at the Head of the Maſts, with a double Block, thro' which the Swifter is reeved; which at the *ſtanding Part* hath a ſingle Block with a Hook, hitched into a Ring at the *Chain Wale*, and ſo the Fall being haled up, helps to ſtrengthen the Maſt, and it is belayed about the Timberheads of the lower Rails aloft.

SWIFTING of a Boat, is compaſſing her Gunwale round with a good Rope, to ſtrengthen her in a Streſs of Weather, that ſhe be not ſhattered by the Violence of the Sea.

SWIFTING of a Ship, is either bringing her aground, or upon a Careen; for then they uſe to *Swift the Maſts*, to eaſe and ſtrengthen them, that all the Weight may not hang by the Head; which is done by laying faſt all the *Pendants* of the *Swifters* and *Tackles* (with a Rope) cloſe to the Maſt, and as near to the Blocks as can be; and then to carry forward the Tackles, and there to *Bowſe*, or hale them down as hard and taught as is poſſible. (So that the Sea Word of Command here, is, *Ho! Bowſe Men!* All this is done alſo to keep the Maſt from riſing out of the *Step*.

SWIFTING the *Capſtan-Bars*, is ſtraining a Rope all round the outer Ends of the *Capſtan-Bars*, in order to ſtrengthen them, and make them bear all alike, and together, when the Men heave or work there.

SWING-WHEEL, in a Royal Pendulum-Clock, is that Wheel which drives the Pendulum: This Wheel in a Watch is called the *Crown-Wheel*, as alſo in a Balance-Clock.

SUPERFICIAL *Fourneau*, a Term in Fortification, the ſame with *Caiſſon*, which is a wooden Cheſt, or Box with 3, 4, 5, or 6 Bombs in it, and ſometimes 'tis filled only with Powder; and is uſed in a cloſe Siege, by being buried under Ground with a Train to it, to blow up any Lodgment that the Enemy ſhall advance to. Therefore they uſually expreſs it thus: "After the *Mine*, "or *Fourneau*, had deſtroyed the *Bonette*, a *Caiſſon* "was buried under the Ground, thrown up, and "the Enemy advancing to make a Lodgment "on the Ruins of the *Bonette*, the *Caiſſon* was "fired, and blew up the Poſt a ſecond time.

SYCOSIS, is an Excreſcence of the Fleſh about the Fundament; 'tis alſo an Ulcer, ſo called from the Reſemblance of a Fig; this is of two kinds, one hard and round, the other ſoft and flat; out of the hard iſſues a very ſmall Quantity of glutinous Matter; out of the moiſt proceeds a greater Quantity, and of an ill ſmell: Theſe Ulcers grow in thoſe Parts only which are covered with Hair; the hard and round chiefly in the Beard; the moiſt for the moſt part in the Scalp. *Blanchard*.

SYDERATION. See *Apoplexy*.

SYDERIAL *Year*. See *Year*.

SYLLEPSIS, or *Conceptio*, (in *Grammar*) is when the Senſe of an Expreſſion is to be conceived otherwiſe than is imported by the Words; and ſo the Conſtruction is made accordingly as ſome define it. But *Voſſius* ſaith, 'tis an Agreement of a Verb or an Adjective, not with that word which is moſt near, but with that which is moſt worthy, honourable, *&c.* in any Sentence, as *Rex & Regina beati*.

SYMBOLS. See *Characters*.

SYMMETRAL, the ſame with *Commenſurable*.

SYMMETRY, is uſually taken in *Architecture* for the Proportion required, according to the Rules of *Geometry*, to make all the Parts of any Structure compleatly agree to, and with the Whole.

SYMPATHETICAL *Inks*, are ſuch as can be made to appear or diſappear very ſuddenly by the Application of ſomething that ſeems to work by Sympathy.

There

There are ſome ways of preparing Inks of this Kind, which are really wonderful and ſurprizing, as well as curious and diverting.

The Experiments are theſe.

Take of good unſlacked Lime, two or three Parts, according to the Strength and Goodneſs of the ſame, and one Part of *Yellow Orpiment*, (which to powder, had beſt be wrapt up in a thick Paper, and ſo beaten, to prevent the dangerous Steams that may affect the Head) both theſe being powder'd and mix'd, put to them 15 or 16 times as much Water in weight, as there was of *Orpin*: Stop the Viol well with Cork and a Bladder, and ſet it in warm Embers, or ſome ſuch Place; ſhaking the Viol now and then for 4 or 5 Hours; then warily decant the clear Part, or which is better, *filtrate* it.

In the mean time burn a piece of Cork throughly; and when it is well inflamed, quench it in common Water (or which is better, *Aqua Vitæ*, or *Brandy*) and by this means reducing of it to a friable Coal, grind it with a ſufficient quantity of fair Water, in which you have diſſolved a little *Gum-Arabick*, and ſo it will make a Liquor as black as common Ink, which will ſerve very well to write any thing with.

While theſe are doing, diſſolve in three times as much diſtilled, or ſtrong Vinegar, over warm Embers, a Quantity of *Red-Lead*, (or *Minium*) or of *Saccharum Saturni*, in three times as much Water, for 3 or 4 Hours, or till you find the Liquor have a very ſweet Taſte. This will likewiſe, as the firſt Liquor, be clear as common Water.

All things being thus ready (for you muſt be pretty quick at it) write on a piece of Paper what you will, with this laſt Liquor, with a clean, or new Pen, and when it is dry, nothing will appear.

Then over that place write with the Ink you made of the Cork, what you pleaſe; it will look juſt as if it had been written with common Ink, which let dry; then dipping a ſmall piece of Rag, or Sponge, in the firſt Liquor, rub it on the Place written, and you will immediately ſee the Black writing vaniſh, and that written with the Inviſible Ink, appear Black and Legible.

Take alſo a Book 4 or 5 Inches thick, and writing on the firſt Blank Leaf with the laſt Liquor, or the Inviſible Ink; or putting in there a Paper ſo written, turn to the other end of the Book, and rub there with a Rag dipt in the firſt Liquor, on that part that is as nearly as you can gueſs, oppoſite to the Writing, and leave alſo the Rag there: And over it clap a folded Paper, and nimbly ſhutting the Book, ſtrike 4 or 5 good Stroaks on it with your Hand, and then turning it t'other ſide uppermoſt, clap it into a Preſs, or lay it between two Boards with a good Weight on it for a Quarter of an Hour (or half that time will do) then taking it out, you'll find the Writing black and legible, which was written with the Inviſible Ink.

This Proceſs, Mr. *Boyle* communicated in his Hiſtory of Gold, *p.* 322. and afterwards *Lemery* publiſhed it in his *Courſe of Chymiſtry*, with the Addition of the latter Experiment.

By whoſe help we may endeavour at a Solution of theſe ſtrange Experiments, if we conſider,

1. That the firſt of theſe Liquors is a Mixture of the Alkalizate, and fiery Salt of Quick-lime, with the Sulphureous Subſtance of the *Orpin*, which is a kind of *Arſenick*.

2. That the Blackneſs of the Ink, which is the ſecond Liquor, proceeds only from the porous, light, and ſooty Parts of the Cork; which are its Oily Parts very much rarified.

3. That the laſt Liquor (or the Inviſible Ink) only the Parts of the Lead held up imperceptibly in the acid Liquor of Vinegar.

Hence then, the Reaſon of the diſappearing of the Ink in the firſt Experiment, is from the penetrating Parts of the firſt Liquor, which conſiſting of an Alkalizate Salt, and a penetrating Oil, or Sulphur, doth make a kind of Soap, which ſoon diſſolves the rarify'd Fuliginoſity of the Ink, as common Soap takes away greaſie Spots out of Cloaths, &c.

And the inviſible Ink then appears black, becauſe the Edges of the acid Liquor that hold the Parts of the Lead diſſolved, being now broken by its Conflict with the Alkali of the firſt Liquor; the Parts of the Lead are, as it were, precipitated on the Paper, and ſo appear in their proper Colour, which is Black.

So that the Viſible Ink diſappears, becauſe its black Parts are diſſolved; and the Inviſible doth appear, becauſe its diſſolved Parts are revived, or reſtored.

The ſecond Experiment ſhews the ſtrange piercing Subtility of the firſt Liquor.

You had beſt make all the Liquors in different Places, leſt they ſhould mingle, and ſo ſpoil the Experiment, as I have known them ſometimes do.

Experiment the Third.

Diſſolve a little white, or green Vitriol in Water; and then write with a clean Pen with the Solution, nothing will appear.

Boil Galls in Water, and dip a Rag of Linen in the Decoction, and with it rub the Place before written, and it will appear Black and Legible.

But if you rub over it with a Feather, or a Rag dipt in Spirit of Vitriol, (or its Oil) the Letters will diſappear again.

Dip another Rag in Oil of *Tartar per Deliquium*, and rub on the Place, the Letters will *appear again*, but of a Yellowiſh Colour. *Lemery's Chymiſtry, laſt Edit. pag.* 330.

REASONS.

The Coagulum of the Vitriol and Galls, is the Cauſe of the firſt Blackneſs, (as is ſeen in making common Ink) which the acid Spirit of Vitriol diſſolves, and ſo the Letters diſappear: But the Oil of Tartar breaking (as it uſes to do in all Precipitations) the Force of this acid Spirit, reſtores the Coagulum, but ſpoils its Colour a little, by mingling it ſelf with it.

SYMPATHETICK *Powder*, is only (ſaid *Lemery*) Green, or *Roman Vitriol*, opened by the Sun-Beams

Beams penetrating into it, and imperfectly calcining it: The Vitriol is uſually expoſed to the Sun's Heat in the Month of *July*, but ſome uſe only Powder of Vitriol. When they uſe it, they ſpread ſome of the Powder upon a Linen-cloth dipt in the Blood of any Wound, and then pretend, that if the Cloth be many Miles off the wounded Perſon, yet he ſhall be healed: But this is ſo far from being true, notwithſtanding the vaunting Stories of Sir *Ken. Digby* and others, that 'twill hardly have its Effect, if done in the ſame Room where the Patient lies; and he is certainly very much wanting to himſelf, who will uſe no other Help.

Vitriol hath its Parts in continual Motion; and 'tis probable, many *Effluvia* may go out from it; and ſome few of thoſe, if Application be made to the Cloth, juſt by the Patient, may perhaps enter into the Wound, and help to ſtop the Bleeding, for Vitriol is a known Styptick; but he that will neglect all other Means, and depend only on this, may probably pay dear for his Credulity.

SYMPEPSIS, is a Coction of thoſe Humours, which are growing into an Impoſtume.

SYMPHYSIS, is the joyning of two Bones of which neither has a proper diſtinct Motion: This is either without any Medium, or elſe with it, as with a Cartilage, or Griſle, a Ligament, or Fleſh, *&c.*

SYMPTOM, is a preternatural Diſpoſition of the Body, occaſioned by ſome Diſeaſe; this is either a Diſeaſe cauſed by another Diſeaſe; or elſe the Cauſe of a Diſeaſe proceeding from another Diſeaſe; or elſe ſimply a Symptom: This laſt is either ſome Action of the Body hindred, or diſturbed, ſome Fault of the Excrement, or change of the Natural Temper. *Blanchard.*

SYMPTOMATICAL *Fevers* according to ſome, are thoſe which ariſe from the Inflammation and Putrefaction of Humours contained in ſome of the Bowels, of which kind are thoſe *Fevers* that accompany the *Pleuriſie*, *Inflammation of the Lungs, and Liver*, *Frenzy*, *Quinſie*, and other Inflammations, as Ulcers of the Internal or External Parts.

SYMPTOTES. See *Aſymptotes.*

SYNACTICA, are Medicines that contract any Part.

SYNALÆPHA, is a Figure in the Dimenſion, or Scanning of a *Latin* Verſe; whereby there is a Coalition of the two Vowels or Diphthongs, one of which ends, and the other begins two contiguous Words in a Verſe, ſo that they make but one.

SYNARTHROSIS, is a joyning of Bones by a Griſle, and is of two ſorts, *viz. Sutura*, and *Gomphoſis*, which ſee.

SYNCHONDROSIS, the ſame with *Synarthroſis.*

SYNCHYSIS, in *Grammar*, is a confuſed and diſorderly placing of Words in a Sentence.

SYNCHYSIS, a Diſeaſe, is a preternatural Confuſion of the Blood, or Humours of the Eyes. *Blanchard.*

SYNCOPALIS *Febris*, or the *Swooning Fever*; is that in which the Patient often Swoons and Faints away. *Blanchard.*

SYNCOPATION, a Term in Muſick, which is when a Note of one Part ends and breaks off upon the middle of a Note of another Part.

SYNCOPE, in Muſick, is the driving a Note, when ſome ſhorter Note prefix'd at the beginning of the Meaſure, or Half-meaſure, is immediately follow'd by two, three, or more Notes of a greater Quantity, before you meet with another ſhort Note equivalent to that which began the driving, to make the Number even. As when an odd *Crotchet* comes before two, three, or more *Minims*, or an odd *Quaver* before two, three, or more *Crotchets.*

SYNCOPE, in Phyſick, is a ſudden Proſtration or Swooning, with a very weak, or no Pulſe, and a Depravation of Senſe and Motion.

SYNCOPE, in *Grammar*, is the taking away a Letter or Letters, out of the middle of a Word: As *Dixti* for *Dixiſti*, *Repoſtum* for *Repoſitum.*

SYNCRITICA, are relaxing Medicines.

SYNDESMUS, or *Syndeſmous*, the ſame with a *Ligament.*

SYNDROME, is a Concurrence of ſeveral Symptoms in the ſame Diſeaſe.

SYNECDOCHE, a Trope in *Rhetorick*, where the Name of the the Whole is put for Part; or the Name of the Part for the Whole: As if we ſhould ſay, *Europe* for *England*, or *England* for *Europe.*

SYNECDOCHE, in *Grammar*, is when the Ablative Caſe of the Part, or the Adjunct, is changed into the Accuſative: As in that of *Virgil*:

Deiphobum vidi lacerum crudeliter Ora.

And in this:

Flores inſcripti nomine Regum.

SYNECHPHONESIS, or *Synizeſis*, is a Figure in *Grammar*, whereby two Vowels are contracted into one, as in this Verſe of *Virgil.*

Seu lento fuerint Alvearia vimina texta.

Where the *ea* in *Alvearea*, are contracted into one Vowel.

SYNEDRENONTA, are common Symptoms which accompany Diſeaſes; and yet neither flow from the Nature of the Diſeaſe, nor are neceſſary Concomitants of it; but do, notwithſtanding, ſignifie the Greatneſs, Continuance, *&c.* of the Diſeaſe.

SYNANCHE, is a ſort of *Squinancy*, which quite ſtops the Breath, or a preternatural Inflammation of the Muſcles of the Jaws.

SYNEUROSIS, is an Articulation of Bones by a Ligament; as the Extremity of the *Ulna*, is joined to the Bones of the *Carpus.*

SYNGULTUS, the *Hiccough*, is a depraved Convulſive Motion of the Stomach, by which it endeavours to expel ſomething that is hurtful, or offenſive.

SYNIZESIS. See *Synechphoneſis.*

SYNOCHA, is a continued intermitting Fever, this laſts for many Days with a great Heat, ſometimes Putrefactions of the Blood; it is either *Quotidian*, *Tertian*, or *Quartan. Blanchard.*

SYNOCHUS, is a continued Fever without any Intermiſſion, or Abatement of the Heat, which continues for many Days: This is either ſimple, or accompanied with Putrefaction. *Blanchard.*

SYNOD, a Meeting or Aſſembly of Eccleſiaſtical Perſons concerning Religion: Of which there are four Kinds.

1. *General*, where Biſhops, *&c.* meet of all Nations.

2. *National*, where thoſe of one Nation only come together.

3. *Provincial*, where they of one only Province meet.

4. *Dioceſan*, where thoſe of but one Dioceſs meet: See *Convocation*, which is the ſame with *Synod*, only the one is a *Greek*, and the other a *Latine* Word. *Cowel's Interpreter.*

SYNODICAL *Month*, is the Space of Time, (*viz*, 29 Days, 12 Hours, 45 Minutes) contained between the Moon's parting from the Sun at a Conjunction, and returning to him again; during which Time ſhe puts on all her Phaſes. And her

SYNODICAL *Revolution*, is that Motion whereby her whole Syſtem is carried along with the Earth round the Sun.

SYNONOMY, is when the ſame thing is expreſs'd by ſeveral Words that have but one and the ſame Signification: As if one ſhould ſay, *He went away, he eſcaped, he fled.*

SYNTASIS, is a preternatural Diſtention of the Parts.

SYNTECTOE, is a kind of Looſeneſs that proceeds from the melting away of the Subſtance of the Body by a violent hot Diſtemper of the ſolid Parts ſuch as ſometimes happen in the Inflammation of the Bowels, and in a vehement burning Fever, Hectick, or Peſtilential; in which a fat Matter, as it were mixt with Oil or Greaſe, is voided by Stool.

SYNTENOSIS, is reckon'd by ſome to be the Unition of one Bone to another, by a *Tendon*; as the Knee-pan to the Thigh-bone and *Tibia*.

SYNTERETICK Medicines, are that Part of Phyſick, which give Rules for the Preſervation of Health.

SYNTEXIS, is a Conſumption and Colliquation of the Body, in which firſt the Fleſh is waſted, and afterwards the Subſtance of the more ſolid Parts. *Blanchard.*

SYNTHESIS, is either the Frame and Structure of the whole Body; or more ſtrictly, the Compoſure of the Bones. 'Tis alſo uſed in *Mathematicks*, in Oppoſition to the Word *Analyſis*; in which Senſe it ſignifies *Compoſition*, or the

SYNTHETICAL Method of *Enquiry*, or *Demonſtration* in *Mathematicks*, is when we purſue the Truth chiefly by Reaſons drawn from Principles before eſtabliſhed, and *Propoſitions* formerly proved, and proceed by a long regular Chain, till we come to the Concluſion: As is done in the Elements of *Euclid*, and in almoſt all the *Demonſtrations* of the Ancients. This is called *Compoſition*, and is oppoſed to the Analytical Method, which is called *Reſolution*; which ſee.

SYNTHESIS is alſo uſed by the *Grammarians*, to ſignifie an Agreement of the Parts of a Sentence as to Senſe, but not as to the Words.

SYNULOTICKS. See *Cicatriſantia*.

SYNYMENSIS, is taken to be the uniting of Bones together by a *Membrane*, as in Infants, the Bones of the *Synciput*, with the *Os Frontis*.

SYPHON, is a Tube, or Pipe of Glaſs, or Metal, which is uſually bent to an Acute Angle, and having one Leg ſhorter than the other; they are frequently to draw off Liquors out of one Barrel or Veſſel into another, without raiſing the Lees, or Dregs, and are called *Cranes*. Sometimes Glaſs Tubes or Pipes, tho' ſtrait, are called *Syphons*.

For the Cauſe of the running of Water, or other Liquors, through the *Syphons* or *Cranes*: See *Hydroſtaticks*, *Paradox* 10.

SYRINGE, is an Inſtrument which is uſed in injecting Liquors into Wounds, Ulcers or any diſeaſed Parts of the Body.

SYRINGOMATA, are Chirurgeons Knives, which they open *Fiſtula's* with.

SYRINGOTOMIA, is the Inciſion of the *Fiſtula*.

SYSSARCOSIS, is the Connexion of Bones by Fleſh. *Blanchard.*

SYSTEM, in Muſick, is the Extent of a certain Number of *Chords*, having its Bounds toward the *Grave* and *Acute*, which hath been differently determined by the different Progreſs made in Muſick, and according to the different Diviſions of the *Monochord*.

The *Syſtem* of the Ancients was compoſed of four *Tetrachords*, and one *Supernumerary Chord*, the whole making Fifteen Chords.

SYSTEM properly is a regular orderly Collection, or Compoſition of many things together.

Thus the *Solar Syſtem*, is the Aggregate Union, or orderly Diſpoſition of all thoſe Planets which move round the Sun as their Centre, in determin'd Orbits, and never deviate farther from him than their proper and uſual Bounds. And a

Syſtem of Philoſophy, is a regular Collection of the Principles and Parts of that Science into one Body, and a treating of them Dogmatically, or in a Scholaſtical Method; which is called the *Syſtematical Way*, in Contra-diſtinction of the *Way of Eſſay*, wherein the Writer delivers himſelf more looſely, eaſily and modeſtly.

The Learned Dr. *Hook*, did in the Year 1674, at the End of his Attempt to prove the Motion of the Earth by Obſervation, promiſe that he would explain a Syſtem of the World, differing in many things from any then known, and yet exactly agreeable to Mechanical Principles. Which Syſtem he there ſays, depends on theſe three Suppoſitions, *viz*.

Firſt, That all the Heavenly Bodies have a gravitating or attracting Power towards their own Centers, whereby they attract not only their own Parts, and keep them from flying off from them, but alſo all other Celeſtial Bodies within the Sphere of their Activity.

Secondly, That all Bodies put into a direct and ſimple Motion, will ſo continue to move forwards in a ſtrait Line, till they are by ſome or other more effectual Power bent or deflected into a Motion, which deſcribes ſome Curve Line.

Thirdly, That theſe attractive Powers are ſo much the more powerful in operating by how much the nearer the Body wrought upon, is to their own Centers.

All which is abundantly confirmed in Sir *Iſaac Newton's Admirable Principia Philoſophiæ Mathematica*.

SYSTOLE, in *Anatomy*, is the Contraction of the Ventricles of the Heart, whereby the Blood is forcibly driven into the great Artery.

SYSTOLE, in *Grammar*, is part of the Poetical Licenſe, whereby a long Syllable is made ſhort: As in that of *Virgil*:

——*Tulerunt faſtidia Menſes.*

SYSTYLE, in *Architecture*, is a Building where the Pillars ſtand thick, but not altogether ſo cloſe as in the *Pychnoſtyle*; the Inter-columniation, or Diſtance between them, being only two Diameters of the Column.

SYZYGIE, in *Aſtronomy*, is the ſame with the Conjunction of any two Planets, or Stars, or when they are both referred to the ſame Point in the Heavens; or when they are referred to the ſame Degree of the Ecliptick, by a Circle of Longitude paſſing through them both.

TABES. *See Atrophia.*

TABES *dorſalis*, a Conſumption in the ſpinal Marrow, incident to thoſe who are too much addicted to Venery, they are without a Fever, eat well, and yet waſte, or conſume away: If you ask one in this Diſeaſe an account of himſelf, he will tell you, that there ſeems as if ſo many Piſmires did crawl from his Head down upon his ſpinal Marrow; when he eaſes Nature, either by Urine or Stool, there flows thin liquid Matter like a *Semen* plentifully; when he goes or runs any way, but eſpecially by a ſteep Place, he grows weak and ſhort-breathed, his Head is Heavy, and his Ears tingle; ſo in proceſs of Time he dies of a Fever called *Lipyria*, where the External Parts are cold, and the Internal burn at the ſame time. *Blanchard.*

TABLE, in Architecture, is a ſmooth and ſimple Part of a different Figure; but moſt commonly in Form of a long Square, or of a Triangle.

Projecturing Table, is that which jets out beyond the naked Face of a Wall, Pedeſtal, or any Part whereof it makes the Ornament: And a

Raked Table, is that which is hollow'd in the Square of a Pedeſtal, or elſewhere.

TABLETS, or ſolid Electuaries, are much the ſame with *Lozenges*, being made uſually of Sugar and Powder, *&c.* incorporated well together, and given in many Diſeaſes, eſpecially thoſe of the Lungs and Breaſt.

TABLING *of Fines*, is the making a Table for every County where his Majeſty's Writ runs, containing the Contents of every *Fine* paſſed in any one Term, as the Name of the County, Towns, and Places, wherein the Lands or Tenements lie; the Name of the Demandant and Deforceant, and of every Manor named in the *Fine*.

TABUM, is a thin ſort of Matter that comes from an ill Ulcer. *Blanchard.*

TACK, in a Ship, is a great Rope having a *Wale knot* at one End, which *ſeized* or faſtened into the *Clew* of the Sail; ſo is reeved firſt thro' the *Cheſſe Trees*, and then is brought thro' a Hole in the Ship's Side. Its Uſe is to carry forwards the Clew of the Sail, and to make it ſtand cloſe by a Wind: And whenever the Sails are thus trimmed, the Main-tack, the Fore-tack, and Miſſen-tack are brought cloſe by the Board, and haled as forward on as they can be. The Bowlings alſo are ſo on the Weather ſide; the Lee-ſheets are haled cloſe aft, and the Lee-braces of all the Sails, are likewiſe braced aft. Hence they ſay, a Ship *Sails*, or *ſtands cloſe upon a Tack*, *i.e.* cloſe by the Wind. *Hale aboard the Tacks*; that is, Bring the Tack down cloſe to the Cheſs-trees. *Eaſe the Tack*, *i.e.* Slacken it, or let it go, or run out. *Let riſe the Tack*, *i.e.* Let it all go out. The Tacks of a Ship are uſually belayed to the *Bitts*, or elſe there is a *Chevil* on purpoſe to faſten them.

TACK *about*: The Word, when a Ship's Head is to be brought about ſo as to lie a contrary Way; to do which, Firſt they make her ſtay, (See Stay) and when ſhe is ſtay'd, they ſay, She is *Pay'd*. The next Word is, *Let riſe and Hale*, that is, Let the *Lee-tack riſe, and Hale aft the Sheets*, and ſo trim all the Sails, by a Wind as they were before; for they caſt off that which was before the *Weather-Bowling*, and ſet up the other taught; and ſo they do alſo by all *Sheets*, *Braces* and *Tacks*, which a Ship that is trimmed by a Wind muſt have.

TACKLES, in a Ship, are ſmall Ropes running in three Parts, having at one End a *Pendant* with a Block faſtened to them, or elſe a *Lannier*; and at the other End, is a Block and an Hook to hang any Goods upon, which is to be heaved into the Ship, or out of it.

There are ſeveral ſorts of theſe *Tackles*.

1. The *Boat Tackles*, which ſerve to hoiſe the Boat in and out, as alſo for many other Uſes: Theſe ſtand on the Main-maſt Shrouds, the other on thoſe of the Fore-maſt.

2. The *Tackles* belonging to the Maſts, theſe ſerve as a kind of Shrouds, to keep the Maſts from ſtraining.

3. The *Gunners-Tackles*, with which the Ordnance are hoiſted in and out.

4. There is alſo another called *Winding-Tackle*; which ſee under that Word.

There is alſo another kind of *Tackle* which is called a *Burnett*. See *Burnett*.

TACTILE *Quantities*, are ſuch as have a primary Relation to the Senſe of Feeling, or to our Touch: As Heat and Cold, *&c.*

TÆNIA, in Architecture, is a Member of the *Dorick* Capital, which reſembles the Shape of a ſquare Fillet, and ſerves inſtead of a *Cymetium*, being faſtened, as it were, to a Capital below the *Triglyphs*, whereof it ſeems to be the Baſe.

TAFFEREL, is the uppermoſt Part, Frame, or Rail of a Ship abaft over the Poop.

TAILE, in common Law, ſignifies two ſeveral Things both grounded upon one Reaſon. Firſt, it

is to be used for the Fee, which is opposite to *Fee Simple*, by reason it is so minced or pared, as it were, that it is not in the Owner's free Power to dispose, but is by the first Giver *cut* or *divided* from all others, and tied to the Issue of the Donee: And this Limitation of *Tail*, is either *General*, or *Special*.

Tail General, is that whereby Lands or Tenements are limited to a Man, and to the Heirs of his Body begotten; and it is so called, how many Wives soever the Tenant holding by this Title, shall have one after another in Lawful Marriage, his Issue by them all, have a Possibility to inherit one after another.

Tail Special, is when Lands or Tenements limited to a Man and his Wife, and the Heirs of their two Bodies begotten; and hath this Term of *Special*, because if the Man bury his Wife before Issue, and take another, the Issue by his second Wife cannot inherit the Land, *&c.* Also, if the Land be given to a Man and his Wife, and their Son *R.* for ever; this is *Tail Special*.

TAIL *after Possibility of Issue Extinct*, is where Land is given to a Man and his Wife, and to the Heirs of their two Bodies, the one over-lives the other without Issue between them begotten; he shall hold the Land for Term of his own Life, as Tenants in *Tail after Possibility of the Issue Extinct*; and notwithstanding that he do waste, he shall never be Impeached of it: And if he Alien, he in the Reversion shall not have a Writ of Entry *in consimili Casu*, but he may enter, and his Entry is Lawful.

TAILLOIR. See *Abacus*.

TAINT, in Law, signifies Substantively, either a Conviction; or Adjectively, a Person Convicted of Felony or Treason, *&c.* See *Attaint*.

TAKE *and leave*, they say at Sea, that when a Ship sails so well that she can come up with another, or out-sail her when she pleases; that *she can Take and Leave upon her*, whenever she will.

TALES, in Law, is taken for a supply of Men, impannelled upon a Jury or Inquest, and not appearing, or at their Appearance challeng'd by either Party as not indifferent; in which Case the Judge upon Motion, grants a Supply to be made by the Sheriff of one or more such there present; and hereupon the very Act of supplying is called a *Tales de Circumstantibus*: But he that hath had one *Tales* either upon Default or Challenge, may not have another to contain so many as the former: For the first *Tales* must be under the principal Pannel, except in a Cause of Appeal, and so every *Tales* less than other, until the Number be made up of Men present in Court, and such as are without Exception; yet this general Rule is not without some Exceptions, as appears by *Stamford Pl. Cor. Lib.* 3. *Cap.* 5. These commonly called *Tales*, may in some sort, and indeed are called *Meliores*, *viz.* when the whole Jury is challenged.

TALLY *the Sheats*, is a Word of Command at Sea, when the Sheats of the Main-sail or Fore-sail are to be halled aft. See *Sheets*.

TALON, a small Member in Architecture composed of a square Fillet, and a straight *Cymetium*. It differs from the *Astragal*, which is a round Member, whereas the *Talon* consists of two Portions of a Circle, one without, and the other within; and when the Concave Part is uppermost, it is called *Reversed Talon*.

TALPA, is a Tumor so called, because that as a Mole (in Latin *Talpa*) creeps under Ground, so this feeds upon the Scull under the Skin: It may be referred to the Species of *Athermas*; which see. *Blanchard*.

TALUS, the same with *Astragulus*. See it described under the word *Tarsus*.

TALUS, or *Talut*, properly signifies any Thing that goes sloping, as the *Talus* of a Wall in Masonry, when its thickness is diminished by Degrees as it rises in height. But in *Fortification*, the *Talus* of a *Bastion* or *Rampart*, is the Slope allowed to such a Work whether it be of Earth or Stone, the better to support its Weight.

TALUS *Exterior*, of a Work, is its Steepness on the Sides of the Field; and is always made as little as possible, to prevent the Enemies *Scalado*, unless the Earth be bad, then it is absolutely necessary to allow a considerable *Talus* for its *Parapet*.

TALUS *Interior*, of a Work, is its Steepness on the inside towards the Place.

TAMPKIN, *Tampion*, or *Tampin*, at Sea, is a round piece of Wood filled with the Muzzle of a great Gun, which serves to stop it so, that no Water or Rain may get in to wet the Powder.

TANGENT, of a Parabola, (or other Conick Section, or Geometrical Curve) is a Right Line drawn, cutting the Ax produced, and touching the *Section* in one Point without cutting it.

In Philos. Transact. N. 90. there is an easie Method of *Slusius*, to draw Tangents to all Geometrical Curves without any Labour of Calculation: The Demonstration of which you have afterwards, *Hunts* 95 communicated by the same Author, and is contained in these three *Lemmata*.

1. The Difference between any two Dignities, or Powers of the same Dimensions or Degrees divided by the Difference between the Roots of those Powers, gives several Parts or Members of the next inferior Powers, which may be formed from those two Roots, as from a Binomial, thus.

$$\frac{x\,xx-y\,yy}{x-y}=x\,x+x\,y+y\,y.$$

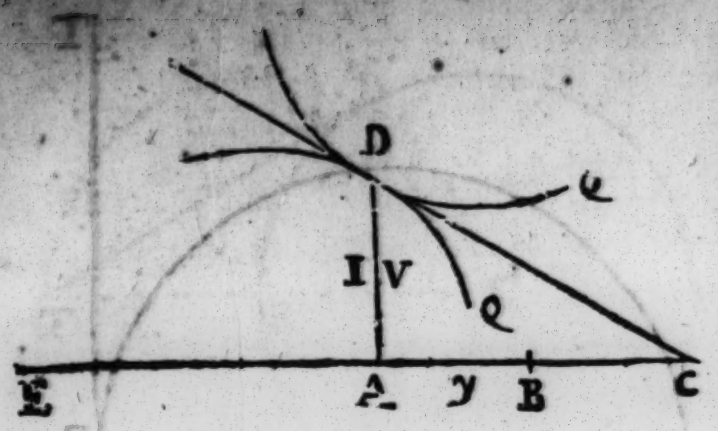
2. There are always so many several Members in any Degree or Power raised from a *Binomial*, as are the Unites in the *Exponent* of the *Power* next above it. Thus in the Square of a *Binomial* there are three Members, in the Cube, there are four, *&c.*

3. If any Quantity divide 2 others whose Ratio is given, the Quotients will be also reciprocally in the same given Ratio; or that the Quotients of any two Numbers, or Quantity, divided by one and the same Quantity, are as the Dividends.

This premised, Let there be *any Curve*, as D Q, whose Points are all referrable to any Right Line given, as E A B, whether that Right Line be the Diameter, or not; or whether there be more given Right Lines than one, if their Powers do but come into the Equation, 'tis enough.

And in all his Equations he puts V always for the Line D A, *y* for B A; and for E B, and the other given Lines, he puts *b d*, &c. *i. e.* always, Consonants.

Then



Then ſuppoſing D C to be drawn touching the Curve in D, and meeting with E B, produced in C, he always calls the ſought Line C A, by the Name of *a*.

To find which he gives this general Method.

RULE I.

He rejects out of the Equation all Members which have not either *V* or *y* with them; then he puts all thoſe that have *y* on one ſide, and all thoſe which have V on the other, with their Signs + or —. And the latter for Diſtinction and eaſe-ſake, he calls the *Right*, the former the *Left Side*.

RULE II.

On the Right Side, let there be prefix'd to each Member, the Exponent of the Power which *u* hath there: Or which is all one, Let that *Exponent* be multiplied into all the Members.

RULE III.

Let the ſame be done alſo on the Left Side, multiplying each Member there by the *Exponent* of the Power of *y*.

Adding this moreover, That one *y* muſt (in each Member) be always changed into *a*.

This done, I ſay, that the Equation thus reformed, will ſhew the Method of drawing the required Tangent to the Point D; and when that is given, as alſo *y*, *u*, and the other Quantities expreſſed by Conſonants, *a* cannot be unknown.

Let there be this Equation $by - yy = VV$, in which E B is *b*, B A $= y$, D A $= V$, and let *a*, or A C be required to find the Point C, from whence C D being drawn, ſhall be a true Tangent to that Curve Q D, in D.

In this Example nothing is to be ejected out of the Equation, becauſe *y* or V, are in each Member: 'Tis alſo ſo diſpos'd as required by *Rule* 1. To each part therefore there muſt be prefixed the Exponent of the Powers of *y* and V, as in *Rule* 2; and on the Left Side let one *y* be changed into *a*: And then the Equation will be in this Form, $ba - 2ya = 2VV$, which Equation reduced, gives eaſily the Value of $a = \frac{2VV}{b-2y} =$ A C. And ſo the Point C is found, from whence the Tangent D C may be drawn.

To determine which way the Tangent is to be drawn, whether towards B or E, he directs to conſider the Numerator and Denominator of the Fraction, which at laſt is found equal to *a*. For,

1. If in both Parts of the Fraction, either all the Signs are Affirmative, or if the Affirmative ones are more in Number, then the Tangent is to run towards B.

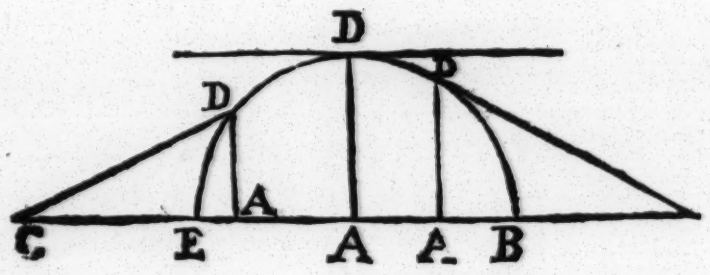
2. If the Affirmative Quantities are greater than the Negative in the *Numerator*, but equal to them in the *Denominator*, the Right Line drawn thro' D, and touching the Curve in that Point, will be parallel to A B: For in this Caſe, *a* is of an infinite Length.

3. If in both Parts of the Fraction, the Affirmative Quantities are leſs than the Negative, changing all the Signs, the Tangent muſt be drawn now alſo towards B: For this Caſe, after the Change, comes to be the ſame with the firſt.

4. If the Affirmative Quantities are greater than the Negative in the *Denominator*, but in the *Numerator* are leſs, or *vice verſa*; then changing the Signs in that Part of the Fraction where they are leſs, the Tangent muſt be drawn a contrary way; *i. e.* A C muſt be taken towards E.

5. But whenever the Affirmative and Negative Quantities are equal in the *Numerator*, let them be how they will in the *Denominator*, *a* will vaniſh into nothing: And conſequently either A D it ſelf is the Tangent, or elſe E A; or at leaſt, a Line Parallel to E A, as will eaſily be found by the Data.

This he gives plain Examples of, in Reference to the Circle, thus.

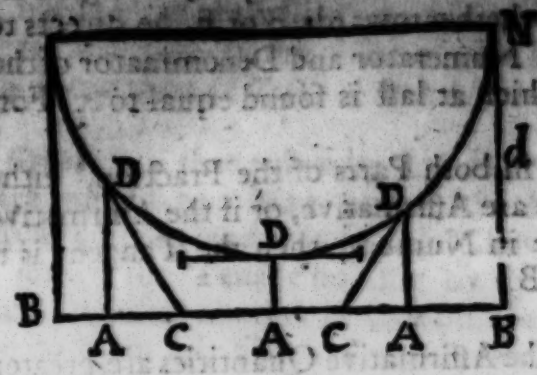


Let there be a Semi-circle, whoſe Diameter is E B, in which there is given any Point; as D, D, D, &c. from which the Perpendicular D A, is let fall to the Diameter.

Let D A $= V$, B A $= y$, B E $= b$: Then the Equation will be $by - yy = VV$, and drawing the Tangent D C, A C or $a = \frac{2VV}{b-2y}$

Now if *b* be greater than 2 *y*, the Tangent muſt be drawn towards B, if leſs, towards E, if it be equal to it, it will be Parallel to E B, as was ſaid in the 1ſt, 2d, and 4th Rules.

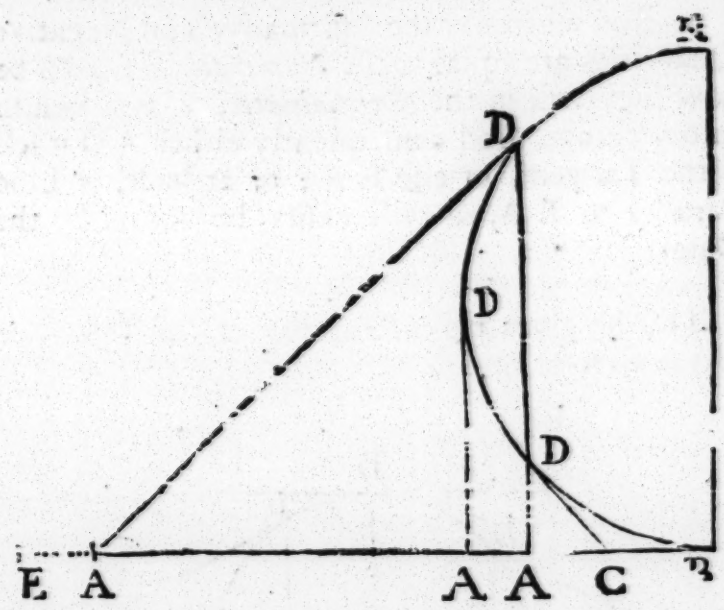
Let



Let there be another Semi-circle inverted; as, N D D; the Points of whoſe Periphery are referred to the Right Line B B, parallel and = to the Diameter.

Let N B be called d; and all things elſe, as before; then the Equation will be $by - yy = dd + VV - 2dV$; which being managed according to his Rules, you have $a = \frac{2VV - 2dV}{b - 2y}$

Now ſince V here is ſuppoſed to be always leſs than d; if b be *greater* than $2y$, then the Tangent muſt be drawn towards E; if *equal*, it will be parallel to B B; if *leſs*, changing all the Signs, the Tangent muſt be drawn towards B, as by *Rule* 4, 5, and 3. But there could be no Tangent drawn, or at leaſt, E B would be it, if N B had been taken equal to the Diameter.



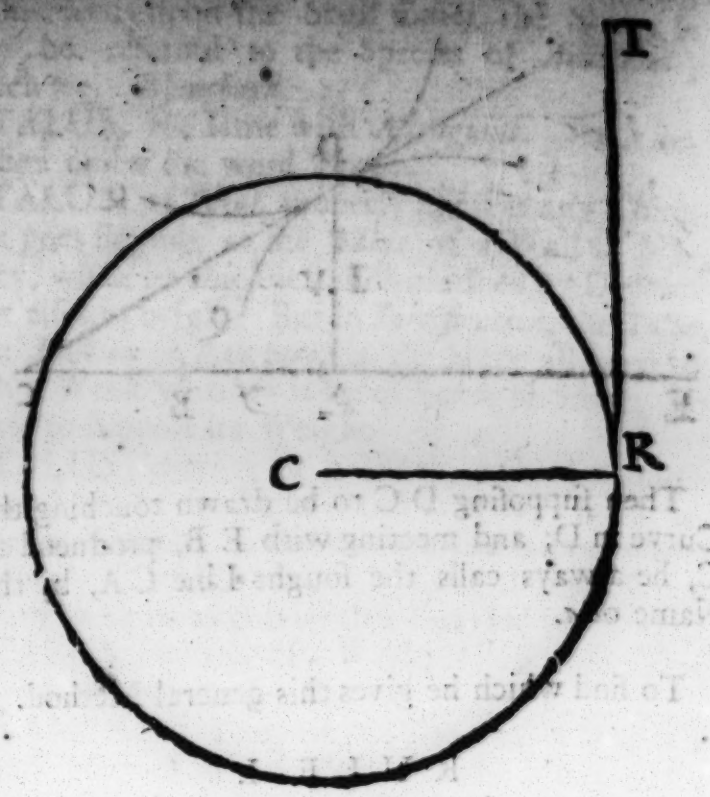
Let there be another Semi-circle, whoſe Diameter N B, is perpendicular to E B, and to which its Points are ſuppoſed to be referred.

Let N B be called b, and all things elſe as above; the Equation will be $yy = bV - VV$, and $a = \frac{bV - 2VV.}{2y}$

If now b be *greater* than 2 V, the Tangent muſt be drawn towards B, if *leſſer*, towards E, if *equal*, D A will be the Tangent; as by *Rule* 1, 4, and 5, appears.

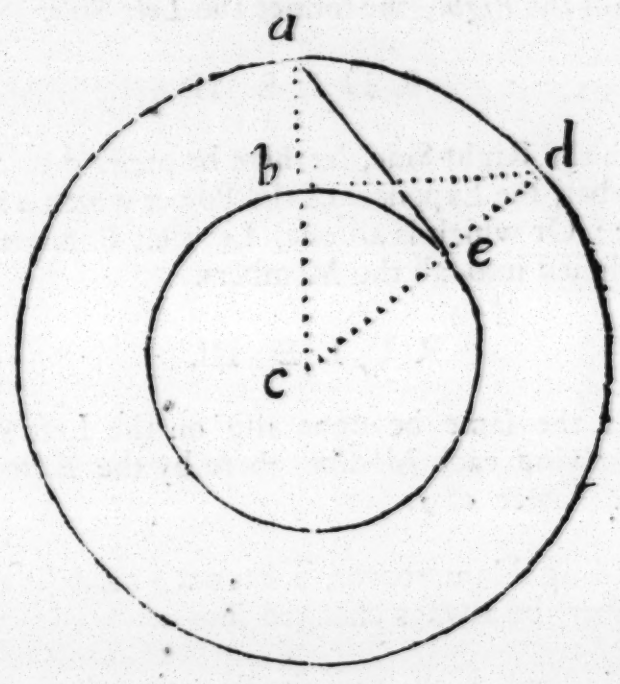
N. B. In the *Acta Eruditorum* for *December*, 1682. there is an univerſal Method for drawing Tangents to all Curves, which is an Improvement of this.

TANGENT *of a Circle in Geometry*, is a Right Line, as T R drawn without the Circle, perpendicular to ſome Radius, as C R, and which touches the Circle but in one Point.



PROBLEM.

To draw from a Point given, as a; *the true* Tangent a e, *to any given Circle, as* c b e.



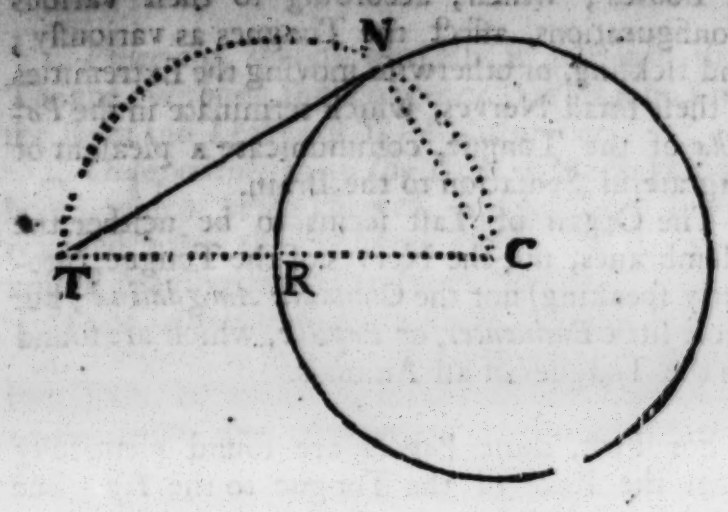
Join the Point a and the Center of the Circle, by drawing the Line $a\,c$. Then with the Radius $a\,c$ on c, deſcribe another Circle; erect a Perpendicular on b, which ſhall cut the latter Circle in d; draw $d\,c$, cutting the former Circle in e; then $a\,c$ being drawn, is the *Tangent* required.

Demonſtration.

The Line $e\,a$ is a true Tangent, becauſe perpendicular to the Radius $c\,e$, and 'tis perpendicular to $c\,e$, becauſe $c\,e\,a$ is a Right Angle; and $c\,e\,a$ is a Right Angle, becauſe 'tis equal to $c\,b\,d$, (which was made ſo by Conſtruction) and 'tis equal to $c\,b\,d$, becauſe the Triangle $c\,b\,d$, is equal to the Triangle $a\,o\,c$, as having two Sides and one Angle equal: Wherefore the Angle $c\,e\,a$, is equal to the Angle $c\,b\,d$, which is a Right Angle. *Q. E. D.*

Another very expeditious way of drawing a Tangent to a Circle, is this.

Let

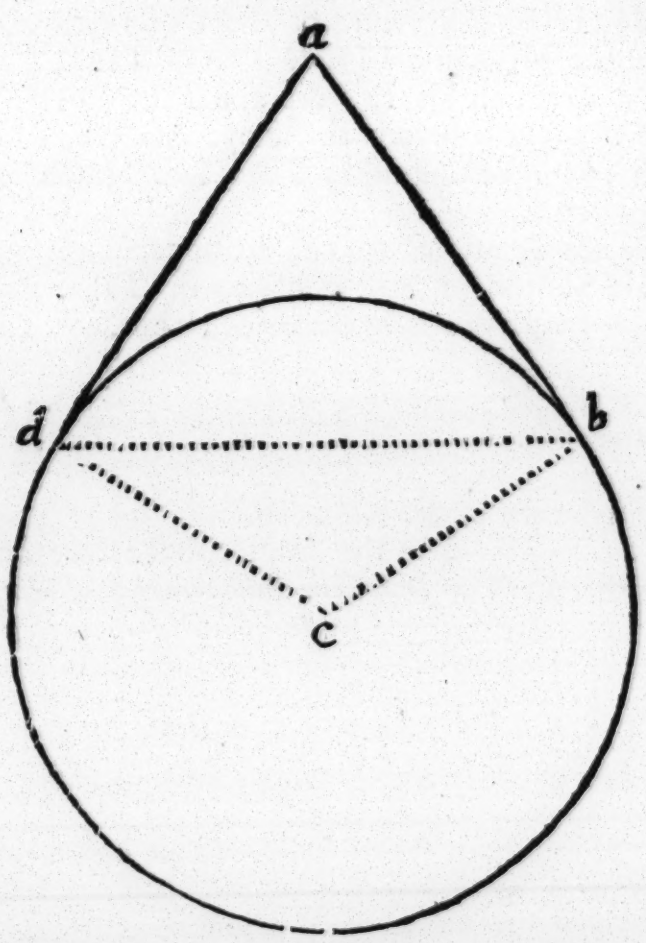


Let the Circle be R N C, the Point of Contact N; transfer the Radius N C, any where from N, downwards into the Poſition R C, ſo that R N be equal to R C; then with R C on the Center R, ſtrike a Semicircle, and a Ruler laid from C thro' R, will find the Point T; from whence T N being drawn, will be a true Tangent, becauſe the Angle T N C being in a Semicircle, is a Right one.

PROPOSITION I.

If two Tangents be drawn to any Circle from a Point (a) without, theſe Tangents ſhall always be equal.

I ſay, $a\,d = a\,b$.

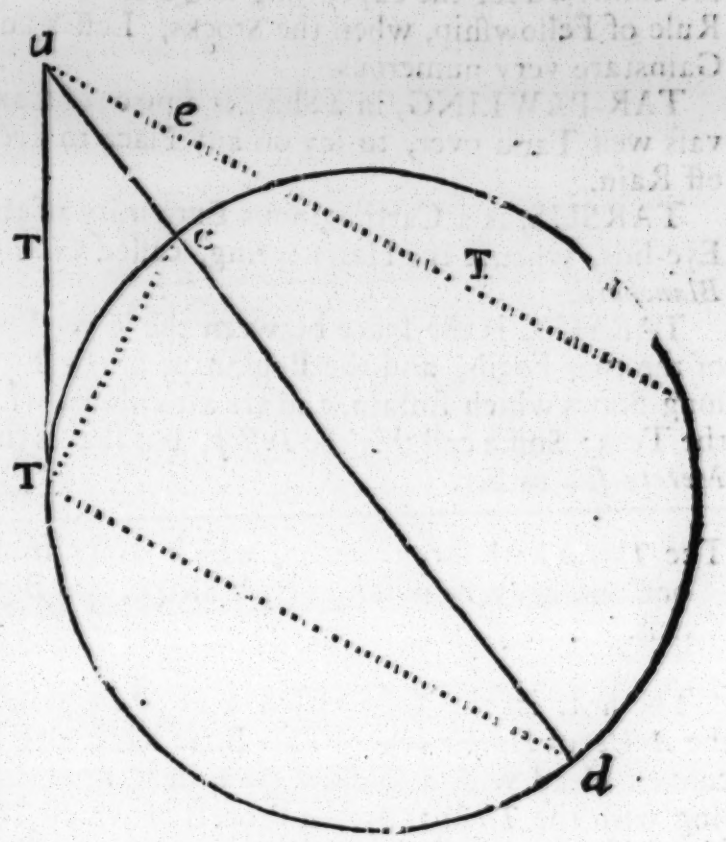


Demonſtration.

The Triangle $d\,b\,c$ being an Iſoceles, the Angle $c\,b\,d$ = Angle $c\,d\,b$; the Right Angles $a\,d\,c$, and $a\,b\,c$ are alſo equal: Wherefore if from theſe right and equal Angles, you ſeverally take the equal Angles $c\,b\,d$, and $c\,d\,b$, the Remainders $a\,b\,d$, and $a\,d\,b$, muſt be equal, and conſequently the oppoſite Sides $a\,d$, and $a\,b$, to thoſe Angles muſt be equal. *Q. E. D.*

PROP. II.

If a Tangent (a T) *and a Secant* (a d) *be drawn from the ſame Point* (a) *without a Circle; the Tangent will be a mean Proportional between the whole Secant* (a T) *and the Part* (a c) *without the Circle.*



Or, as *Euclid* expreſſes it.

The Square of the Tangent (a T) *is equal to the Rectangle made by the whole Secant* (a d) *and the external Part* (a c) *That is,* a T q = ad × a c.

Draw *c* T, and T *d*.

Demonſtration.

Then will the Triangles T *a c*, and T *a d*, be ſimilar; for the Angle *a* is common to both, and *a* T *c* = *d*, becauſe made by a Tangent *a* T, and a Secant *c* T. Therefore *c a* : *a* T :: *a* T : *a d*. That is, *a* T is a mean Proportional between *c a*, and *a d*; and alſo □ *a* T = □ *d a e*. *Q. E. D.*

COROLLARY I.

Hence may a Line be eaſily divided, according to extreme and mean Proportion; if from a Secant-wiſe to the Circle, you draw a Line ſo as that the Part within be equal in length to the Tangent. Thus, Let the prick'd Line be ſo drawn from *a*, that the Part within the Circle be equal to T. Then 'tis plain, if the Part without be called *e*, by this *Propoſition*,

$$e\,e + e\,T = T\,T.$$

TANGIBLE Bodies, are ſuch as are diſcoverable and ſenſible by our Feeling, or Touch.

TAPER-BORED, in *Gunnery*, a Piece of Ordnance is ſaid to be Taper-bored, when it is wider at the Mouth, than towards the Breech.

TARAXIS, is a Perturbation of the Humours of the Eye, the Stomach, or the Entrails. *Blanchard.*

TARE and *Tret*, *Tare* is the Weight of Box, Straw, Cloths, &c. wherein Goods are packed.

The other, *viz. Tret*, is a Conſideration allowed in the Weight for Waſte, in emptying and reſelling the Goods.

TARIF, (in *Arithmetick*) is either a ſmall Table of the Diviſor multiplied by the 9 Digits to expedite Multiplication; or elſe a Proportional Table contrived for the expediting a Queſtion in the Rule of Fellowſhip, when the Stocks, Loſſes and Gains are very numerous.

TAR-PAWLING, in a Ship, is a piece of Canvaſs well Tar'd over, to lay on any Place to keep off Rain.

TARSUS, is a Cartilaginous Extremity of the Eye-lids, whence the Hairs ſpring, called *Cilium*. *Blanchard*.

TARSUS, is the ſpace between the lower End of the two Focils, and the Beginning of the Five long Bones which ſuſtain, and are articulated with the Toes: Some call this the *Inſtep*, but that is the *Metatarſus* rather.

The *Tarſus* hath ſeven Bones, which differ from one another very much in both Shape, and Bigneſs.

The firſt, is the *Talus* called alſo *Aſtragalus*; the *Ankle* or *Huckle-bone*: This Bone has above a convex Head with a ſhallow *Sinus* in it, articulating with the *Tibia*: By the Proceſs of which *Tibia*, which makes the Inner Ankle, it is hedg'd in, as it were, on the inſide, as it is by that of the *Fibula* on the outer; before, it hath a long Neck, on which grows a round Head, that enters into the *Sinus* of the *Os Naviculare*; on which jointing the Foot is moved ſide-ways: Its inner ſide is rough, and above hath a Tranverſe *Sinus* to receive the Ligament of the *Tibia*, and below there is a deſcending *Sinus*, by which the Tendons of the Muſcles of the Foot paſs: At the bottom of all there is a *Sinus* behind, and Protuberance before, by which it is articulated with the *Os Calcis* by a *Ginglymus*.

The ſecond Bone of the Tarſus, is the *Os Calcis*, or *Calcaneum*, which ſee.

The third, is the *Os Scaphoides*, *Naviculare*, or *Cymbiforme*, which ſee.

The remaining Four ſtand all in one Rank, being leſs than the three former; and the firſt, articulates with the *Os Calcis*; the other three, with the *Os Naviculare*: There is no Cartilage between them, but they are knit together on the outſide like a Cartilaginous Ligament. The firſt of theſe is called *Cubiforme*, having ſix almoſt equal ſides, is the greateſt of theſe Four, and is ſeated on the outſide of the Foot. See *Cubiforme*. The other three are called *Oſſa Cuneiformia*, from their Wedge-like Shape; for above they are thick, and below they are thin. See that *Word*.

TARTAR *Emetick*. See *Emetick Tartar*.

TARTAR *Soluble*. See *Soluble Tartar*.

TARTAR *Vitriolate*, is made by pouring Spirit of Vitriol on Oil of Tartar, *per Deliquum*, by little and little; and when the Effervеſcence is over, placing the Glaſs in the Sand, and evaporating the Moiſture with a ſmall Heat, that a very white Salt may remain at the Bottom. This is the Tartar Vitriolate; 'tis a good Apertitive, and a little Purgative Medicine, and works alſo by Urine: Doſe from 10 to 30 Grains.

TAST, is probably cauſed by the Salts that are in Bodies; which, according to their various Configurations, affect the Tongues as variouſly; and tickling, or otherwiſe moving the Extremities of theſe ſmall Nerves, which terminate in the *Papillæ* of the Tongue, communicate a pleaſant or ungrateful Senſation to the Brain.

The Organ of Taſt ſeems to be neither the Membranes, nor the Nerves of the Tongue, (properly ſpeaking) nor the *Glandulæ Amygdalinæ*; but thoſe little *Eminences*, or *Papillæ*, which are found on the Tongues of all Animals.

For Firſt, thoſe *Papillæ* are found plentifully from the Root of the Tongue to the *Tip*; but none from thence to the *String*; or at leaſt but very few.

Secondly, any *Salt*, or ſtrong taſted Object, being placed on the Parts void of thoſe *Papillæ*, affects not the Taſt at all.

Thirdly, In thoſe *Papillæ*, in the Tongues of Live Animals, may (by a Microſcope) be diſcerned many ſmall Holes ſupply'd at the Bottom by ſmall Nerves, which communicate the *Senſation* to the Brain.

That various Taſts may be Mechanically produced, and that Sapours do depend on the Shape, Size, Motion, &c. of the ſmall Saporifick Particles of the Saporous Body.

The Honourable Mr. *Boyle*, hath abundantly made out by Experiments and Obſervations, about the Mechanical Production of Taſts.

Dr. *Grew*, in his Lecture about the Diverſities of Taſts, read before the Royal Society, *March* 25th 1675. diſtinguiſhes Taſts into Simple and Compound.

By the former of which, he underſtands ſuch as are Simple or Single Modes of Taſts, altho' mingled with others in the ſame; thus, the Taſte of a Pepin, is *Aci-dulcis*; of Rhubarb, *Amara-ſtringent*, and therefore compounded in both; but yet in the Pepin the Acid is one Simple Taſt, and the Sweet another; as diſtinct as the Bitter, and Aſtringent are in the Rhubarb.

Two Faults, ſaith the Doctor, have here been committed: The *Defective Enumeration of Simple Taſts, and Reckoning them Indiſtinctly among ſuch as are compounded.*

Simple Taſts, (of which uſually are reckoned not above ſix or ſeven Sorts) are, at leaſt, *ſixteen*.

1. *Bitter*, as in Wormwood, whoſe contrary is,
2. *Sweet*, as in Sugar.
3. *Sower*, as in Vinegar; whoſe contrary is,
4. *Salt*.
5. *Hot*, as in Cloves; to which is oppoſite,
6. *Cold*, as in *Sal Prunellæ*; for we may as properly ſay, a *Cold Taſte*, as an *Hot one*; ſince there are ſome Bodies which do manifeſtly impreſs the Senſe of Cold upon the Tongue, tho' not to the Touch.
7. *Aromatick*; to which is contrary,
8. *Nauſeous*, or malignant.
9. He thinks alſo, that Taſts may be diſtinguiſhed into ſuch as are *Soft*, which are either *Vapid*, as in Water, Starch, Whites of Eggs, &c. or *Unctuous*, as in Oils, Fat, &c.
10. Or ſuch as are *Hard*.

Of

Of which he reckons four Kinds. As,

1. *Penetrant*, which worketh it ſelf into the Tongue, without any Pungency; as is found in the Root and Leaves of Wild Cucumber.

2. *Stupefacient*, as in the Root of black Hellebore; which being chewed, and for ſome Time retained upon the Tongue, affects the Tongue with a Numbneſs, or Paralytick Stupor.

11. 3. *Aſtringent*, as in Galls. And,

4. *Pungent*, as in Spirit of *Sal Armoniack*, which two Taſts he makes contrary to the *Unctuous*; as *Penetrant*, and *Stupefacient*, are contrary to the *Vapid one*.

The compounded Taſts are very numerous, but we have Words to expreſs but ſix of them. As,

1. *Auſtere*, which is *Aſtringent* and *Bitter*; as in the green and ſoft Stones of Grapes.

2. *Acerb*, properly ſo called, is *Aſtringent* and *Acid*; as in the Juice of unripe-Grapes.

3. *Acrid*, which is Pungent and Hot.

4. *Muriatick*, is Salt and Pungent; as in common Salt.

5. *Lixivious*, which is Saltneſs joined with ſome Pungency and Heat.

6. *Nitrous*, which is Saltneſs, joined with Pungency and Cold.

TAUGHT, in the Sea Language is the ſame as ſetting a Rope ſtiff, or faſt. They ſay, *Sett Taught the Shrouds*, to Stays, or any other Ropes which are too ſlack, and looſe.

TAUNT, when the Maſts of a Ship are too tall for her, they ſay ſhe is *Taunt-maſted*, or that her Maſts are very *Taunt*.

TAURUS, is the ſecond Sign of the *Zodiack*.

TAUTOLOGY, is a vain Repetition of Words, which ſerves only to lengthen out Diſcourſe, and tire the Reader.

Tautological Echo's, are ſuch as repeat the ſame Sound of Syllable many times; whereas thoſe which repeat many Syllables or Words diſtinctly, are called *Polyſyllabical Echo's*.

TAW: The Heralds have an Ordinary which they reckon among the Croſſes, called by this Name, and of this Figure.

TECHNICAL, is ſometimes the ſame with *Artificial*, and expreſſes whatever relates to the Arts and Sciences, as the *Term*, *Rules*, &c. So that the Terms of Art are commonly called *Technical Words*.

TEETH. The Teeth are called in *Latine*, *Dentes*, *quaſi Edentes*, from their Office of *eating*, or *chewing*. They are fixed in their *Alveoli*, three manner of Ways.

The firſt and chief is by their Articulation with the Jaw-bones, by *Gomphoſis*.

The ſecond is, by the Nerve which is inſerted into their Root by *Synneuroſis*.

And the laſt is, by the Gums, which cleave to the outſide of their Roots by *Syſſarcoſis*.

Their *Subſtance* is the hardeſt of all other Bones, but more eſpecially that Part of them that ſtands out naked above the Gums. This Part, Dr. *Havers* thinks ought to be eſteemed rather ſtony than bony, and yet not the whole of it neither, but only the outſide, or *cortex*, which like a Shell covers the Bony; which being broken off, or decayed, the Bony quickly rots, and moulders away: Upon which account it is, that when the Gums are eaten away, ſo that ſome part of the Tooth, which is not defended with this ſtony *cortex*, is laid bare, it is eroded; when that Part that naturally ſtands out of the Gums, and is by ſuch a ſolid Subſtance ſecured, ſuffers no ſuch Injury; the ſtony Part is not covered with any *Perioſteum*, but that Part which is within the Sockets of the Jaw-bones, is inveſted with a thin Membrane; which, he ſays, is not the true *Perioſteum*, (though that inveſts the Socket wherein they ſtand) but is propagated from that Membrane that covers the Gums, and is common to the whole Mouth, which does not terminate with the Gums, but when it comes to their extreme Edge, turns in, and is reflected between the other ſide of the Gum, and the Tooth, deſcending into the *Alveolus*, or Socket, and adhering on one ſide, immediately to thoſe Parts of the Teeth which lie within; and on the other, to the hard fleſhy Subſtance of the Gums, which with this, is communicated to the Roots of ſome Teeth (eſpecially in the upper Jaw) to faſten them more firmly in their Sockets; and where none of this hard Fleſh intervenes, it coaleſces, as it were, into one Membrane with the *Perioſteum*, that covers the inſide of the Socket. By this Membrane, and the Nerve inſerted into the Root of every Tooth, theſe lower Parts of the Teeth become exquiſitely Senſible

The Grinders have a manifeſt *Cavity* within (but the *Inciſores* and *Canini*, but an obſcure one) whereinto by the very ſmall Holes of their Roots, they each receive a Capillary Artery from the *Carotides*, a Vein from the Jugulars, and a Twig of a Nerve from the fifth Pair. The Vein, Artery, and Nerve are united together, and clad with a common Membrane when they enter the Jaw, within which they have a proper Channel to run along in, under the Roots of the Teeth, ſending Twigs to each, as they paſs under them.

The Rudiments, or *Principles* of the Teeth, are bred with the other Parts of the Womb, but lie hid for ſome Months within the Jaws and Gums: Theſe Principles are partly Bony, and partly Mucous, and both Parts are at firſt included in a Membranous, and ſomewhat Mucous *Folliculus*, or Caſe, which in Proceſs of Time they break through (ſome ſooner, other later) their Bony Part aſcending upwards out of the Gums; and their Mucous Part (hardening by degrees) deſcending downwards into the Jaw ſo far as there is ſpace for it; the *Folliculus* it ſelf turning to a kind of Cement, whereby the Tooth is faſtened to the ſides of the *Alveolus*.

At what time, and at what order, they *break forth* out of the *Alveoli*, is known to every Nurſe: Omitting therefore to ſpeak of that, I ſhall only Note, That the Teeth alone, of all the Bones in the Body, continue to grow ſo long as a Man Lives (and they continue in his Head) for elſe they would be ſoon worn to the Stumps by their daily Uſe; and we ſee that when a Tooth is loſt out of either Jaw (in the oldeſt People) that which

is oppoſite to it in the other Jaw, will commonly grow longer than the reſt, having none to grind againſt: Though it muſt be confeſt, that the ſeeming length of old Peoples Teeth, is more owing to the falling away of their Gums, than the growth of their Teeth.

When Children come to be ſeven or eight Years old, they change ſeveral of their Teeth; but very rarely, if ever, all. The *Inciſores*, or Fore-teeth; the *Canine*, or Eye-teeth; and the foremoſt Double-teeth moſt change; but the reſt of the Double-teeth very few. Now concerning this changing of the Teeth, we muſt know, that the Old ones do not come out by their Roots, but their upper Part only drops off, their Roots remaining ſtill in the Socket of the Jaw; which (being like Seed for the new ones) by degrees grows up above the Gums, to ſupply the Place of that which is fallen off. Commonly about the twentieth Year (or upwards) there ſpring out two Double-teeth behind the reſt, which till then, had lain hid in their Sockets. Theſe are called *Genuine Teeth*, or *Dentes Sapientiæ*; becauſe Men are then come to Years of Diſcretion.

As for the *Number* of them, commonly there are found ſixteen in each Jaw; if there fall out any difference in Number, as to individual Perſons, it generally falleth out in the *Molares*.

There are three Ranks, or Sorts of Teeth.

Thoſe of the *firſt* Rank (for the foremoſt) are called *Inciſores*, Cutters. Moſt commonly four are found in each Jaw; they have but one Root, or Fang; and ſo eaſily fall, or are pulled out. Theſe firſt make way out of the Gums in Children, becauſe the Tops of them are ſharpeſt.

Thoſe of the *ſecond* Rank, are called *Canini*, or Dog-teeth, from their length, hardneſs, and ſharpneſs above the reſt: In each Jaw there are two; at each ſide of the Cutters, one. They are otherwiſe called *Eye-teeth*, either from an Opinion that their Roots (*viz.* of the upper) reach as far as the Eyes, or that the ſame Nerve that moves the Eye, ſends a Twig to theſe Teeth; neither of which Conceits are true: The Roots of theſe are ſingle, as thoſe of the *Inciſors*, but they are both ſometimes crooked; and if ſuch People in whom they are ſo, chance to have one of them drawn, they can hardly be pulled out, without breaking off a Piece of the *Alveolus*, in which they are fix'd.

Thoſe of the *third* Rank, are called *Molares*, Grinders, becauſe, like Mil-ſtones, they grind the Meat. Moſt commonly they are twenty in Number, five in each ſide of both Jaws. The two foremoſt that ſtand next to the Dog-teeth, are leſs than the reſt, having but two Knobs at the Top; but the three hindmoſt are larger, and have four, being in a manner Four-ſquare.

The two foremoſt alſo, have but two Roots at moſt; but the three hindmoſt commonly three or four. But thoſe of the upper Jaw, have for the moſt part, one Root more than thoſe which are oppoſite to them in the lower; or however their Roots are larger.

The Reaſon whereof may be,

Firſt, Becauſe they are Pendulous, and ſo are the apter to drop out: And,

Secondly, Becauſe the Subſtance of the upper Jaw is not ſo firm, as that of the lower.

The Uſe of the Teeth, is principally to chew the Meat, to prepare it for the Stomach, that it may the eaſier concoct it into Chyle. The *Inciſores* bite of the Morſel, the Dog-teeth break it, and the Grinders make it ſmall; wherefore they are flat in the Top, that they may the better receive and keep the Meat; and rough, that they may grind it the better. The Teeth contributes alſo to the Formation of the Speech, eſpecially the Fore-teeth; for thoſe that have loſt them, Liſp, as we ſay, and cannot pronounce plainly ſuch Syllables as have C, X, &c.

TEINT, is a *French* Term in Painting, ſignifying that Artificial Colour, of which any Object is compoſed.

TELEPHIUM, is the ſame Ulcer with *Chironia*, (which ſee;) it is ſo called from one *Telephius*, who was a long time troubled with this Diſeaſe. *Blanchard.*

TELESCOPE, is an *Optick* Inſtrument which ſerves to diſcover Objects at a Diſtance.

If a Teleſcope conſiſts only of a Convex Object-glaſs and an Eye-glaſs of a much greater Convexity, (or which is a Portion of a much leſſer Sphere) than the Object-glaſs is, (which is the common Form of the Teleſcope for the Night.) Then will the apparent Magnitude of the Object ſeen through it, be to the Object ſeen by the naked Eye at the Station of the Object-glaſs:: as the Focal Length of the Object-glaſs, to the Focal Length of the Eye-glaſs. *Molineux Dioptr. Nov. Prop.* LXII. Thus,

Suppoſe the Focal Length of the Object-glaſs be 12 Foot, or 144 Inches, and that of the Eye-glaſs 3 Inches; then the apparent Diameter of the Object ſeen through the Glaſs, to that ſeen by the naked Eye, will be as:: 144 to 3, or as 48 to 1. Wherefore ſuch a Teleſcope will be ſaid to magnifie the Diameter of the Object 48 times, and its Surface 2344 times (*i. e.* the Square of 28.)

Wherefore if the ſame Object-glaſs be combined with an Eye-glaſs, whoſe Focus is 1: and at another time with an Eye-glaſs whoſe Focus is 2. the former Teleſcope will magnifie twice as much as the latter.

Alſo, if two Teleſcopes have different Lengths, and the Focus of the Eye-glaſs of the *Shorter* be in the ſame Proportion to the Focus of its Object-glaſs:: as the Focus of the Eye-glaſs of the *Longer* bears to its Object-glaſs; then thoſe two Teleſcopes will *magnifie alike.*

But yet long Teleſcopes are of very great Uſe, and 'tis impoſſible to make ſhort ones perform as well: For,

1. Object-glaſſes of a ſhorter Focus, will not bear Eye-glaſſes proportionably ſhort, without colouring the Object, or rendring it dark and obſcure.

For Inſtance: Suppoſe a very good 12 Foot Object-glaſs will receive an Eye-glaſs of no ſhorter Focus than 3 Inches, with clearneſs and diſtinctneſs; yet however an Object-glaſs of 24 Foot, equally good, will bear an Eye-glaſs of leſs than 6 Inches Focus (perhaps of 5 or 4 Inches Focus) with equal clearneſs and diſtinctneſs.

And then, tho' an Object-glaſs of 12 Foot, with an Eye-glaſs of 3 Inches will magnifie but 48 times, as is above proved; yet an Object-glaſs of 24 Foot, with an Eye-glaſs of 4 Inches, will magnifie

nifie 72 times; which is nearer one third more than the former; and this is a vaſt Advantage.

2. The Image of the Moon, or other Object, in the diſtinct Baſe of an Object-glaſs of 24 Foot, is twice as long as the Image of the diſtinct Baſe of an Object-glaſs of 12 Foot: And conſequently the Image in the former will be much more plain and diſtinct.

Hence may be concluded alſo, That if the Object-glaſs be formed on a leſs Sphere than the Eye-glaſs, the Appearance of Objects will be diminiſhed in the aforeſaid Proportion; as is plain by the Caſe, when a Teleſcope is inverted.

Therefore all Perſons which relate Phænomina, obſerved by their Teleſcopes, or Microſcopes, ought to mention not only the Length of the *Tube* in general, but alſo to expreſs the particular Focus of both Eye-glaſs and Object-glaſs, together with the *Aperture* of the Object-glaſs; or elſe one cannot well judge of the Degree of magnifying.

To determine the Angle received by a Teleſcope of this Form, Mr. *Molineux* gives this Rule.

As the Diſtance between Object and Eye-glaſs, is to half the Breadth of the Eye-glaſs :: Radius to the Tangent of the Angle.

If a Teleſcope conſiſt of a Convex Object-glaſs, and 3 Convex Eye-glaſſes, (which is the uſual Form of Teleſcopes to be uſed by Day:) Then the Diſtance between the firſt Eye-glaſs and the ſecond, muſt be the Sum of their *Foci*; the Diſtance between the ſecond and third Eye-glaſſes, muſt be alſo the Sum of their *Foci*; ſo that all the Glaſſes are diſtant from the next adjacent Glaſſes the Sum of their *Foci*; only indeed there may be ſome little Variety in the Diſtance between the firſt and ſecond Eye-glaſs; which is the Reaſon there is a *Draw* always made there, to alter it at pleaſure.

This Teleſcope is only a double one of the former Sort, and as the former Inverts the Objects, this Inverts that Inverſion, by the Addition of two more Glaſſes, and conſequently repreſent all things *Right*, or makes them appear *Erect*.

Teleſcopes may be made with Concave Eye-glaſſes, but then the Area of the Object will be proportioned always to the Breadth of the Pupil of the Eye of the Beholder; whereas in a Convex Eye-glaſs, 'tis determin'd by the Breadth of that Glaſs.

The practical Rule for combining, or putting together this Day-Teleſcope of Four Glaſſes, is this.

Take the two firſt Eye-glaſſes, and combine them by Trials, ſo as to make a diſtinct inverted Teleſcope, conſiſting of a Convex-object-glaſs, and a Convex Eye-glaſs of a leſs Sphere.

Then take the Object glaſs, and firſt Eye-glaſs, and combine them by Trials alſo.

Laſtly, Take both theſe *Teleſcopes*, and without altering the Diſtances of their Glaſſes, in either of them ſingly; by Trials combine both theſe Teleſcopes, till the Appearance be clear and diſtinct.

But what is here done by Trials, may be effected by actual Menſuration, or deſigning out the Diſtances of the Glaſſes from each other, by knowing their Focal Diſtances.

TELESCOPE *Aerial*, ſo Mr. *Ch. Hugens* calls a Teleſcope, (deſcribed in *Phil. Tranſ.* Numb. 161.) which was made for the Night, and to be uſed without a cloſe Tube, (becauſe there is no need of one in a dark Night) and by that means a long Teleſcope becomes much lightened, and more eaſily manageable.

TELESCOPE *Reflecting*, of Sir *Iſaac Newton*, is made thus: The Tube of it, which is large, is open at the end, which reſpects the Object; the other end is cloſe, where a concave metalline *Speculum* is laid; and near the open end, there is a flat oval *Speculum* made as ſmall as may be, the leſs to obſtruct the entrance of the Rays of Light into the Tube by it, and inclined towards the upper part of the Tube, where is a little Hole furniſhed with a ſmall *Plane Convex* Eye-glaſs: So that the Rays coming from the Object, do firſt fall upon the Concave placed at the bottom of the Tube, and are thence reflected to the upper end of it, where they meet with the flat *Speculum* obliquely poſited, by the Reflection of which they are directed to the little *Plano-convex* Glaſs, and ſo to the Spectators Eye, who looking downwards, ſees the Object which the Teleſcope is turned to. This Inſtrument is deſcribed more at large in *Philoſ. Tranſ.* N. 81.

After this firſt Eſſay, the learned Inventor made another Inſtrument of the ſame Nature, with which he ſaith, that he could read in the *Philoſophical Tranſactions* opened in the Sun-ſhine, at an hundred Foot diſtance, and diſcern ſome of the Words at the diſtance of 120; its *Aperture* (define next the Eye) was then equal to above an Inch and $\frac{1}{2}$ of the Object Metal.

The Advantages of this Teleſcope would be very great, if it could be brought to its deſired Perfection. But it is liable to two Inconveniences. Firſt, That 'tis not very eaſie by it to find the Object you would ſee; though this a little Uſe and Practice would obviate; at leaſt, placing a ſmall Proſpect-Glaſs on the outſide parallel to the Axis of the Cavity of the Catoptrick Tube, you might readily enough find the Object by that, and then the Tube it ſelf would be right. The 2d and much greater Inconvenience is the concave metalline Object *Speculum* being ſubject to Tarniſh, ſo that it will not continue long good. But if any Perſon could be ſo happy as to find out a good metalline mixture that would poliſh finely, reflect vividly, and hold without ruſting or tarniſhing, it would be a Diſcovery of very great Advantage, both to Teleſcopical and Microſcopical Improvements.

TELESCOPICAL-*Stars*, are thoſe that are not viſible to the naked Eye, but diſcoverable only by the Help of a *Teleſcope*.

TEMPERATE *Zone*.

TEMPORALIS, alſo *Crotaphites*, is a Muſcle of the upper Jaw, which has a large Semicircular fleſhy beginning, from part of the *Os Frontis*, *Syncipitis*, *Sphænoides*, and *Temporalis*; from theſe Places its Fibres paſs (like Lines drawn from a Circumference to a Center) under the *Os Jugale*, from whence alſo ariſe ſome fleſhy Fibres joining with the former at their united, partly tendinous, and partly fleſhy Inſertion, to the upper part of the *Proceſſus Coronæ* of the lower Jaw: This, with its Partner, draws the lower Jaw upwards.

TEMPORARUM *Oſſa*, are Bones of the Scull ſituated in the lower part of the ſides of the *Cranium*; their upper part, which is thin, conſiſting only of

one Table, is of a circular Figure, and is joined to the *Offa Parietalia* by the *Sutura Squamoſa*; their lower part, which is thick, hard, and unequal, is joined to the *Os Occipitis*, and to the *Os Sphænoides*, this part is called *Os Petroſum*; they have each three external *Apophiſes* or Proceſſes, *viz. Proceſſus Zygometicus*, *Mammillaris* or *Maſtoidæus*, and the *Proceſſus Styliformis*, and one Internal. In the temporal Bones, there are 2 Internal, and 4 External Holes. The firſt of the Internal, is the Hole thro' which the Auditory Nerve paſſes; the ſecond is common to it and the *Os Occipitis*; the 8th pair of Nerves, and the lateral *Sinus* paſſes through it. The firſt of the External, is the *Meatus Auditorius Externus*; the ſecond is opened behind the Palate, it is the end of that Paſſage which comes from the Barrel of the Ear to the Mouth. The 3d is the Orifice of the Conduit, by which the Carotidal Arteries enter the *Cranium*; and the fourth is behind the *Proceſſus Maſtoidæus*; by it paſſes a Vein which carries the Blood from the external Teguments to the lateral *Sinus's*; ſometimes this Hole is wanting; there is another which is between the *Proceſſus Maſtoidæus*, and the *Styliformis*, thro' which the *Portio dura* of the Auditory Nerve Paſſes. They have each a *Sinus* lin'd with a Cartilage under the *Meatus Auditorius*, which receives the condyle of the lower Jaw.

TEMPORARY *Fortification*. See *Fortification*.

TENAILLE, in Fortification, is a kind of Outwork reſembling a *Horn-work*, but generally ſomewhat different, in regard that inſtead of two Demibaſtions, it bears only in Front a Re-entring Angle between the ſame Wings without Flanks; and the Sides are parallel: But when there is more breadth at the *Head* than at the *Gorge*, theſe *Tenailles* are called *Queuve d'yronde*.

TENAILLE *Double* or *Flank'd*, is a Work whoſe Front conſiſts of four Faces, making two *Re-entring Angles*, and three *Saliant*; the Wings or Sides of this Work being in the like manner correſpondent to the Front of the *Gorge*.

TENAILLE *Simple*, is a Work having its Front form'd by two Faces, which make a Re-entring Angle, the Sides running directly parallel from the Head to the Gorge.

TENAILLE *of the Place*, is that which is comprehended between the Points of two neighbouring Baſtions; that is to ſay, the *Curtain*; the two *Flanks* that are raiſed on the Curtain, and the two Sides of the *Baſtions* which face one another: So that 'tis the ſame with what is otherwiſe called, *The Face of a Fortreſs*.

All *Tenailles* are defective in this reſpect, That they are not Flanked or Defended towards their *inward* or *dead Angle*; becauſe the height of the Parapet hinders ſeeing down before the Angle, ſo that the Enemy can lodge himſelf there under Covert: Wherefore *Tenailles* are never made but when they want time to make a *Horn-work*.

TENANT, or *Tenent*, is one that holds or poſſeſſes Lands or Tenements by any kind of Right, either in Fee for Life, Years, or at Will. And 'tis uſed in Law, with divers Additions, as *Tenents in Dower*, which is ſhe that poſſeſſes Land by Virtue of her *Dower*.

Tenent per Statute-Merchant, that holds Land by Virtue of a Statute forfeited by him.

Tenent in Frank-Marriage, is he that holds Lands or Tenements by Virtue of a Gift thereof made to him upon Marriage between him and his Wife.

Tenant by the Courteſie, that holds for his Life, by reaſon of a Child begotten by him of his Wife, being an Inhereritrix, and born alive.

Tenant by Elegit, that holds by Virtue of the Writ called an *Elegit*.

Tenant in Mortgage, that holds by means of a *Mortgage*.

Tenant by the Verge, in ancient Demeſne, is he that is admitted by the Rod in the Court of ancient Demeſne.

Tenant by Copy of Court-Roll, is one admitted Tenant of any Lands, &c. within a Manor, which Time out of Mind, have been demiſable, according to the Cuſtom of the Manor.

Tenant by Charter, is he that holdeth by Feoffment in Writing, or other Deed.

Tenant in Chief, that holdeth of the King in Right of his Crown.

Tenant of the King, is he that holds of the Perſon of the King, or as ſome Honour.

Very Tenant, that holds immediately of his Lord: For if there be Lord, *Meſne* and *Tenement*, the Tenant is *very Tenant* of the Meſne, but not to the Lord above.

Joint-Tenants, that have equal Right in Lands and Tenements, by Virtue of one Title.

Tenants in Common, that have equal Right, but hold by divers Titles.

Particular Tenant, that holds only for this Term.

Sole Tenant, is he that hath no other joined with him.

Several Tenant, is oppoſite to *Joint-Tenants*, or *Tenant in common*.

Tenant al Præcipe, is he againſt whom the Writ *Præcipe* is to be brought.

Tenent in Demeſne, is he that holdeth the Demeans of a Manor for a Rent without Service.

Tenant in Service, is he that holdeth by Service.

Tenant by Execution, is he that holds by Virtue of an Execution upon any Statute, Recogniſance, &c.

There was alſo, *Tenant by Knight-Service*, *Tenant in Burgage*, *Tenant in Socage*, *Tenant in Frank-fee*, *Tenant in Villenage*. And there is *Tenant in Fee-ſimple*, *Tenant in Fee-tail*, *Tenant upon Sufferance*, &c.

TENAR, (the ſame with the *Abductor Pollicis*) is with ſome, the Name of the Muſcle which ſerves to draw the Thumb from the Fingers.

TENASMUS. See *Teneſmus*.

TENDER, in a legal Senſe, ſignifies as much as carefully to offer, or circumſpectly endeavour the Performance of any thing belonging to us. As to *tender Rents*, is to offer it at the Time and Place where and when it ought to be paid. To *tender his Law of Summons*, is to offer himſelf ready to make his Law, whereby to prove that he was not Summoned.

TENDON, is a ſimilar nervous Part annexed to Muſcles and Bones, whereby the voluntary Motion of the Members is chiefly performed. The Generality of Surgeons ſcarce ever diſtinguiſh betwixt a *Tendon* and a Nerve.

TENEMENT, ſignifies the Houſe or Land that a Man holdeth of another, and when join'd with *Frank*, it contains Lands, Houſes and Offices, where-

wherein we have Eſtate for Term of Life, or in Fee.

TENEMENTIS *Legatis*, is a Writ that lies to *London*, or any other Corporation, (where the Cuſtom is, That Men may demiſe Tenements as well as Goods and Chattels by their laſt Will) for the Hearing any Controverſie touching the ſame, and for rectifying the Wrong.

TENENTIBUS *in aſſiſis non onerandis*, &c. is a Writ that lieth for him to whom a Diſſeiſor hath alienated the Land whereof he diſſeiſeth another, that he be not moleſted for the Damages awarded, if the Diſſeiſor have wherewith to ſatisfie them himſelf.

TENESMUS, *Tenaſmus*, is a continual Deſire of going to Stool, yet attended with an Inability of doing any thing, but ſometimes voiding of bloody and ſlimy Matter. *Blanchard.*

TEN-FOOT *Rod.* See *Station-Staff.*

TENNY, or *Tawny*, the Heralds Term for a bright Colour made of Red and Yellow mixed; and is expreſſed in Engraving by thwart Stroakes or Hatches like *Purpure* in the Coats of all below the Degree of Noble, 'tis called *Tenn*, but in thoſe of Nobles 'tis called *Hyacinth*, and in Princes Coats by the Name of the *Dragon's Head.*

TENOR, is the Name of the firſt Mean or middle Part in *Muſick.*

TENORE *indictamenti mittendo*, is a Writ whereby the Record of an Indictment and the Proceſs thereupon is called out of another Court into the *Chancery.*

TENSORS, or *Extenſors*, are thoſe common Muſcles that ſerve to extend the Toes, and have their Tendons inſerted into all the leſſer Toes.

TENTHS, is that yearly Portion or Tribute which all Eccleſiaſtical Livings pay to the King.

TENURE, a Term in Law, ſignifying the manner whereby Tenements are *holden* of their Lords; what may make a *Tenure*, and what not. See *Perkins Cap.* 10. *Reſervation* 70, where you'll find moſt of thoſe *Tenures* that are now uſed in *England.*

TEREBRUM. See *Mediolus.*

TERES *Major*, is a Muſcle which ariſes from the inferior Angle of the *Scapula*, and becoming a round fleſhy Body, aſcends obliquely with the former, but then paſſeth under the ſuperior Head of the *Gemellus*, and makes a ſhort flat Tendon, inſerted below the Neck of the *Os Humeri*, cloſe to that of the Muſcle called *Aniſcaptor* or *Latiſſimus Dorſi.*

TERES *Minor*, is a Muſcle of the Arm, ſo called from its Figure and Magnitude, to diſtinguiſh it from the *Teres Major.*

This Muſcle is in ſome Bodies confounded with the *Infraſpinatus*, but in others it is diſtinct. It ariſes fleſhy from the lower Part of the inferior *Coſta* of the *Scapula*, and deſcends obliquely over the ſuperior Head of the *Gemellus Major*, where becoming tendinous, it is inſerted to the Head of the *Os Humeri*: When this acteth, the Arm is moved backwards and downwards.

TERGIFOETOUS *Plants*, ſuch Herbs (as the *Capillaries*) as bear their Seeds on the back ſides of their Leaves, are for that reaſon called by ſome Botaniſts *Tergifœtæ.*

TERM, in Geometry, is ſometimes taken for the Bounds and Limits of any thing; as a Point is the Term of a Line, a Line of a Superficies, and a Superficies of a Solid: And this is what the Schools call *Terminus Quantitatis.*

TERM, in Law, ſignifies the Bounds and Limitation of Time, as a Leaſe for *Term* of Life or Years. But 'tis moſt commonly uſed for that Time wherein the Tribunals or Places for Judgment are open to all that think fit to complain of Wrong, or to ſeek their own by due Courſe of Law, or Action; the reſt of the Year is called *Vocation.*

Of theſe *Terms* there be Four in every Year, during which Time Matters of Juſtice are diſpatched.

One is called *Hillary Term*, which begins the 23d Day of *January*, or if that be *Sunday*, then the next Day after, and endeth the 12th of *February* following.

The Second is *Eaſter Term*, which begins the *Wedneſday* Fortnight after *Eaſter-day*, and ends the *Monday* next after *Aſcenſion-day.*

The Third is *Trinity Term*, beginning the *Friday* next after *Trinity-Sunday*, and ending the *Wedneſday* Fortnight after.

The Fourth is *Michaelmas Term*, which begins the 23d of *October*, unleſs it be *Sunday*, and then the Day after, and ends the 28th of *November* following.

TERMINTHUS, is a Swelling in the Thighs, with a black Pimple at the top as big as the Fruit of the Turpentine-Tree. *Blanchard.*

TERMS *of an Equation in Algebra*, are the ſeveral Names or Members of which it is compoſed, and ſuch as have the ſame unknown Letter, but in different Powers or Degrees. For if the ſame unknown Letter be found in ſeveral Members in the ſame Degree or Power, they all paſs but for one Term.

Thus in this Equation $aa + ab = R$, the three Terms are, aa, ab and R.

And in this, $aa + ab + ac = Rd + dc$; the Terms are aa, $ab + ac$, and $Rd + dc$; which are but 3, becauſe $ab + ac$, having a in the ſame Dimenſions in both Parts, is taken but for one Term. Hence the firſt

Term in any Equation muſt be that, where the unknown Root hath the higheſt Dimenſions; and that Term which hath the Root in it of one Dimenſion of Power lower, is called the *ſecond Term*, and ſo on.

Des Cartes ſhews a Method of taking away the ſecond Term of any Equation, and the Method is very well known, and in common Uſe. But there is one *D. T.* mentioned in the *Acta Eruditorum*, *May* 1683, which gives a general Analytical Method for taking away all the intermediate Terms of an Equation; which (he ſaith) was never done before, and was thought Impoſſible by many.

TERMS *of Proportion*, in Mathematicks, are ſuch Numbers, Letters or Quantities, as are compared one with another.

Thus if $\begin{matrix} 4 . 8 :: 6 . 12 \\ a . b :: c . d \end{matrix}$ then a, b, c, d, or 4, 8, 6, 12, are called the Terms; of which a is called the firſt Term, b the ſecond Term, &c. a and c are called the two Antecedents, and b and d the two Conſequents.

TERRA *Damnata.* See *Earth.*

TERRA *extendenda*, is a Writ directed to the Eſcheator, &c. willing to enquire and find out the true Yearly Value of any Land, &c. by the Oath of Twelve Men, and to certifie the extent into the *Chancery*, &c.

TERRA-

TERRAQUEOUS, in Geography, ſignifies the Globe of Earth and Water, as they both together conſtitute one Spherical Body.

TERRE-PLAIN, in Fortification, is the Platform or Horizontal Surface of the Rampart lying level, only with a little ſloap on the outſide for the Recoil of the Cannon.

It is terminated by the Parapet on that Side toward the Field, and by the *Inner Talus* on the other toward the Body of the Place.

TERRE-*Tenant*, is he who has the actual Poſſeſſion of the Land, which otherwiſe is called *Occupation*.

Thus a Lord of a Manor hath a Free-holder, who letteth out his Free-hold to another to be Occupied.

This Occupier (having the actual Poſſeſſion) is called the *Terre-Tenant*.

TERELLA: When a Loadſtone is turned into an exact Spherical Figure, and is placed ſo that its Poles and Equator, *&c.* do exactly correſpond to the Poles and Equator of the World; it is called by *Gilbert* μικρόγη, or *Terrella*, a little Earth; becauſe it is a very juſt Repreſentation of the Great Magnetical Globe which we inhabit.

It was believed that ſuch a Terrella as this, if nicely poiſed and placed in a Meridian, like a Globe, would be turned round in 24 Hours, as the Earth is by the Magnetick Particles that pervade it; but this by plain Experience is to be found a Miſtake.

TERRESTRIAL *Globe*. See *Globe*.

TERRESTRIAL *Line*. See *Line Terreſtrial*.

TERRIS, *bonis & catallis rehabendis poſt purgationem*, is a Writ that lies for a Clerk, to recover his Lands, Goods or Chattels, formerly ſeized. after he hath cleared himſelf of that Felony, upon Suſpicion whereof he was formerly Convicted, and delivered to his Ordinary to be purged.

TERRIS *& catallis tentis ultra debitum levatum*, is a Writ Judicial, for the reſtoring of Lands or Goods to a Debtor that is Diſtrained above the Quantity of a Debt.

TERRIS *Liberandis*, is a Writ that lies for a Man Convicted by Attaint, to bring the Record and Proceſs before the King, and to take a Fine for his Impriſonment, to deliver him his Lands and Tenements again, and to releaſe him of the *Strip* and *Waſte*.

It is alſo a Writ for the Delivery of Lands to the Heir after Homage and Relief performed, or upon Security taken, that he ſhall perform them.

TERSION, is Wiping or Cleanſing the outſide of any Body.

TERSOR. See *Latiſſimus Dorſi*.

TERTIAN *Ague*, or Fever, is that which intermits intirely, and then returns again every third Day incluſively.

TERTIATE: To Tertiate a Great Gun, is to know the thickneſs of the Metal at the Touch-hole, the Trunnions, and at the Muzzle; by which to judge of the Strength of a Gun, or whether it be well *Fortified* or not. This is uſually done with a Pair of Calliper Compaſſes; and if the Piece be *Home-bored*, the Diameter leſs by the height divided by 2 is the Thickneſs at any Place.

TEST, the ſame as the *Cuppel*, or Coppel, an Inſtrument uſed by Chymiſts and Refiners, to purifie Gold or Silver. See *Cuppel*.

TESTACEOUS *Fiſhes*, are ſuch whoſe ſtrong and thick Shells are entire and all of one piece; as the Oyſter, Eſcollop, Cockle, *&c.* But thoſe whoſe Shells are ſofter and thinner, and which are divided into diſtinct Joints, and compoſed of ſeveral Pieces, ſuch as Lobſters, Crawfiſh, Crabs, *&c.* are called *Cruſtaceous Fiſhes*.

TESTAMENT, is the Laſt Will or Declaration of the Mind of a Perſon deceaſed; and is of two kinds, *viz*, *A Teſtament in Writing*, and *A Teſtament in Words*, which is called a *Nuncupative Teſtament*; which is, when a Man being Sick, and for fear leſt Death, want of Memory, or Speech, ſhould come ſo ſuddenly upon him, that he ſhould be prevented if he ſtay'd the Writing of his *Teſtament*, deſires his Neighbours and Friends to be Witneſs of his Laſt Will, and then declares the ſame before them by Words, which after his Deceaſe, is proved by Witneſſes, and put in Writing by the Ordinary, and then ſtands in as good Force as if it had at the firſt, in the Life of the Teſtator, been put in Writing, except only for Lands, which are deviſable but by a *Teſtament* put in Writing in the Life of the *Teſtator*.

TESTATUM, is a Writ in Perſonal Actions, as if the Defendant cannot be arreſted upon a *Capias* in the County where the Action is laid, but is returned *non eſt inventus* by the Sheriff.

The Writ ſhall be ſent into any other County, where ſuch Perſon is thought to have wherewith to ſatisfie; and is called a *Teſtatum*, becauſe the Sheriff hath formerly *teſtified*, That the Defendant was not to be found in his Bayliwick.

TESTE, is a Word commonly uſed in the laſt Part of every Writ, wherein the Date is contained, which begins with theſe Words, *Teſte meipſo*, &c.

TESTES; the Teſticles of a Male are juſtly reckoned among the principal Parts, becauſe they are neceſſary to the Conſervation of the *Species*.

But before I proceed to an Anatomical Deſcription of them, 'tis neceſſary to ſay ſomething of the *Vaſa Præparantia*, which prepare the Matter out of which the *Semen* in the Teſticles is elaborated; as I ſhall afterwards deſcribe the *Vaſa Deferentia*, that ſo the Reader may have this great and wonderful *Apparatus* all before him at one View.

In Man, ſome of the *Vaſa Præparantia* afford Matter for the *Semen*, as the *Arteriæ Spermaticæ*; others bring back again the Blood that is ſuperfluous, to the making of the *Semen*, and to the Nouriſhment of the Teſticles; and theſe are the *Venæ Spermaticæ*; and both theſe Arteries and Veins were formerly called *Vaſa Præparantia*: Some make the *Semen*, as the Teſticles; ſome convey it from thence to its Conſervatory or Store-houſe, as the *Vaſa Deferentia*: Some contain the *Semen* till the time of Copulation, and theſe are the *Veſiculæ Seminales*: Some diſcharge the *Semen* into the Matrix in Coition; this is done by the *Penis*; and ſome, laſtly, moiſten the Paſſage (*viz.* the *Urethra*) whereby the *Semen* iſſues, and thoſe are the *Proſtrates*. Of all which in Order. And firſt of the

Vaſa Præparantia, which are ſaid to prepare Matter for the *Semen*, theſe are of two ſorts, *Arteries* and *Veins*.

The *Arteries* are two, and ſpring from the Trunk of the *Aorta*, commonly two Fingers breadth under the Emulgents, not from its Side, but out of its Fore-part, the right whereof climbing over the Trunk

Trunk of the *Vena Cava*, runs obliquely to the Vein of that ſame Side; as alſo the left, marches to the Vein of that Side.

The *Veins* are alſo two. The right ariſes uſually from the Trunk of the *Vena Cava*, a little below the Emulgent; the left from the Emulgent it ſelf, for otherwiſe it muſt have gone over the *Aorta*, whereby it might have been in Danger of breaking; or rather, by the continual Pulſe of the Artery, the Recourſe of the Venal Blood might have been retarded.

Now both theſe Veins and Arteries, a little after their riſe, meet, and are inveſted both in one Membrane, made of the *Peritonæum*, and then run ſtreight through the Region of the Loins above the Muſcles *Pſoæ* on each ſide, and above the *Ureters*, as they go, beſtowing little Slips here and there upon the *Peritonæum*, between whoſe Duplicature they deſcend, and ſo arrive at its Proceſſes. The Veins divide very often into many Branches, and by and by inoſculate and unite again; but the Arteries go along by one Pipe only on each ſide, until within 3 or 4 Fingers breadth of the Teſticles, where each is divided into two Branches, the leſs whereof runs to the *Epididimys*, the larger to the Teſticle; and as I ſaid, they deſcended between the Membranes of the *Peritonæum*, ſo they paſs into the *Scrotum* between them, not perforating the inner in the Proceſſes, as in Dogs and other Creatures, wherein the Proceſſes of the *Peritonæum* are hollow like a Quill; but in Man, the inner Membrane of the *Peritonæum* ſhuts the Hole, leſt the Inteſtines fall by it into the *Scrotum*; of which there is greater danger in him, (and we ſee it often happen) becauſe of his going upright. But to return to the *Vaſa Præparantia*.

It has been generally taught, That there are divers Inoſculations of the Arteries with the Veins in their Paſſage, whereby the Venal and Arterial Blood are mixed; but this Opinion is now exploded, for that granting the Circulation of the Blood, it is impoſſible: For the Blood in the Arteries deſcends towards the Teſticles, and that in the Veins aſcends from them, ſo that if theſe two Veſſels ſhould open one into the other, the Blood in one of them muſt needs be driven back, or elſe ſtagnating, diſtend and break the Veſſels. But the Truth is, the Blood both for Nouriſhment of the Teſticles, and the making of the *Semen*, flows down by the Arteries only, and that in an even undivided Courſe, without any of thoſe Windings and Twirlings like the Tendrels of Veins talk'd ſo much of (as the Curious *de Graef*, from his own frequent Inſpection, teſtifies) and the Veins bring back from the Teſticles what of the Blood remains from their Nouriſhment and making of the *Semen*; and theſe, indeed, come out of their inmoſt Membrane, by almoſt innumerable Roots, by which they imbibe the ſaid Blood, and are moſt admirably interwoven and inoſculated one with another, till about Four or Five Fingers breadth above the Teſticle, which Space is called *Corpus Pyramidale*, *Plexus Pampiniformis*, or *Varicoſus*.

But theſe Veins are ſo far from preparing the *Semen*, as that they only bring back what was ſuperfluous from the making of it. And, indeed, the *Arteries* in Men, do no more merit the Name of *Præparantes*, in reſpect to the *Semen*, than the *Gullet* in reſpect to the Chyle, or the *Ductus Thoracicus Chyliferus* in regard to the Blood; for their Blood acquires no ſenſible Alteration till it come to the Teſticles themſelves. But however, we continue the old Names, declaring only againſt the Reaſon of them. And we will only note two things more.

Firſt, That the Spermatick Veins have from their riſe to their End, ſeveral *Valves* which open upwards, and ſo ſuffer the Blood to aſcend towards the *Cava*, but not to ſlide back again.

2dly, That tho' the Spermatick Arteries go ſuch a direct Courſe in Men, as has been ſaid; yet in Brutes they are more complicated and twiſted with the *Veins*, but without any *Anaſtamoſes* of one into the other.

Theſe *Vaſa Præparantia* thus deſcribed, proceed we to the *Teſtes*.

Theſe have Arteries and Veins (as is ſaid above) from the former *Vaſa Præparantia*, which ſome have thought to reach only to the inmoſt Coat, called *Tunica albuginea*, becauſe they are not conſpicuous in the inner Subſtance of the Teſticles. But tho' this may be true of the Veins which only receive the ſuperfluous Arterial Blood, and have nothing to do with the *Semen*, yet it is not true of the Arteries, namely, of the moſt numerous branches of them. Indeed Blood is ſeldom ſeen in the Subſtance of the Teſticles; but that comes to paſs by reaſon that the Arterial Blood preſently loſes its Colour, and by the Semenifick Faculty of the *Teſtes* is turned into *Semen*, which being whitiſh, of the ſame Colour with the Veſſels, makes them indiſcernible; yet in thoſe Men that have died of languiſhing Diſeaſes, and whoſe *Teſtes* have their Faculty impar'd.

Diemerbroeck affirms, That he has oft diſcover'd ſanguiferous Veſſels in the inmoſt Parts of the *Teſtes*, and has ſhew'd them to many in the Publick Anatomical Theatre.

As for *Nerves*, Dr. *Willis* ſays, he could never obſerve more to go to them than one from a Vertebral Pair, and that too was moſt of it ſpent upon the Muſcle *Cremaſter*.

Diemerbroeck agrees to one Nerve, but thinks it proceeds from the ſixth Pair, (which is Dr. *Willis*'s *Intercoſtal*, as diſtinguiſh'd from that commonly called the *Sixth*, but his *Eighth*.) Others will have Branches from both theſe Nerves to go to them. Concerning the Uſe of theſe Nerves there is great Controverſie. Dr. *Gliſſon*, *Wharton*, &c. will have them to convey a *Succus Genitalis*, which makes the greateſt part of the *Semen*. Dr. *Willis*, as he denies (in *Cerebri Anatom. cap.* 27.) any *Succus Nutritius* to be conveyed by the Nerves to other Parts; ſo that any *Succus Genitalis* is brought by them hither, but only Animal Spirits.

And whereas, to ſtrengthen the former Opinion, 'tis uſually objected, That the *Semen* muſt needs conſiſt of a Nervous Juice, and plenty of Spirits brought from the Brain, becauſe of the great Debility and Enervation that is induced upon the Brain and Nerves, by the too great Expence of it. He thus anſwers, That this comes to paſs, becauſe after great Profuſions of the *Semen*, for the reſtauration of the ſame Humour, (whereof Nature is more ſolicitous, than for the benefit of the Individual) a greater tribute of Spirituous Liquor is required from the Blood, to be beſtowed on the *Teſticles*. Wherefore the Brain being defrauded of

of a due Incoue and Afflux of the ſaid Spirituous Liquor, languiſhes; and ſo the Animal Spirits failing in the Fountain, the whole Nervous Syſtem becomes depauperated and flaggy. Whereto may be added, That alſo the Animal Spirits themſelves that actuate the *Proſtates*, being derived from the Spinal Marrow, are much waſted by Venereal Acts: So that for this Reaſon beſides, the Loins are enervated.

In this Anſwer *Bartholin* acquieſces: And *de Graef*, *Diemerbroeck*, &c. confeſs, indeed, That the Spirituous Arterial Blood is impregnated with Animal Spirits from the Nerves; but affirm, That the Matter out of which the *Semen* is elaborated, is only the ſaid Blood; and to theſe we ſubſcribe.

Lympheducts they have alſo a riſing from betwixt their Coats, and aſcending upwards into the *Abdomen* with the *Vaſa Deferentia*. Theſe have many Valves looking upwards, which hinder any thing from deſcending by them to the *Teſtes*, but permit the *Lympha* to aſcend, which they convey into the Chyliferous Veſſels. *Malphigi* thinks it probable that ſome fall is derived to the Seminary Veſſels for the Generation of the *Semen*, or at leaſt to be mixed with it, ſeeing moſt Creatures grows the fatter upon being Caſtrated.

They have two ſorts of *Coats*, Proper, and Common. The *Common* inveſt both the *Teſtes*, (conſtituting the *Scrotum*) and are two, The outermoſt conſiſts of the *Cuticula* and true Skin (here thinner than in other Places.) It is ſoft and wrinkled, and is generally affirmed by Anatomiſts to be without Fat. On the outſide it has a Suture or Seam that runs Lengthways of the *Scrotum*, and divides it into the Right and Left ſide. The other or inner *common* Coat, is a carnous Membrane, which ſeems to be Muſcular, becauſe of the Power it has to contract and wrinkle it ſelf. It is called δαρτος, and adheres to the proper Cato next under it (call'd *Vaginalis*) by many Membranous Fibres.

This is the common Account of this Part that all Anatomiſts have uſually given; but lately Dr. *Fred. Ruyſch* affirms, That it has the *Membrana adipoſa* alſo under the *Carnoſa*; or rather, That the *Carnoſa* is fatty, (on the inſide) as it is in other Parts of the Body. And beſides, he ſays, that in the *Scrotum*, there is a *Septum* within dividing it into two Parts; of which, ſays he, you have nothing in *Veſalius*, *Bartholin*, *de Graef*, &c. Men that have otherwiſe deſerved very well of Anatomy: And what wonder, ſeeing all things about the *Scrotum* of one newly dead, are ſo ſlippery and moveable, that the true Conſtitution of the *Septum* can hardly appear. Wherefore, if any one would demonſtrate this, the *Scrotum* is to be blown up, and to be cut open after 'tis dried, by which means the *Septum* yields it ſelf to view, and has an Infinity of Blood-veſſels running through it.

Thus he. This *Septum*, *Verheyen* ſays, is the ſame Subſtance with the carnous Membrane above deſcribed, from which it ſeems to ariſe in the ſame manner as the *Mediaſtinum* from the *Pleura*. To each ſide of it the *Teſtes* are firmly knit, by means of their outer Proper Coat, and its *Uſe* is partly to ſuſtain the *Teſtes*, and to hinder them from hitting againſt one another; and partly to help the carnous Membrane to wrinkle, and purſe up the *Scrotum*.

The proper Coats are alſo two, and theſe encloſe each Teſticle apart. The outer is called *Elitroides*, or *Vaginalis*; becauſe it contains the Teſticle as a *Sheath*. It is a thick and ſtrong Membrane, having many Veins; in the outſide it is uneven, by reaſon of the Fibres, by which it is knit to the *Dartos* and *Septum*; but in the inner ſide it is ſmooth. This is nothing elſe but the production of the *Peritonæum*, even as the *Scrotum* is of the Skin and *Membrana carnoſa* of the *Abdomen*. Into this Coat is inſerted the Muſcle *Cremaſter*, of which preſently.

The inmoſt is νευρώδης, the *Nervous Membrane*, called *Albuginea*, from its Colour. It it white, thick and ſtrong, framed of the External Tunicle of the *Vaſa præparantia*: It immediately enwraps the Teſticles, towards which it is rough, but on the outſide next the *Vaginalis*, it is ſmooth; and between theſe two, the Water is contained in an *Hernia aquoſa*.

Into the outer of the proper Membranes (as was ſaid) is inſerted the *Muſcle Cremaſter*. Theſe Muſcles (to each Teſticle one) have their Riſe from the *Oſſa Pubis*; and almoſt encompaſſing round the Proceſſes of the *Peritonæum*, deſcend with them to the *Teſticles*; where their Carnous Fibres run through the whole length of this ſame *Tunica Vaginalis*, eſpecially in its lower Part, and ſo keep the Teſticles ſuſpended, from whence they have their Name (from κρεμάζω *Suſpendo*) from their ſpreading themſelves thus on the outer ſide of the outer proper Coat.

Riolanus reckons them for a third proper Coat, calling it *Erythroides*; and becauſe of its Carnous Fibres, it makes the *Vaginalis* look *Red*; ſuch as take it not for a diſtinct Coat, do give the Name of *Erythroides*, alſo to the *Vaginalis*, calling it by either Name indifferently. Theſe Muſcles pull up the Teſticles in the Act of Generation, that the Veſſels being ſlackened, may the more readily void the *Semen*; and at other times they help to ſuſtain their Weight.

The Muſcles in Sickneſs, and old Age become flaggy, and ſo the *Scrotum* relaxing it ſelf, the Teſticles hang low.

Upon the *Teſtes* as yet clad with the *Tunica Albuginea*, are fixed the *Epididymidæ* (called alſo *Paraſtatæ*, *Standers by*, *or Aſſiſtants*) enwrapped in the ſame Coat with the Spermatick Veſſels; they adhere cloſer to the Teſticles at their ends, than in the midſt.

De Graef defines them to be *Veſſels making with their various Windings, that Body that is fixed on the Back of the Teſticles.*

To find out their Subſtance he directs us thus.

Firſt, Take off the Membrane that encompaſſes them, and knits them to the Teſticles, and then there will appear many Windings, which with the Edge of a Knife, may without hurting the Veſſels be ſo eaſily ſeparated one from another, that they may be drawn out into a length like a thing folded; for they are only folded from one ſide to the other, and are kept in that ſite, by the Membrane received from the *Tunica Albuginea*, (or Spermatick Veſſels.)

But when you have unravell'd half of them, you muſt cut another very thin Membrane, and then you will ſee other Veſſels lie juſt like theſe, and may be unlooſed like them: And the whole

whole being unravel'd, the thicker they are by how much further from their Origin, which is implanted into the upper Part of the Testicle, by six or seven Ramifications; which having run so far, as where they join into one Duct, make it as thick as a small Thread; and this by degrees so thickens, that being encreas'd like a Chord, it makes the *Vas Deferens*.

So that (saith he) it is clear from hence:

First, That the *Testes* do not differ from the *Epididymidæ* (or *Parastatæ*) saving that those consist of divers Ducts; but these, after their six or seven Roots that arise out of the Testicle are united, (which they are in a short Space) but of one, only a little thicker.

Secondly, That the *Epididymidæ* differ not from the *Vasa differentia*, saving that the former go by a serpentine winding Passage, and these by a streight; and that those are a little softer and narrower.

Out of the *Epididymidæ* at their smaller End, arise the two *Vasa deferentia*, otherwise called *Ejaculatoria*, as if in the *Coitu*, the *Semen* were ejaculated from the Testes through them; which indeed was the common Opinion, till the *Vesiculæ seminales* were found out, which are now known to be the Store-houses of the *Semen*, and not the *Testes*; so that the *Vasa deferentia* deserve not the Name of *Ejaculatoria*, except it be that Part of them which reaches from the *Vesiculæ seminales* to the *Prostatæ*, through which indeed, the *Semen* is ejaculated *in Coitu*.

They are white, hardish Bodies, like a pretty large Nerve, with a Cavity not very discernible, but which may be made so, if one open one of them six or seven Fingers breadth above the Testicle, and then either blow into it with a small Pipe, or squirt some colour'd Liquor into it, with a Syringe towards the *Testes*; for then the Vessel will be distended, and the Colour will run along its Cavity towards the *Epididymidæ*: Or if you either blow or squirt Liquor by a Syringe, the other way towards the *Vesiculæ seminales*, the said *Vesiculæ* will be distended.

Now from the *Epididymidæ* these *Vasa deferentia* ascend, and pass out of the *Scrotum* into the *Abdomen*, the same way by which the *Vasa præparantia* came down, *viz.* by the Process of the *Peritonæum*. When they are entred the *Abdomen*, they are carried presently over the *Ureters*, and turning back again, they pass to the back-side of the Bladder; between which, and the *Intestinum rectum*, they march at a little Distance the one from the other, till about the Neck of the Bladder, where they grow wider and thicker; and then just as they are going to meet, their sides open into the *Vesiculæ seminales*, in which they deposite the *Semen*, but not terminating here, but coming close together, and growing smaller and smaller, they go on and end at the *Urethra*, betwixt the *Prostatæ*. At their ending *Verheyen* (with some others) affirms there is a little *Septum* between them, with a Caruncle (which they call a *Cock's Head*) to hinder the *Semen* that comes out at one Orifice, to go in by the other; and the two Orifices by which the *Semen* is ejaculated into the *Urethra*, are called the *Eyes* of the *Cock's Head*.

These *Vesiculæ* are little Cells like those in a Pomegranate, or something like a Bunch of Grapes; *De Graef* compares them to the Guts of a little Bird diversly contorted. They consist of one thin Membrane, through which some small Twigs of both Veins, Arteries and Nerves run. They are about 3 Fingers-breadth long, and 1 broad; but in some Places broader, some narrower, as they run in and out. They are two (one for each *Vas deferens*) divided from one another by a little interstice; and they do severally by a peculiar Passage, emit the *Semen* contained in them into the *Urethra*. They are very anfractuous and winding, and (as was said) consist of many little Cells, and they should not pour out all the *Semen* contained in them in one Act of Coition, but might retain it for several: They have no Communication one with another, not even in their very opening into the *Urethra*; but the *Semen* is brought to the *Vesiculæ seminales* on the right side, by the right *Vas deferens*, issues by its proper passage into the *Urethra*; and that which is brought to the left likewise; so that if by any accident the *Vesiculæ*, or one side be burst, or cut (as in cutting for the Stone they generally are) yet those on the other being entire, may still suffice for Generation: Now when the Seed is emitted out of these *Vesiculæ* in the Act of Coition, it passes out the same way it came in, which in this Case may easily be (though otherwise it be unusual, there should be a contrary Motion in the same Vessel) for as it comes in from the *Vasa deferentia*, it drills along *gently* without any force; but *in Coitu*, when the Muscles in the *Penis*, and all the bordering Parts are much tumified, it is expressed, or ejaculated out of them with some Violence, and passing along their Neck (which is a Continuation of the *Vasa deferentia*) ouzes through a Caruncle into the *Urethra*, for there is one Place as a Valve before the Orifice of each of them, partly to hinder the coming of the Urine into them, partly to hinder the involuntary Effusion of the *Semen*.

Now, though naturally, the little Holes through which the *Semen* passes out of the Necks of the *Vesiculæ* into the *Urethra*, be almost imperceptible; yet if they be either eroded by the Acrimony of the *Semen* (such Acrimony as is contracted by impure Embraces, or in Claps (as they call them;) or if of themselves they be debilitated and so become more lax (as sometimes happens to old and impotent Men that meddle too much) then there happens a *Gonorrhæa*, or continual efflux of the *Semen*. And so *Vesalius* and *Spigelius* have observed them much dilated, in dissecting such as have died with a *Gonorrhæa* upon them.

The *Prostatæ* are placed near to the *Vesiculæ seminales*, *de Graef* calls them *Corpus glandulosum*, supposing them to be one Body, and only divided by the common Ducts of the *Vesiculæ seminales*, and *Vasa deferentia* coming through the midst of it.

They are of a white, spongy, and glandulous Substance, about as big as a small Wallnut, encompass'd with a strong and fibrous Membrane from the Bladder to the beginning of whose Neck they are joined at the Root of the *Penis*: In shape they come nearer to an Oval, save that on their upper and lower sides, they are a little depress, and in that end by which the *Vasa deferentia* enter, they are something hollow like a Tunnel. The Sphincter Muscle of the Bladder encompasses them so that for so far as they cover the Neck of the Bladder, the *Sphincter* touches it not, they coming

between. They have all ſorts of Veſſels, which run moſtly on the outer ſide; in their inner Part, they have ten or more ſmall Ducts, which all unload themſelves into the *Urethra*, by the ſides of the Caruncle, through which the *Semen* paſſes from the *Veſiculæ* into the *Urethra*, and themſelves have each one a ſmall one to ſtop its Orifice, leſt the Liquor that is contained in the *Proſtatæ* ſhould continually flow out, or the Urine ſhould flow in: And theſe ſmall Ducts, I ſuppoſe, are continued from thoſe *Veſiculæ*, which appear in the *Proſtates* of thoſe that die (any way) ſuddenly after Coition. For in ſuch the ſpongy part of the *Proſtatæ* is very turgid with a ſorous Liquor; and in their inner part may be found the ſame *Veſiculæ*, like to *Hydatides*, which if you preſs upon, they will diſcharge themſelves in the aboveſaid Ducts.

What the Liquor they contain ſhould be, or what is their Uſe, there is a great Variety of Opinions: Some think that the *Semen*, that flows from the Teſticles, is further elaborated here: But that cannot be; for that the *Vaſa deferentia* depoſite nothing in them, but all into the *Veſiculæ Seminales*. Others think that from the Blood there is ſeparated in them an acrimonious, and ſerous Humour, which ſerves for procuring the Titillation *in Coitu*. As to this, *de Graef* appeals to the Taſt of it, which has nothing of an Acrimony.

Dr. *Wharton* thinks they make a particular kind of *Semen*, as the Teſticles do another, and the *Veſiculæ Seminales* a third; That theſe laſt make a *Semen* different from that made in the Teſticles, is grounded on a Miſtake in Anatomy, *viz.* That the *Vaſa deferentia* have no Communication with the *Veſiculæ*; whereas they apparently open into them, and depoſite in them all the *Semen* they contain; that the *Proſtatæ* make a peculiar ſort, he endeavours to prove, becauſe caſtrated Animals emit ſome *Semen*. But that is but precarious; for tho' they emit ſomething, 'tis not neceſſary it ſhould be any true *Semen*: Or if it be, it may well be ſuppoſed to proceed from the *Veſiculæ Seminales*, that were full when the Animal was caſtrated. For, for this Reaſon it has been obſerved, that preſently after the Caſtration they have ſometimes got the Female with Young, but not afterwards, when that Stock was ſpent. *Bartholin*, with many others, thinks they make an oily, ſlippery, and fatty Humour, which is preſſed out, as there is need, to beſmear the *Urethra*, whereby to defend it from the Acrimony of the *Semen*, and Urine, and leſt it ſhould dry up. This Humour *Malpighius* thinks to be conveyed hither by the *Ductus adipoſi*, and quotes *Severinus*, affirming that he has obſerved a plain Veſſel in the Fat of the Kidneys, tending to the Spermatick Veſſels. He aſcribes the ſame Uſe to it as *Bartholin*, &c. *Diemerbroeck* confeſſes, that 'tis neceſſary the inſide of the *Urethra* ſhould be kept moiſt, and ſlippery, but thinks that is done here, as in the Bladder, Inteſtines, and many other places, from ſome muced Part of the Nouriſhment of the *Urethra* it ſelf, and concludes that the *Vaſa deferentia* depoſite not all the *Semen* into the *Veſiculæ ſeminales*, but carry a ſmaller Part to theſe *Proſtatæ*.

De Graef denies, that the *Vaſa deferentia* convey any thing to them, or have any Communication with them; and therefore believes, that the Humour that is ſeparated in the *Corpus glanduloſum* (as he calls the *Proſtatæ*) ſerves for a *Menſtruum*, or *Vehicle* of the *Semen*, which flowing but in ſmall Quantities, through ſmall Pores into the *Urethra*; it was neceſſary, that this Humour ſhould be mixt with it, that it might the better reach the Womb. Whatever this Humour be, it is ſqueezed out partly by the Intumeſcence and Erection of the *Penis*; and partly by the Compreſſion of the Sphincter of the Bladder, that girds the *Proſtatæ* about.

Theſe *Proſtates* are often (at leaſt partly) the Seat of the *Gonorrhœa*; and the Humour that they contain, is that which is ſhed.

TESTES *Cerebri*, are the two lower and leſſer Protuberances of the Brain, ſo call'd from the likeneſs they have to Teſticles. Theſe with the *Nates* which lie above them, and the *Protuberantiæ Striatæ*, are the Origin of the *Medulla oblongata*. The Uſes of theſe *Teſtes* you may ſee in *Willis*'s Anatomy of the Brain; but they ſeem but *conjectural*.

TESTUDO, is a ſoft large Swelling, or not very hard, in the Head, broad, in Form of an Arch-Dome, or the Back of a Tortoiſe, from which reſemblance it takes its Name. At the beginning it grows like a Cheſs-nut, afterward like an Egg, wherein is contained a ſoft Matter clothed with a certain Tunick, (whence ſome refer this ſort of Tumour to *Meliceres*, which ſee) which ſticks ſo cloſe to the Skull, that many times it infects and corrupts it. *Blanchard.*

TETANUS, or *Tetanon*, is a Contraction, whereby a Limb grows rigid and inflexible. The cauſe of it is ſometimes a Relaxation or Palſy in ſome other Muſcles, which when they are relaxed, the oppoſite Muſcles act too ſtrongly; ſo that they draw the Part wholly to themſelves, which ought to conſiſt as it were in an *Æquilibrium* betwixt both. Yet ſometimes ſuch a permanent Contraction may proceed from the Tendons being loaded and obſtructed with ſerous Matter, which thereupon grow rigid and ſtiff.

This Diſtemper is frequent in the Scurvy, ſo that the Patient can extend neither Joint nor Limb. The Tendons in the Back are ſometimes contracted into a round globular Form, which by reaſon of ſuch an Afflux of Humours upon them, draw the Bones out of their due places, and cauſe an Hunched Back, or a ſtooping or bending of it. It is uſually diſtinguiſhed into *Univerſal*; of which there are three ſorts, *Emproſthotonos*, *Opiſthotonos*, and *Tetanos*, properly ſo called; and *Particular*, which reſpects a certain Member, or a particular Joint. *Blanchard.*

TETRACHORD, in Muſick, is a Concord or Interval of 3 *Tones*.

The *Tetrachord* of the Ancients, was a Rank of four Strings, accounting the *Tetrachord* for one Tone, as it is often taken in Muſick.

TETRADIAPASON, a Quadruple Diapaſon is a Muſical Chord, otherwiſe called a Quadruple Eighth, or Nine and Twentieth.

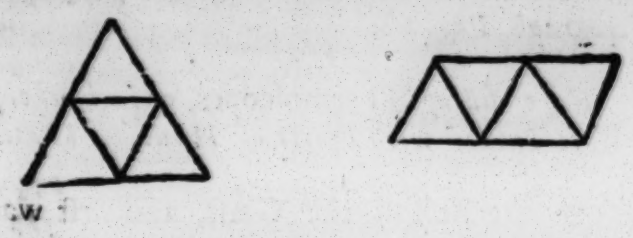
TETRAGONIAS, a Comet whoſe Head is of a Quadrangular Figure, and its Tail or Train, long, thick and uniform, and does not differ much from the Meteor called *Trabs*.

TETRAGONISM, with ſome foreign Writers, is the ſame as the Quadrature of the Circle.

TETRAGONUS. See *Quadratus Genæ*.

TETRAHEDRON. See *Regular Bodies*. N. B. theſe following Figures being cut in Paſt-board and folded up, will either of them repreſent the *Tetrahedron*.

TETRAPE-



TETRAPETALOUS *Flower*, of a Plant, is that which conſiſts of but four ſingle coloured Leaves (which the Botaniſts call *Petala*) ſet round the *Stylus* to compoſe the Flower.

Plants having a Tetrapetalous Flower, conſtitute a *diſtinct Kind*, and by Mr. *Ray* are divided into,

1. Such as have an uniform Tetrapetalous Flower, and their Seed-veſſels a little oblongiſh, which therefore he calls *Siliquoſe*.

As the *Keiri* or *Leucoium Luteum*, and the other common *Leucoium*; the *Dentaria*, the *Leucoium Siliquoſum*, *Alyſſon*, *Viola Lunaris*, *Paronychia*, *Heſperis*, *Alliaria*, *Rapa*, *Napus*, *Sinapis*, *Rapiſtrum*, *Eruca ſpuria*, *Eryſimum*, *Cardamine*, *Turritis*, *Piloſella Siliquoſa*, and the *Raphanus Ruſticanus* and *Aquaticus*.

2. Such as have their Seed-caſe or Veſſel *ſhorter*, which therefore for diſtinction he calls *Capſulatæ* and *Siliculoſa*; as the *Myagrum*, *Draba*, *Leucoium Siliqua ſubtorunda*, *Cochlearia*, *Naſturtium*, *Lepidium vulgare*; *Thlaſpi*, *Braſica marina*, *Glaſtum*, *Eruca marina*, &c.

3. Such as have a kind of, or ſeeming Tetrapetalous Flower, *i. e.* a Monopetalous one divided deeply into 4 Partitions, and theſe he calls *Anomalous*; as the *Papaver*, *Agrèmone*, *Veronica*, *Tithymallus*, *Plantago*, *Coronopus*, *Pſyllium*, *Lyſimachia Siliquoſa*, *Alſine ſpuria*, &c.

TETRAPHARMACUM, is a Medicine conſiſting of four Ingredients, as *Unguentum Baſilicum*.

TETRAPTOTES, are in Grammar, ſuch defective Nouns, as have only four Cales; as, *Plus*, which wants the *Dative* and *Vocative* Singular.

TETRASTYLE, in Architecture, is a Building which hath four Columns in the Faces before and behind.

TEXTURE. The Texture of any Natural Body, is that peculiar diſpoſition of its conſtituent Particles, and making it have ſuch a Form, or be of ſuch a Nature, or be endowed with ſuch Qualities.

THALAMI *Nervorum Opticorum*, are two Prominences of the lateral Ventricles of the *Cerebrum*, ſo called, becauſe the Optick Nerves riſe out of them. They are Medullary without, but a little Cineritious within. They are of an oblong Figure.

THAUGHTS, or *Thoughts*, are the Benches on which the Rowers ſit in a Boat to Row.

THELONIA *rationabili habendo pro Dominis habentibus Dominica Regis ad firmam*, is a Writ that lies for him that hath of the King's Demeſne in Fee-farm, to recover reaſonable *Toll* of the King's Tenants there, if his Demeſne have been accuſtomed to be *Tolled*.

THELONIUM, or *Breve eſſendi quieti de Thelonio*, is a Writ lying for the Citizens of any City, or Burgeſſes of any Town, that have a Charter or Preſcription to free them from *Toll*, againſt the Officers of any Town or Market, who would conſtrain them to pay *Toll* of their Merchandize, contrary to the ſaid Grant or Preſcription.

THENOR, or *Tenor*, according to ſome, is the Name of an abducent Muſcle which draws the Thumb from the Fore-finger.

THEODOLITE, is an Inſtrument uſed in *Surveying*, and taking of Heights and Diſtances.

It conſiſteth of ſeveral Parts: As,

1. *A Circle of Braſs*, divided into four Quadrants, repreſenting the four Cardinal Points of the Compaſs, *Eaſt*, *Weſt*, *North* and *South*, and noted with the Letters, N. S. W. E.

Each of theſe *Quadrants* is divided into 90 Degrees, and ſubdivided as the Largeneſs of the Inſtrument will permit, commonly by *Diagonals*.

Theſe four Quadrants are to be numbred by 10, 20, 30, &c. both ways beginning at the *North* and *South* Points, and ending with 90, at the *Eaſt* and *Weſt* Points.

2. *A Box* and *Needle*, ſo conveniently contrived to ſtand upon the Centre of the Circle, upon which *Centre*, the *Inſtrument*, the *Index*, with its *Sights*, muſt be made to turn about, and yet both the *Inſtrument*, and the *Box* and *Needle* remain firm. At the bottom of the *Box* there muſt be a *Card* or *Mariner's Compaſs* fixed, anſwerable to the Letters E. W. N. S. upon the *Inſtrument*.

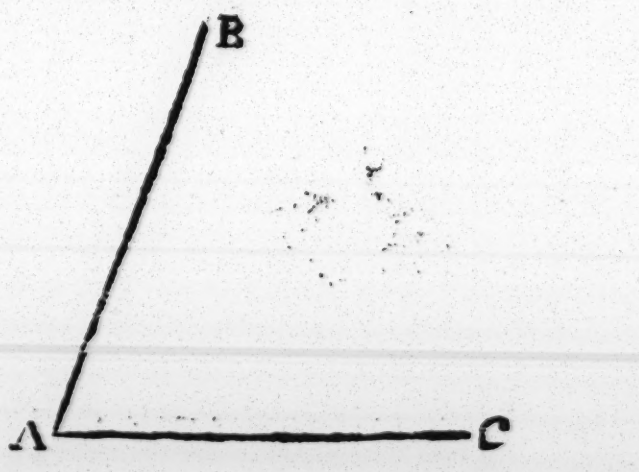
3. *A Socket* on the Back-ſide, (either Plain or with a *Ball*, which is much better) to be put upon the Head of a three-legged Staff.

4. *A Staff* to ſet the *Inſtrument* upon; the Neck at the Head whereof muſt be made to go into the *Socket* on the Backſide of the *Inſtrument*.

Its Uſe is for taking *Heights* and *Diſtances*, as alſo taking of *Angles*, in Surveying of Land, &c.

To take the Quantity of an Angle by the Theodolite.

As ſuppoſe the Angle A, of a Field, two of whoſe Sides is A B or A C.



Place your Inſtrument in the Angle A, or as near as poſſible, and let Marks be ſet up near B and C, ſo far off the Hedges as your Inſtrument at A ſtands (which yet is not neceſſary) then turn the Inſtrument about, till through the fixed Sights you ſee the Mark at B, there ſcrew it faſt; next turn the moveable Index, till through the Sights thereof

you ſee the Mark at C, then the Degrees upon the Limb cut by the Index, gives the Angle B A C.

THEOREM, is a Speculative Proportion, demonſtrating the Properties of any Subject: This is either,

1. *Univerſal*, which extends univerſally to any Quantity without Reſtriction; as, *That the Rectangle of the Sum and Difference of any two Quantities, is equal to the Difference of their Squares.*

2. *Particular*, when it extends only to a particular Quantity.

3. *Negative*, which demonſtrates the Impoſſibility of an Aſſertion; as, *That the Sum of two Biquadrate Numbers cannot make a Square.*

4. *Local*, which relates to a Surface; as, *That Triangle of the ſame Baſe and Altitude are equal.*

5. *A plain Theorem*, is that which relates to either a Rectilneal Surface, or to one terminated by the Circumference of a Circle; as, *That all Angles in the ſame Segment are equal.*

6. *A ſolid Theorem*, is that which treats about a Space terminated by a ſolid Line; that is, by any of the three *Conick Sections*; as, *If a Right Line cut two Aſymptotick Parabola's, its two Parts terminated by them ſhall be equal.*

7. *A Reciprocal Theorem*, is one whoſe Converſe is true; as, *That if a Triangle have two equal Sides, it muſt have two equal Angles.* The Converſe of which is true, *That if it have two equal Angles, it muſt have two equal Sides.*

THERAPEUTICA, is that part of Phyſick, which delivers the Method of Healing.

THERIOMA, is a wild cruel Ulcer, like *Carcinoma*; which ſee. *Blanchard.*

THERMÆ, are the *Bath* or other Medicinal Waters which are Hot. 'Tis moſt probable, as Dr. *Woodward* well obſerves, (*Nat. Hiſt. of the Earth, p.* 144.) That theſe do not owe their Heat to any Colluctation or Effervescence of the Minerals in them, but to the *ſubterranean Heat or Fire*, which communicates with them by ſome *Spiracle* or *Canal*, by which a greater Quantity of Heat is derived thither, than to ordinary Springs. Tho' Mr. *Charas* hath lately revived the former Opinion. *Vid. Memoirs Mathemat. & de Phyſique, A. D.* 1692.

THERMANTICA, are healing Medicines.

THERMOSCOPE, or *Thermometer*, is a Philoſophical Inſtrument, uſually made of Glaſs, filled with tinged Spirit of Wine, or ſome other proper Liquor; and deſigned to meaſure, or eſtimate the Heat and cold of any particular Place; or of the ſame Place in different Seaſons, and at different Times.

At the Bottom is a pretty large Ball filled with the Spirit or tinged Liquor, with a Stem riſing, to about three or four Foot perpendicular. To adjuſt the Diviſions, or Degrees of which; the Ball may be placed in Water, which is juſt beginning to freeze, and then noting the height of the Spirit in the Stem, place againſt that O, and graduate it afterward, up and down, for Heat and Cold.

Dr. *Hook*, in order to adjuſt theſe Graduations with the greater Accuracy, hath contrived, and deſcribed an Inſtrument for that purpoſe. See *Micrograph. Pag.* 38.

The Way of filling Thermoſcopes, *or ſuch other ſmall Glaſs Tubes, with Spirit of Wine, or Water.*

Take the Ball of the Glaſs, and firſt warm it gently between your Hands, then neal it very well (tho' gently) before a good Fire, turning it round, that it may be equally warm, for without this Caution, you'll endanger breaking it. Then applying the Ball to the Flame of a Lamp or Candle, turning it about in it, heat it as hot as you can, without melting the Glaſs, and then ſpeedily immerſing the open end of the Pipe into a Veſſel of that Liquor you intend to fill it withal, the Liquor will riſe into it, and fill it very near full.

The Reaſon of which aſcent of the Liquor is, That the Air within the Ball and Tube, being expelled in great Meaſure by the Heat, or at leaſt, rarified there to a very great Degree; the immerſed open End of the Tube keeps off the Preſſure of the Incumbent Atmoſphere on that part of the Liquor that the end of the Tube covers; but the Atmoſphere preſſes on all other Parts of the Liquor in the open Veſſel; and conſequently (there being none, or but a very ſmall Quantity of Air within the Tube to hinder it) forces it by its weight, up into the Tube, till it gain an Equilibrium with the Preſſure, or Weight of the Air without.

If by this Method the Tube cannot be filled full enough, the reſt may be ſupplied by a ſmall Glaſs-Funnel, whoſe Shank muſt be drawn out exceeding ſlender, and inſerted into the Orifice of the Tube; and then by blowing, you may force with your Breath the *Spirit of Wine* into the Tube, ſo as to fill it quite, or to what Degree you pleaſe.

Dr. *Hook*, in his *Micrographia*, hath an Engine for graduating Thermometers, to make them true Standards of Heat and Cold.

THLIPSIS, is a Compreſſion of the Veſſels in an Animal Body. *Blanchard.*

THORACICA *Inferior*, a Branch of the Subclavial Veins, ſpreading it ſelf upon the ſide of the Breaſts by ſeveral Branches, which communicate by *Anaſtomoſis*, with the Branches of the *Azygos*, under the Muſcles of the Breaſt.

THORACICA *Superior*, is a Branch of the Subclavial Vein, ariſing from the *Baſilica*, and goes to the *Mammilla* and Muſcles of the Breaſt.

THORAX, or *Medius Venter*, the Cheſt; is all the Cavity which is circumſcribed above, by the Neck-bones; below, by the *Diaphragme*; before, by the Breaſt-bone; behind, by the Back-bones; on the Sides, by the Ribs; it is of an Oval Figure, contains the Heart and Lungs, and is cover'd on the inſide with a Membrane called *Pleura.*

Hippocrates and *Ariſtotle*, took all that Space from the Neck-bone, to the very Secrets, both the middle and lowermoſt Cavity, for the Thorax.

THOUGHTS, or *Thaughts*, ſo the Seamen call the Seats or Benches, on which the Men ſit down to row in a Boat.

THOWLES, are thoſe Pines in the Gunnel of a Boat, between which the Men put their Oars when they row.

THREE-LEGG'D-STAFF, is an Inſtrument conſiſting of Wooden Leggs, made with Joints to ſhut all together, and to take off in the middle, for the

the better Carriage; and on its Top is uſually a Ball and Socket to ſupport and adjuſt Inſtruments for Aſtronomy, Surveying, &c.

THROMBUS, is a Coagulation of Blood or Milk into Clots or Cluſters. *Blanchard.*

THYMUS, is a conglobate Glandule in the Throat, growing to the upper part of the *Mediaſtinum*, and ſeated between the Diviſions of the Subclavian Veins and Arteries; it is whitiſh, ſoft and ſpungy, and larger in Children, and in Women, than in Men. The Jugular Veins and Arteries paſs thro' the Gland as they go up the Neck, but this don't ſend any conſpicuous Twigs or Branches to it: Its Uſe ſeems to be to prop and ſtrengthen the Diviſions of the *Aorta* and *Cava*, and to defend them from being compreſſed by the *Claviculæ* when we ſtoop forwards, and perhaps in Infants in whom it is large, and conſiſts in 3 Glands, it may contribute towards the refining and depurating of the Chyle; and poſſibly it may hinder (as *Verheyen* thinks) and too haſty Mixture of the Chyle with the Blood in Children.

THYROARYTÆNOIDES, is a Pair of large Muſcles, that proceed from the Cartilage, called *Scutiformis*, and extending themſelves forward to the ſides of the *Arytænoides*; the fourth and fifth Part of the *Larynx*, ſerve to contract, and cloſe the opening of the *Larynx*.

THYREOIDEÆ *Glandulæ*, are two of a viſcous, ſolid Subſtance, wonderfully adorned with Veſſels of all ſorts, and hard Membranes, almoſt of the bigneſs, and ſhape of an Hen's Egg, ſituate at the lower Part of the *Larynx*, at the ſides of the Cartilages, called *Scutiformis*. Their Uſe ſeems to be to ſeparate a Liquor from the Lubrication of the *Larynx*, whereby the Voice is rendred firm, ſmooth and ſweet; and they contribute alſo to the roundneſs of the Neck, by their filling up the empty Spaces about the *Larynx*.

THYROIDES, is the Cartilage, called *Scutiformis*, of the *Larynx*: Alſo the Hole of the *Os Pubis*, is by ſome called by this Name. See *Scutiformis*.

THYRSUS, is a Word uſed by the Botaniſts, for the upright, and tapering Stalk: And 'tis often uſed for *Spica*, which is an Ear, or Blade of Corn.

TIBIA, the Leg, is the Part betwixt the Knee and the Ancle: It conſiſts of two Bones; one outward, called *Focile Minus*; another inward, and larger, which has uſurped the Name of the whole, and is called *Tibia*; others call it *Focile Majus*, and *Canna Major*: The upper End has a Proceſs, which is received by a Cavity in the Thigh, and two oblong Cavities to admit the Heads of the Thigh-bone; the Depth of which Cavities is encreaſed by a Cartilage that is annexed thereunto by Ligaments: This Cartilage is moveable, ſoft, ſlippery, moiſtened with an unctuous Humour; thick in its Circumference, and ſmaller towards the Center, whence it is called *Lunata*, made like an Half Moon; there are rugged ſharp Ligaments before, which encreaſe the Lunary Cartilages: The fore Part, which is acute and long, is called *Spina*: There is below a prominent and gibbuus Proceſs in the inner Side, nigh the Foot; and is called *Malleolus Internus*, the inner Ancle-bone.

TIBIALIS *Anticus*, a Muſcle of the *Tarſus*, ſo called from its Situation on the Fore-part of the *Tibia*: It's alſo by *Spigelius* called, *Muſculus Catenæ*, becauſe when it is divided, the Patient is forced to uſe a Sling, to ſupport the Foot in walking: Its Origination is fleſhy from the lower Part of the ſuperior Appendage of the *Tibia*, between the Prominence, where the great Tendon of all the extending Muſcles of the Leg is inſerted, and the Origination of the *Muſculus Extenſor magnus Digitorum Pedis*: It alſo continues a diſgregated fleſhy Origination, for near two Thirds of the ſuperior Part of the ſaid *Tibia*, externally Laternal, next the *Fibula*; which compoſing a fleſhy Belly, leſſens it ſelf in half its Progreſs, and growing into a ſtrong, and ſomewhat round Tendon, deſcending obliquely over the inferior Part of the ſaid *Tibia*; and under the Annular Ligament, is inſerted to the inſide of the *Os Cuneiforme Majus*, that ſuſtains the *Os Metatarſus Pollicis*: This pulls the Foot upwards and forwards, directly.

TIBIALIS *Poſticus*, is a Muſcle of the Foot, which being placed on the Back-part of the *Tibia*; is alſo called *Muſculus Nauticus*, becauſe Mariners chiefly uſe it in climbing up the Maſts of their Ships. It lies partly under the *Flexor tertii internodii Pollicis*, which Muſcle muſt be partly raiſed together with the *Flexor tertii internodii Digitorum Pedis*, before we can have a clear ſight of it. It appears Biventral, ariſing partly Tendinous, and partly fleſhy from the Superior and Back-part of the *Fibula*; as alſo from the Ligament that is contained between the ſaid Bone and the *Tibia*; in near half its Progreſs it becomes leſs, and grows fleſhy again, and making a ſtrong round Tendon which runs in a *Sinus*, on the Back-part of the lower Appendage of the *Tibia*, called the *Malleolus Internus* under an Annular Ligament, and is inſerted to the *Os Naviculare*, internally and laterally. This draws the Foot upwards and inwards.

TIDE, the Word *Tide* ſignifies as well the Ebbing as the Flowing of the Sea; the former of which the Seamen call *Tide of Ebb*; the latter, *Tide of Flood*. A *Windward Tide*, is when the Tide runs againſt the Wind. A *Leeward Tide*, is when the Wind and Tide go both the ſame way; when the Tide runs very ſtrong, they call it a *Tide-Gate*. *To tide it over*, or *up* into any Place, is to go in with the Tide of Flood or Ebb, as long as that laſts, and then to ſtay at an Anchor all the Time the contrary *Tide* laſts, and then to ſet in again, when the ſame Tide returns. It's ſaid to flow *Tide* and *Half-tide*, when the Tide runs three Hours (which is four Points of the Compaſs) in the *Offing*, longer than it doth by the Shore. By longer, they do not mean more Hours, for it always Ebbs and Flows ſix Hours, but that if it be high Water a Shoar at Twelve a Clock, it will not be ſo in the *Offing* till Three, which is the Bound, and Time for the running of a Half tide. If it Ebbs and Flows more, they ſay, It runs Half-tide, and half Quarter, that is five Points; when they are to go into a Harbour over a Bar or Sand, their Word is, that they will bring the Tide with them; that is, they will come in with the Flood, that ſo they may get over the Bar or Sand ſafely.

TIDES. Mr. *Henry Philips* in *Philoſoph. Tranſ.* N. 34. gives the following Proportion for finding the *Tides*.

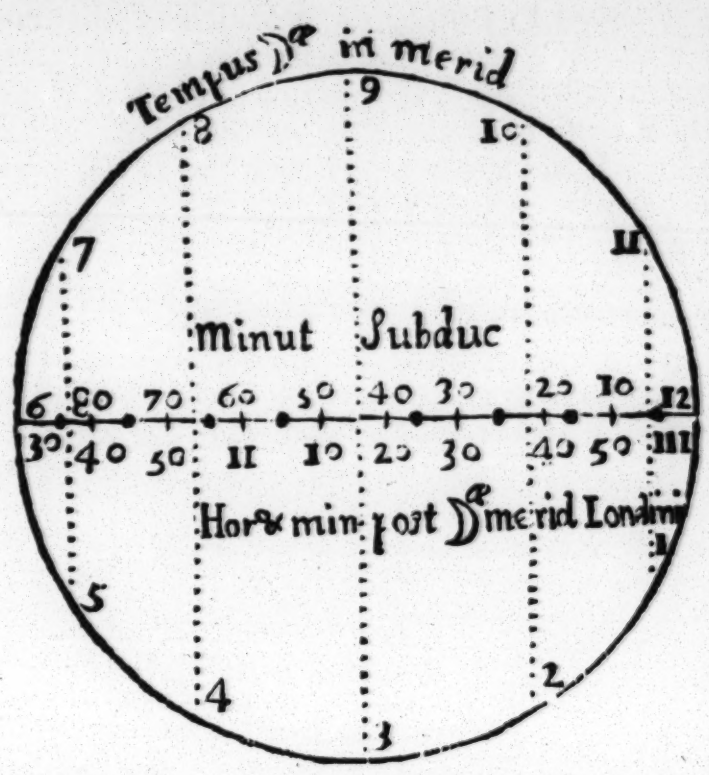
Firſt, Divide a Circle into 12 equal *Parts*, or *Hours*, according to the Moon's Motion, or Diſtance from the Sun, from the *New Moon* to the *Full*.

Second-

Secondly, Let the Diameter of the Circle be divided into 90 *Parts* or *Minutes*, that is according to the Time of the Difference of Tides between the *New*, or *Full Moon*, and the *Quarters*, which is one Hour and a half.

Thirdly, Make *Perpendicular Lines* croſs the Diameter of the Circle, from Hour to Hour.

Fourthly, Reckon the Time of the *Moon*'s coming to the *South* in the Circumference of the Circle, and obſerve the *Perpendicular Line* that falls from that Point upon the Diameter; and the Proportional *Minutes* cut thereby, will ſhew how many *Hours* or *Minutes* are to be ſubtracted from the Time of high Tides at the *New* and *Full Moon*, that ſo you may have the true Time of the *Tides* that preſent Day.



Example.

At *London*, on the Day of the *New* and *Full Moon*, it is *High-tide* at 3 of the Clock; that is, when the *Moon* is 3 Hours paſt the *Meridian*: And ſo by the common Rule, the *Moon* being about 4 Days old, it will be South about 3 of the Clock, and it will be *High-tide* 3 Hours afterwards; that is, at 6 of the Clock. But now by this Rule, if you count this Time of the *Moon*'s coming to the South, in the Circumference, the Perpendicular Line which comes from 3 to 9, cuts the Diameter in the half at 45 *Minutes*: Which ſhews, that ſo much is to be abated from the Time of *High-water* in the *New* and *Full Moon*: So that it is *High-tide* 45 *Minutes* before 6 of the Clock; that is, at 5 *Hours*, 15 *Minutes*, and not at 6 of the Clock, according to the *common Rules*.

The like you may do for any other Port or Place, knowing the Time of *High-water*, at the *New* and *Full Moon* in that Place: And this may be more readily done, if you ſet down the Time of *High-water* at the *New* and *Full Moon* under the *Diameter*, as is done for *London* in this Example, where 'tis *High-tide* at 3 of the Clock. So that when the *Moon* is South at 3 of the Clock, the Perpendicular cuts the Diameter at 2 Hours, 15 Minutes; which added to the Time of the Southing, gives 5 Hours, 15 Minutes; and ſo when the Moon is South at 9 of the Clock, by adding 2 Hours, 15 Minutes, you have the Time of *High-water*, which is 11 Hours, 15 Minutes.

And thus you may eaſily make a *Table*, which by the Southing of the *Moon*, ſhall readily tell you the Time of *High-tide* at any Time of the *Moon*.

Note, If the Difference be not ſo much between the *Neap-tides* and *Spring-tides*, in other Places as it is in this our Example, the Diameter muſt be divided into fewer Parts.

Our learned Aſtronomer Mr. *Flamſtead*, *Philoſ. Tranſ. N.* 143. gives us a new and more correct *Tide-Table*, (which he alſo now publiſhes every Year) improving what Mr. *Philips* had begun, by obſerving that the Tides did not uſually hold out ſo long as Mr. *Philip*'s Calculation made them to do. He found by above 80 Obſervations of the *High-waters* at *Tower-wharf* and *Greenwich*, That the greateſt Differences between the *Moon*'s *true Southing*, and the *High-waters*, were not, as *Philips* ſaid, at *Full*, *New*, and *Quarter Moons*, but the *greateſt* near the *Neaps*, and the *leſs* near the *higheſt Spring-tides*.

There is an Hypotheſis to ſolve the Motion of the Tides, mentioned in *Philoſoph. Tranſ. N.* 16. from that Learned Mathematician Dr. *Wallis*: In which, he ſuppoſes the *Earth* and *Moon* to move round the *Sun*, in a Circle, or Ellipſe, deſcribed by their common Centre of Gravity. But this Hypotheſis places the higheſt *Annual Tides* not near the Equinoxes, but about *Candlemas* and *All-hollantide*; that is, in the beginning of *February* and *November*. But I could never find that the Thing was ſo in Fact; but that on the contrary, they are always greateſt at or near the Equinoxes, as hath been generally obſerved: I ſhall therefore refer the Reader to the Ingenious Hypotheſis it ſelf, without giving any particular Account of it here.

The true Theory of the Tides extracted from that admirable Treatiſe of Sir Iſaac Newton, *Intituled*, Philoſophiæ Naturalis Principia Mathematica; *By that Excellent Mathematician, Captain* Halley.

The Principle upon which this Author proceeds to explain moſt of the great and ſurpriſing Appearances of Nature, is no other than that of *Gravity*, whereby in the Earth all Bodies have a Tendency towards its Centre, as is moſt evident: And from undoubted Arguments 'tis proved, That there is ſuch a *Gravitation* towards the Centre of the Sun, Moon, and all the Planets.

From this Principle, as a neceſſary Conſequence, follows the Spherical Figure of the Earth and Sea, and of all the other Celeſtial Bodies; and tho' the tenacity and firmneſs of the ſolid Parts, ſupport the Inequalities of the Land above the Level; yet the Fluids preſſing equally, and eaſily yielding to each other, do ſoon reſtore the *Equilibrium*, if diſturbed, and maintain the exact Figure of the Globe.

Now this Force of the Deſcent of Bodies towards the Centre, is not in all Places alike, but is ſtill leſs and leſs, as the Diſtance from the Centre encreaſes: And in the ſaid Book it is demonſtrated, That this Force decreaſes as the Square of the Diſtance encreaſes; that is, the Weight of Bodies, and the Force of their Fall is leſs, in Parts more removed from the Cenrre, in the Proportion of the Squares of the Diſtance.

As

As for Example.

A Ton Weight on the Surface of the Earth, if it were raiſed to the height of 4000 Miles, which let be the Semidiameter of the Earth, would weigh but a Quarter of a Ton, or 500 *l.* Weight.

If to 12000 Miles, or 3 Semi-diameters from the Surface; that is, 4 from the Centre, it would weigh but 1 ſixteenth Part of the Weight on the Surface, or a Hundred and a Quarter: So that it would be as eaſie for the Strength of a Man at that height, to carry a Ton Weight, as here on the Surface to carry a Hundred and a Quarter.

And in the ſame Proportion does the Velocities of the Fall of Bodies decreaſe: For whereas on the Surface of the Earth, all things fall 16 Foot in a Second, at one Semi-diameter above; this Fall is but 4 Foot; and at 3 Semi-diameters, or 4 from the Center, it is but $\frac{1}{16}$ of the Fall at the Surface, or but one Foot in a Second, and at greater Diſtances both Weight and Fall become very little; but yet at all given Diſtances, is ſtill ſomething, tho' the Effect become inſenſible.

At the Diſtance of the Moon (which ſuppoſe to be 60 Semi-diameters of the Earth) 3600 Pounds Weight but one Pound, and the Fall of Bodies is but $\frac{16}{3600}$ of a Foot in a Second, or 16 Foot in a Minute; that is, that a Body ſo far off deſcends in a Minute no more than the ſame at the Surface of the Earth would do in a Second of Time.

And as was ſaid before, the ſame force decreaſing after the ſame manner, is evidently found in the *Sun*, *Moon*, and all the *Planets*; but more eſpecially in the *Sun*, whoſe Force is prodigious becoming ſenſible even at the immenſe diſtance of *Saturn*. This gives room to ſuſpect that the force of Gravity is in the Celeſtial Globes proportional to the Quantity of Matter in each of them: And the Sun being at leaſt 10000 times (for Inſtance, tho' he is far bigger) as big as the Earth, its Gravitation or attracting force, is found to be at leaſt 10000 times as much as that of the Earth, acting on Bodies at the ſame Diſtances.

Whence alſo, all the ſurpriſing Phænomina of the Flux and Reflux of the Sea he ſhews in the like manner to proceed from the ſame Principle.

If the Earth were alone, that is to ſay, not affected by the Actions of the *Sun* and *Moon*, it is not to be doubted, but the Ocean being equally preſſed by the force of Gravity towards the Center, would continue in a perfect Stagnation always at the ſame height, without ever ebbing or flowing; but it being by him demonſtrated, That the *Sun* and *Moon* have a like Principle of Gravitation towards their Centers, and that the Earth is within the Activity of their Attractions, it will plainly follow, That the Equality of the Preſſure of Gravity towards the Centre will thereby be diſturbed; and tho' the ſmalneſs of theſe Forces, in reſpect to the Gravitation towards the Earth's Centre, render them altogether imperceptible by any Experiments we can deviſe, yet the Ocean being fluid, and yielding to the leaſt force, by its riſing, ſhews where it is leaſt preſt, and where it is more preſt by its ſinking.

Now if we ſuppoſe the force of the *Moon*'s Attraction to decreaſe as the Square of the Diſtance from its Center increaſes, (as in the Earth, and other Celeſtial Bodies) we ſhall find, that where the *Moon* is perpendicularly either above or below the *Horizon*, either in *Zenith* or *Nadir*, there the force of Gravity is moſt of all diminiſhed, and conſequently that there the Ocean muſt neceſſarily ſwell, by the coming in of the Water from thoſe Parts where the Preſſure is greateſt, *viz.* in thoſe Places where the *Moon* is near the *Horizon*; but that this may be the better underſtood, 'twas thought needful to add the following Scheme, where M is the Moon, E the Earth, C its Centre, Z the Place where the Moon is in the *Zenith*, N where the *Nadir*.

Now by the Hypotheſis it is evident, that the Water in Z, being nearer, is more drawn by the *Moon*, than the Centre of the Earth C, and that again more than the Water in N; therefore the Water in Z has a Tendency towards the *Moon*, contrary to that of Gravity, being equal to the Exceſs of the Gravitation in Z, above that in C. And in the other Caſe, the Water in N tending leſs towards the *Moon*, than the Centre C, will be leſs preſs'd, by as much as is the Difference of the Gravitations towards the *Moon* in C and in N.

This rightly underſtood, it follows plainly, that the Sea, which otherwiſe ſhould be Spherical, upon the Preſſure of the *Moon*, muſt form it ſelf into a Spheroidal, or Oval Figure, whoſe longeſt Diameter is where the *Moon* is Vertical, and ſhorteſt where ſhe is in the *Horizon*; and that the *Moon* ſhifting her Poſition, as ſhe turns round the Earth once a Day, this Oval of Water ſhifts with her, occaſioning thereby the two Floods and Ebbs obſervable in each 25 Hours.

And this may ſuffice as to the general Cauſe of the *Tides*: It remains now to ſhew how naturally this Motion accounts for all the Particulars that have been obſerved about them; ſo that there can be no room left to doubt, but that this is the true Cauſe thereof.

The *Spring-tides*, upon the *New* and *Full Moons*, and the *Neap-tides*, on the Quarters, are occaſion'd by the attractive Force of the *Sun*, in the *New* and *Full*, conſpiring with the Attraction of the *Moon*, and producing a *Tide* by their united Forces; whereas in the Quarters, the *Sun* raiſes the Water where the *Moon* depreſſes it, and on the contrary; ſo as the *Tides* are made only by the Difference of their Attraction.

That the force of the *Sun* is no greater in this Caſe, proceeds from the very ſmall Proportion the Semi-diameter of the Earth bears to the vaſt Diſtance of the Sun.

It is alſo obſerved, That *cæteris paribus*, the *Equinoctial Spring-tides* in *March* and *September*, or near them, are the higheſt, and the *Neap-tides* the loweſt; which proceeds from the greater Agitation of the Waters, when the fluid *Spheroid* revolves about a great Circle of the Earth, that when it turns about in a leſſer Circle; it being plain, that if the *Moon* were conſtituted in the Pole, and there ſtood, that the *Spheroid* would have a fixt Poſition, and that it would be always *High-water* under the Poles, and *Low-water* every where under the Equinoctial; and therefore the nearer the *Moon* approaches the *Poles*, the leſs is the Agitation of the Ocean;

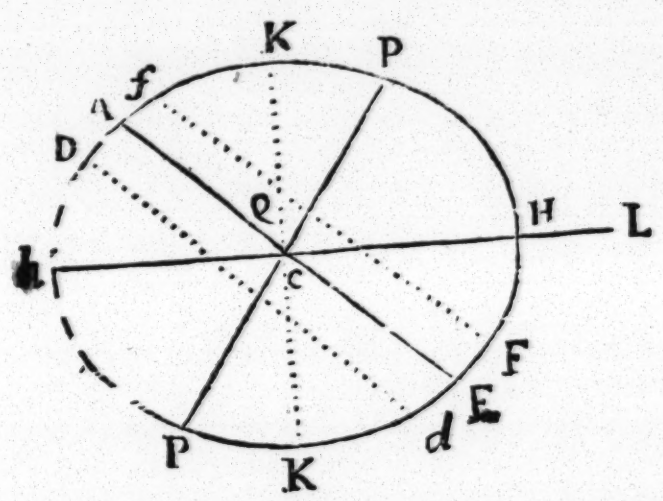
Ocean, which is of all the greateſt, when the *Moon* is in the Equinoctial, or fartheſt diſtant from the Poles.

Whence the *Sun* and *Moon*, being either conjoyn'd or oppoſite in the Equinoctial, produce the greateſt *Spring-tides*; and the ſubſequent *Neap-tides* being produced by the *Tropical Moon* in the Quarters, are always the leaſt *Tides*; whereas in *June* and *December* the *Spring-tides* are made by the *Tropical Sun* and *Moon*, and therefore leſs vigorous; and the *Neap-tides* by the *Equinoctial Moon*, and therefore are the ſtronger.

Hence it happens, that the Difference between the *Spring* and *Neap-tides* in theſe Months, is much leſs conſiderable than in *March* and *September*.

And the Reaſon why the higheſt *Spring-tides* are found to be rather before the *Vernal*, and after the *Autumnal Equinox*, viz. in *February* and *October*, than preciſely upon them, is, becauſe the *Sun* is nearer the Earth in the Winter Months, and ſo comes to have a greater Effect in producing the *Tides*.

Hitherto we have conſidered ſuch Affections of the *Tides* as are univerſal, without Relation to particular Caſes; what follows from the differing Latitudes of Places, will be eaſily underſtood by the following Figures.



Let A P P E P be the Earth covered over with very deep Waters, C its Centre, P P its Poles, A E the Equinoctial, F *f* the Parallel of Latitude of a Place, D *d* another Parallel at equal Diſtance on the other ſide of the Equinoctial, H *h* the two Points where the *Moon* is Vertical, and let K K be the great Circle wherein the Moon appears Horizontal.

It is evident, that a *Spheroid* deſcribed upon H *h* and K K, ſhall nearly repreſent the Figure of the Sea; and C *f*, C D, C F, C *d*, ſhall be the Heights of the Sea in the Places *f*, D, F, *d*, in all which it is *High-water*: And ſeeing that in 12 Hours time, by the diurnal Rotation of the Earth, the Point F is transferr'd to *f* and *d* to D: The Height of the Sea C F, will be that of the *High-water*, when the *Moon* is preſent, and C *f* that of the other *High-water*, when the *Moon* is under the Earth; which in the Caſe of this Figure is leſs than the former C F.

And in the oppoſite Parallel D *d*, the contrary happens: The riſing of the Water being always alternately greater and leſs in each place, when it is produced by the *Moon* declining ſenſibly from the Equinoctial, that being the greateſt of the two *High-waters* in each Diurnal Revolution of the *Moon*, wherein ſhe approaches neareſt either to the *Zenith* or *Nadir* of the Place. Whence it is, that the *Moon* in the Northern Signs in this part of the World, makes the greateſt *Tides* when above the Earth, and in the Southern Signs when under the Earth; the Effect being always the greateſt where the *Moon* is fartheſt from the Horizon, either above or below it.

And this alternate Increaſe and Decreaſe of the *Tides*, has been obſerv'd to hold true on the Coaſt of *England*, at *Briſtol* by Captain *Sturmy*, and at *Plymouth* by Mr. *Colepreſſe*.

But the Motions hitherto mention'd, are ſomewhat altered by the Libration of the Water, whereby tho' the *Action* of the *Luminaries* ſhould ceaſe, the Flux and Reflux of the Sea would for ſome time continue: This Conſervation of the impreſſed Motion diminiſhes the Difference that otherwiſe would be between two conſequent *Tides*, and is the Reaſon why the higheſt *Spring-tides* are not preciſely on the *New* and *Full Moons*, nor the *Neaps* on the Quarters; but generally they are the third *Tides* after them, and ſometimes later.

All theſe things would regularly come to paſs, if the whole Earth were covered with Sea very deep; but by reaſon of the ſhoalneſs of ſome places, and the narrowneſs of the Straits, by which the Tides are in many Places propagated, there ariſes a great diverſity in the Effect, and not to be accounted for, without an exact Knowledge of all the Circumſtances of the Places; as of the Poſition of the Land, and the Breadth and Depth of the Channels by which the *Tide* flows; for a very ſlow and imperceptible Motion of the whole Body of the Water, where it is (for Example) two Miles deep, will ſuffice to raiſe its Surface 10 or 12 Feet in a *Tide*'s Time; whereas, if the ſame Quantity of Water were to be conveyed upon a Channel of 40 Fathom deep, it would require a very great Stream to effect it, in ſo large Inlets as are the Channel of *England*, and the *German* Ocean; whence the *Tide* is found to ſet ſtrongeſt in thoſe Places where the Sea grows narroweſt, the ſame Quantity of Water being to paſs through a ſmaller Paſſage: This is moſt evident in the *Streights* between *Portland* and *C. de Hogue* in *Normandy*, where the *Tide* runs like a Sluce, and would be yet more between *Dover* and *Calais*, if the *Tide* coming about the Iſland from the North did not check it. And this Force being once impreſs'd upon the Water, continues to carry it about the Level of the ordinary height in the Ocean, particularly where the Water meets a direct Obſtacle, as it is in St. *Maloes*; and where it enters into a long Channel, which running far into the Land, grows very ſtrait as its Extremity; as it is in the *Severn-Sea*, at *Chepſtow* and *Briſtol*.

This ſhoalneſs of the Sea, and the Intercurrent Continents, are the Reaſon that in the open Ocean the Time of *High-water* is not at the *Moon*'s Appulſe to the Meridian, but always ſome Hours after it, as it is obſerved upon all the Weſt Coaſt of *Europe* and *Africa*; from *Ireland* to the *Cape of Good Hope*: In all which, a *South-Weſt Moon* makes *High-water*; and the ſame is reported to be on the *Weſt* of *America*.

But it would be endleſs to account all the Particular Solutions, which are eaſie *Corollaries* from this *Hypotheſis*; as, why the Lakes, ſuch as the *Caſpian-Sea*, and *Mediterranean-Sea*; ſuch as the *Black-Sea*, the *Streights*, and *Baltick*, have no ſenſible Tides: For *Lakes*, having no Communication with the Ocean, can neither increaſe or diminiſh

miniſh their Water, whereby to riſe, and fall; and Seas that communicate by ſuch narrow Inlets, and are of ſo immenſe and extent, cannot in a few Hours time receive, or empty Water enough to raiſe, or ſink their Surface in any thing ſenſibly.

Laſtly, to demonſtrate the Excellency of this Doctrine, the Example of the Tides in the Port of *Tunking* in *China*, which are ſo extraordinary, and differing, from all others we have yet heard of, may ſuffice. In this Port there is but one Flood, and Ebb in 24 Hours; and twice in each Month, *viz.* when the *Moon* is near the Equinoctial, there is no *Tide* at all, but the Water is Stagnant; but with the *Moon*'s Declination there begins a *Tide*, which is greateſt when ſhe is in the Tropical Signs; only with this difference, that when the *Moon* is to the *North-ward* of the Equinoctial, it Flows when ſhe is above the Earth, and Ebbs when ſhe is under, ſo as to make *High-Water* at *Moon* ſetting, and *Low-water* at *Moon*'s riſing: But on the contrary, the *Moon* being to the *Southward*, makes *High-water* at riſing, and *Low-water* at ſetting, it Ebbing all the time ſhe is above the Horizon. As may be ſeen more at large, in the *Philoſoph. Tranſact.* N. 162.

The Cauſe of this odd Appearance, is propoſed by Sir *Iſaac Newton*, to be from the concurrence of two *Tides*, the one propagated in 6 Hours, out of the great *South Sea*, along the Coaſt of *China*; the other out of the *Indian Sea*, from between the Iſlands, in 12 Hours, along the Coaſt of *Malacca*, and *Cambodia*.

The one of theſe *Tides*, being produced in North-Latitude, is, as has been ſaid, greater when the *Moon* being to the North of the Equator, is above the Earth, and leſs when ſhe is under the Earth.

The other of them, which is propagated from the *Indian Sea*, being raiſed in South Latitude, is greater when the *Moon* declining to the South is above the Earth, unleſs when ſhe is under the Earth; ſo that of theſe *Tides*, alternately greater and leſſer, there comes always ſucceſſively two of the greater, and two of the leſſer together every Day; and the *High-water* falls always between the times of the arrival of the two greater Floods; and the *Low-water* between the arrival of the two leſſer Floods. And the *Moon* coming to the Equinoctial, and the alternate Floods becoming equal, the *Tide* ceaſes, and the Water ſtagnates; But when ſhe has paſſed to the other ſide of the Equator, thoſe Floods which in the former order were the leaſt, now becoming the greateſt, that which before was the time of the *High-water*, now becomes the *Low-water*, and the Converſe; ſo that the whole appearance of theſe ſtrange *Tides*, is without any forcing naturally deduced from theſe Principles, and is a great Argument of the certainty of the whole *Theory*.

The *Theory of Des Cartes*, whereby he endeavours to explain the Phænomena of *Tides*, ſuppoſes the *Moon* to move round the Earth in an Ellipſis, in whoſe Centre the Earth is placed, ſo that by this means the *Moon* will have two *Apogæums*, and two *Perigæums*; and according to him ſhe muſt always be in one of her *Prigæums*, at the time of her Oppoſition, or Conjunction; ſo that then he ſuppoſes her to preſs more ſtrongly upon the Sea, than ſhe doth at her Quadratures, when he ſaith ſhe is in her *Apogæum*, and conſequently hath a weaker Preſſure: But now beſides that, if this were ſo it would not ſolve the thing, the Fact it ſelf is notoriouſly Falſe; for the *Moon* is as often in her *Apogæum* at New, and Full, as ſhe is in her *Perigæum* at thoſe times; tho' it ſeldom happens, that ſhe is exactly in either, at her Lunations, *Vid.* Mr. *Keil*'s Examination of *Burnet*'s *Theory*, *Introduct.* *P.* 17.

Dr. *Gregory* in his Aſtronomy, *Book* 4. *Prop.* 65 *P.* 384. demonſtrates alſo, That if the Globe of the Earth, were every where covered over with a deep Sea (not now conſidering the Figure, which would ariſe from its Revolution, round its Axis) it would put on the Figure of an oblong Spheroid, whoſe Axis produced, would paſs through the *Moon*; and this by Reaſon of the Gravitation of the Parts the Water towards the *Moon*: And for the ſame Reaſon, the Earth would put on an oblong Spheroidical Figure, whoſe produced Axis, would alſo paſs thro' the *Sun*.

And then in the next Propoſition he proves, That the *Flux, and Reflux of the Sea, is occaſioned by the Water covering our Globe, its putting on two oblong Spheroidical Figures, whoſe Axes produced, would paſs thro' the Moon and Sun.*

And this true Cauſe of the *Tides*, he ſaith, was firſt diſcovered by the great *Kepler*, and afterwards improved very much, by our Incomparable Sir *Iſaac Newton*; which ſhewed that the Sea muſt needs riſe both under the *Moon*, and in the Part Diametrically oppoſite to that.

And this Spheroidical Figure of the Water of the Sea, which like two Mountains is ſtretcht out, one towards the *Moon*, and the other to the Part oppoſite to her, is continually moving, or ſhifting according to the daily Motion of the *Moon*, which it follows; (or rather indeed, the Earth moving towards the Eaſt in its daily Motion, ſhifts it ſelf away from theſe Mountains of Water, which keep as it were immoveable under and oppoſite to the *Moon*, as ſhe more ſlowly moves towards the Eaſt) hence I ſay it muſt needs be, that the Water muſt twice riſe and fall in 25 Hours; in which time the *Moon* moves from the Meridian of any Place, to the ſame again.

And becauſe the Water of the Earth will ſwell, or be raiſed in thoſe Places to whom the *Sun* is in the *Zenith*, or *Nadir*, (as he proves, *Prop.* 64.) altho' much leſs than when the *Moon* is ſo poſited: Therefore in the Conjunction, and Oppoſition of theſe Luminaries, the aforeſaid Protuberance of the Water will be conjoined; and conſequently then the higheſt *Spring-Tides*; and the loweſt Ebbs will be when both thoſe Luminaries are in the Horizon of any Place; becauſe the Water is then elevated, and now depreſſed by the conjoint Force of both.

But in the Quadratures of the Luminaries, the *Sun* elevates the Water where the *Moon* makes it all, and makes it fall where the *Moon* elevates it; ſo that the *Elevation* of the Water depending only on the difference of theſe Forces, will be the leaſt of all, and ſo for the *Depreſſion*. Between the Syzygies, and the Quadratures, the Effects of the Luminaries on the Water, will be at a mean between the two former.

When the Moon is in the Equinoctial, the two oppoſite Protuberances, or Eminences of the Water, will be alſo in the Earth's Equator, and each of them deſcribing that greateſt Circle of the Earth, by its Diurnal Revolution, it will move ſwifter, and when it is thrown towards the Shoars, will

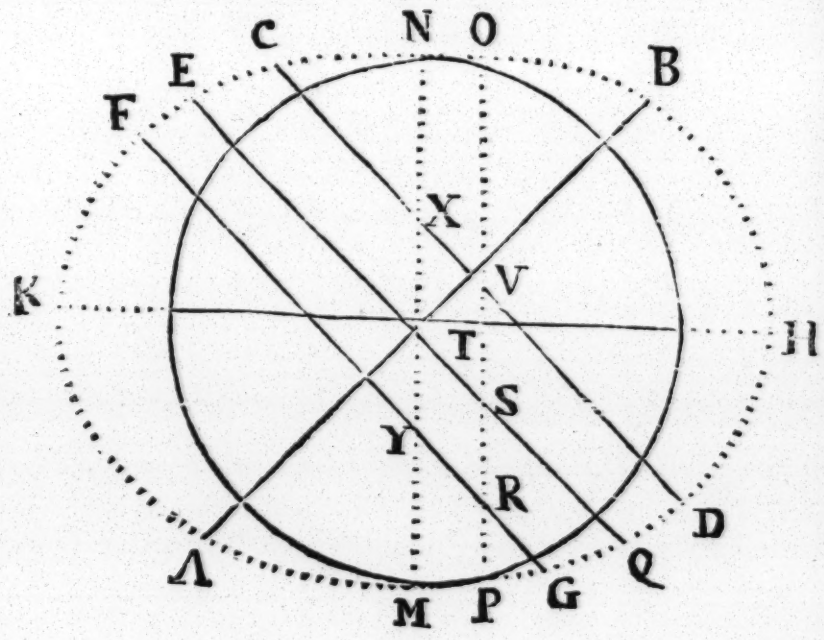
riſe higher there; beſides that, ſomething muſt alſo be allowed for the Equatorial Diameter of the Earth, being its longeſt, and conſequently the Water there being ſomething nearer to the Luminary, will be raiſed higher, by their Influence, than in other Parts.

And therefore whenever the Luminaries are either in Conjunction, or Oppoſition, in the Equator, their Forces will be conjoined to raiſe or elevate the Sea at the Equator; as happens at the Syzygys next the Equinoxes, or in or near *March* and *September*, when we have always the greateſt *Annual Tides*; as the Tides at the Quadratures of thoſe *Moons*, are always the leaſt, or moſt *Neap*.

Again, the Tides, (other things conſidered) are always greateſt when the Luminaries are in *Perigæo*, and leaſt when they are in *Apogæo*; and ſince this is the Caſe of the Moon in every Lunation, but of the Sun only in the Winter, this joined to the former, occaſions that the greateſt Tides in the Syzygys, and the leaſt in the next Quadratures, do precede the Vernal Equinox, and follow the Autumnal one.

Hitherto the Properties of the *Tides* have been conſidered only univerſally, as they affect the whole Globe of the Earth; it remains, that thoſe ſhould be next ſpoken of, which ariſe from the different Latitudes of different Places.

To which purpoſe, let B E K A Q H repreſent the Earth, whoſe Centre is at T, its North Pole A, the other B: E Q the Equator, and C D, F G, two Parallels to it, one toward the North, the other toward the South.



Let the Water round the Earth conform it ſelf into an Oblong Spheroid, (becauſe of the *Moon*'s being near it) whoſe Axis K H, produced towards H, ſhall paſs through the *Moon*: Then ſhall T H, or T K, be the greateſt height of the Water, (reckoning from the Centre T) and T M, or T N, the leaſt; which latter is equal to the height of the Water in any Point of the Circle N M: *v. gr.* where ever it meets with the Parallels, C D, F G, as ſuppoſe in X or Y.

Alſo the Right Lines T C, T F, T D, and T G, (being ſuppoſed to be drawn) will denote the height of the Water in the ſeveral Points C, F, D, and G: Then drawing the Circle P O, parallel to N M, the ſuppoſed Right Lines, T O, T V, T S, T R, and T P, will be the heights of the Water in the Points O, V, S, R and P, where the ſaid Circle meets with the Equator and its Parallels.

This being ſuppoſed, Let us conſider any Place on the Earth, by its Diurnal Rotation, to deſcribe the Parallel C D: It is then plain, that when the Place is at D; T D will then be the greateſt height of that Water, when the *Moon* is in the *Meridian* of the Place; but the Water will be at loweſt, when that Place hath moved to X; and then higheſt again when it is come to C, as hath been before ſhewn.

But now becauſe T D is longer than T C, (as being nearer to the longeſt of all T H) in the preſent Caſe, when the *Moon* declines towards the elevated Pole, the height of the Water will be greater when the *Moon* is in the *Meridian*, above the *Horizon*, than when in the ſame Circle below it.

In like manner T G, will be leſs than T F, (as being nearer the ſhorteſt of all T M) that is in the Place, deſcribing the Path, or Circle F G, by the Earth's Diurnal Motion. T G, will be the greateſt height of the Water, happening while the *Moon* declines toward the depreſſed Pole A, and is on the *Meridian* above the *Horizon*; but this is leſs than its greateſt Altitude which happens when the *Moon* comes to the other half of the *Meridian*.

Moreover, the Difference of this Tide, now greater, now leſſer (in Places ſituate without the Equator, according as the *Moon* moves towards the viſible, or latent part of the *Meridian*) will be greater, if it be conjoined with the Cauſes abovementioned, and which will produce a like Effect, *V. gr.* at the *Solſtices*; for then in the Syzygys, both the Luminaries do moſt of all decline from the Equinoctial; and ſuch a *Declination*, (it hath been ſhewed) occaſions the *Alternation of the Tides*.

And this effect will yet be encreaſed when the aſcending Node of the *Moon*'s *Orbit*, paſſes the Vernal Equinox; for then the *Moon* conjoined to the *Sun*, declines towards the North, or South, by the Quantity of her greateſt Latitude, above the Declination which is equal to the *Sun*'s greateſt Declination.

All which things are in this State if the Earth be ſuppoſed to be quite covered over with Water, to a great Depth; but becauſe of the Land, Iſlands, Straits, *&c.* there will be an infinite Variety in the Phænomena of the *Tides*; yet there is no doubt, but if that the Situation of Places, *&c.* be well conſidered, and Obſervations of the *Tides* there exactly made, all things will be found to agree very well with this Theory, and to be eaſily accountable from it.

TIERCE, or a *Third*, is a Term in *Muſick*, ſignifying a certain Diviſion of the *Monochard*, in which if the Terms be as 5 to 4. 'tis called, a *Tierce Major*, or a *Diton*; but if the Terms are as 6 to 5, then 'tis called a *Tierce Minor*, or *Demi-Diton*.

TIES aboard a Ship, are thoſe Ropes by which the Yards do hang: And when the Halliards are ſtrained to hoiſe the Yards, theſe *Ties* carry them up.

TILLER, the very ſame with the Helm of a *Ship*: It is moſt properly uſed in a Boat where that which would be the Helm in a Ship, is called the *Tiller*.

TIMBRE, (or rather *Timmer*, ſaith *Guillum*) is the Heralds term for the Creſt which in any Atchievement ſtands a top of the Helmet.

TIME, in *Muſick*, is that quantity, or length whereby is aſſign'd to every particular *Note*, its due Meaſure, without making it either longer or ſhorter than it ought to be; and it is twofold, *viz.* *Duple* or *Common*, and *Triple*.

Duple, or *Semi-breve time*, generally called *Common*, becauſe moſt uſed, is when all the *Notes* are encreaſed by two: As 2 *Longs* make a *Large*, 2 *Breves* a *Long*, 2 *Semi-breves* a *Breve*, 2 *Minims* a *Semi-breve*, 2 *Crotchets* a *Minim*, 2 *Quavers* a *Crotchet*, 2 *Semi-quavers* a *Quaver*, and 2 *Demi-Semi-quavers* a *Semi-quaver*.

This ſort of *Time* is uſual in *Anthems*, *Almains*, *Pavans*, *Fantaſies*, &c.

Triple Time, is that wherein the Meaſure is counted by *Threes*: As one *Semi-breve* is equivalent to 3 *Minims*, one *Minim* to 3 *Crotchtes*, &c. So that this ſwifter *Time* or *Meaſure* is proper for Airy Songs, and Light Leſſons: As *Courants*, *Sarabands*, *Jiggs*, &c.

To theſe ſorts of *Time* may be added, *Seſquialteran Proportion*, which ſignifies a *Triple* Meaſure of three *Notes*, to two ſuch like *Notes* of the *Common Time*.

TIME, is a certain Meaſure depending on the Motion of the Luminaries, by which the Diſtance and Duration of things is meaſured; and is either *Aſtronomical*, which is ſimply taken from the Motion of the Stars: Or *Civil*, which is Aſtronomical Time accommodated to Vulgar Uſes.

Aſtronomical, *Mathematical*, or *Abſolute Time*, flows equably in its ſelf without Relation to any thing External; and by another Word is called *Duration*.

But *Relative*, *Apparent*, or *Vulgar Time*, is the ſenſible, and external Meaſure of any Duration eſtimated by Motion, and this the vulgar Uſes, inſtead of true *Time*.

TIN-GLASS. See *Biſmuth*.

TINEA, when a ſort of running Sores in the Head, full of little Holes (called *Achores*) continue long, or be too ſlowly or ill cured, they grow into *Tinea's*, *i. e.* cruſty ſtinking Ulcers of the Head, which gnaw, and conſume its Skin; therefore 'tis deſervedly reckoned amongſt the Diſeaſes of Children, but when they are a little grown; for tho' adult Perſons are ſometimes troubled with this Diſeaſe, yet they contracted the rudiments, and Seeds of it in their Infancy. It is called *Tinea*, which ſignifies a Moth, from thoſe little Worms which eat, and conſume Cloths; becauſe thoſe Ulcers prey upon the Skin of the Head, as thoſe Animals upon Cloths. What the *Greeks* called this Diſtemper, is not ſo obvious. *Blanchard*.

TINCTURE, the Heralds call the Colours in an Eſcutcheon, or Coat of Arms, *Tinctures*.

TINCTURE, in Chymiſtry, is a Diſſolution of the more fine, and volatile Parts of a mixt Body in Spirit of Wine, or ſome ſuch proper Menſtruum. The Matter is bruiſed in a Mortar, and then put into a Matraſs, and on it the Spirit of Wine (uſually) is poured to the height of two, or three Fingers above it: Then the Glaſs is cloſe ſtopt and ſet in Digeſtion in a Sand Heat for four or five Days, till the Spirit is well impregnated, and hath received an high Colour, or Tincture from the Matter. Thus the Tincture of Cinnamon, and all Odoriferous Vegetables are drawn.

And when Tinctures are drawn from Minerals, or Metals; this Spirit is the common Menſtruum made uſe of.

TINNITUS *Aurium*, is a certain buzzing, or tingling in the Ears, proceeding from Obſtruction, or ſomething that irritates the Ear, whereby the Air that is ſhut up, is continually moved by the beating of the Arteries; and the Drum of the Ear is lightly verberated; whence ariſes a buzzing, or noiſe.

TIRE, or as the Seamen pronounce it *Teer* of Guns, are a Rank of them placed along a Ship's ſide, either above, upon Deck, or below: The former of which, are called the *upper Tire of Guns*; the latter, the *lower Tire*. There is alſo in ſome Ships half a *Tire* on the *Fore-deck*, and *Half decks*.

TITE, the Seamen ſay a Ship is *Tight* or *Tite*, when ſhe is ſo ſtaunch as to let in but very little Water; and this is known by the ſmell of the Water Pumpt out, for if ſhe let in but little Water, it will always ſtink, otherwiſe not.

TITILLATION, is that Senſation we have in any Part of the Body when tickled.

TITLE *of Entry*, is when one is ſeiſed of Land in *Fee*, makes a Feoffment thereof on Condition, and the Condition is broken; after which the Feoffer hath *Title* to enter into the Land, and may do ſo at his Pleaſure, and by his *Entry* the Freehold ſhall be ſaid to be in him preſently: And 'tis called *Title of Entry*, becauſe he cannot have a Writ of Right againſt his Feoffee upon Condition, for his Right was out of him by the Feoffment, which cannot be reduced with *Entry*, and the *Entry* muſt be for the Breach of the Condition.

TIMESIS, is a Figure in the Grammar, whereby a compound Word hath its Parts ſeparated from one another, by the Interpoſition of ſome other Word, as in this of *Terrence*.

Quæ meo cunque animo lubitum eſt facere.

Where *Quæ* and *cunque*, are divided by putting *meo* between them.

TOISON *d'Or*, (French) the Term in Heraldry for a golden Fleece, which is ſometimes born in a Coat of Arms.

TOIL, or *Tholl*, in common Law, hath two Significations. Firſt, It is uſed for a Liberty, to buy, and ſell within the Precincts of a Mannor. Secondly, For a Tribute, or Cuſtom paid for paſſage, &c. Some Interpret it to be a Liberty, as well to take, as to be free from *Toll*; for they who are Enfeoffed with *Toll* are Cuſtom-free.

TOLT, is a Writ, whereby a Cauſe depending in a Court-Baron, is removed to the County-court; and is ſo called, becauſe it does *Tollere loquelam*, from the one Court, to another.

TOMENTUM, properly ſignifies *Flocks*, or *Locks* of Wool; but by Botaniſts 'tis uſed for that ſoft Downy Matter which grows on the Tops of ſome Plants; which therefore are denominated from hence; as *Gramen Tomentoſum*, *Carduus Tomentoſus*, &c.

TOMETICA, the ſame with *Attenuantia*.

TOMOTOCIA, the ſame with *Hyſterotomia*. *Blanchard*.

TONDINO, a Term in Architecture. See *Aſtragal*.

TONE, a Term in Muſick, ſignifying a certain Degree of Elevation, or Depreſſion of the Voice, or ſome other Sound. *Muſicians* commonly determine it to be the ſixth Part of an *Octave*, in which Sence, the *Octave* is ſaid to be compoſed of Five *Tones*, and two *Semi-tones*; and the *Tone* to be the

Difference between the fourth and fifth. A *Tone*, or whole Note is divided into nine Particles call'd *Comma's*, five of which are aſſigned to the greater *Semi-tone*, and four to the leſſer.

TONICA, are thoſe things which being externally applied to, and rubb'd into the Limbs; ſtrengthen the Nerves, and Tendon. *Blanchard.*

TONNAGE, is a Cuſtom or Impoſt paid to the King, for Merchandiſe carried out, or brought in Ships, and ſuch like Veſſels, according to a certain Rate upon every Tun.

TONSILLÆ, the Almonds of the Ears, as they are vulgarly call'd, are two Glands ſeated at the Root of the Tongue, on each ſide of the *Uvula*, and at the Top of the *Larynx*, covered with the common Membrane that inveſts all the Mouth.

Dr. *Wharton* ſays, That tho' they ſeem two, yet they are really but one, being continued to one another by a thin and broad Production, which is of the ſame glandulous ſubſtance with themſelves. He ſays, They are of a yellowiſh Colour, and compares their Subſtance to concreted Honey, only they are of a more firm Conſiſtency, but they look ſandy like it: They have ſmall Veſſels from the *Jugular Veins* and *Arteries*, and *Nerves* from the fifth Pair.

They have each a large oval common Duct, or *Sinus* that opens into the Mouth ſo wide in an Ox, that one may put the tip of the little Finger into it. Into this many leſſer open, and by a diſcharge into the Mouth, *&c.* the Liquor that is ſeparated in the Gland.

Fallopius hath obſerv'd this Aperture or *Sinus*, to look like a ſmall Ulcer when the Gland has been ſwelled, and ſometimes by unskilful Perſons, to have been treated as ſuch, when it has only been forced to gap a little too much through the too plentiful Defluxion of Humours upon the Gland.

The *Uſe* of theſe Glands was by the Ancients ſuppoſed to be only to ſeparate a certain mucous, or pituitous Matter from the Blood, for the moiſtening, and lubricating of the *Larynx*, Tongue, Fauces, and Gullet: But Dr. *Wharton*, and as many as attribute a fermentative Quality to the *Saliva*, aſcribe a more noble Uſe to them; *viz.* to make a Ferment to further the Concoction of the Stomach: Yea, Dr. *Wharton* (but I think miſtakingly) thinks that they are the chief Inſtrument of Taſt.

TOP (of a Ship) is a round Frame of Boards lying upon the Croſs-trees near the head of the Maſt: Here they furle or looſe the Top-ſail, *&c.*

TOP-ARMOURS, are a kind of Cloths hung about the Round-tops of the Maſts for ſhow; and alſo to hide the Men which are in the top in a Fight, who lie there to fling Stink-pots, *&c.* or to fire ſmall Shot down on the Enemy in caſe of Boarding.

TOP-GALLANT-*Maſts* of a Ship are two, *viz.* *Maintop-gallant-Maſt*, and *Foretop-gallant-Maſt*: And theſe two are ſmall round Pieces of Timber, ſet on to their reſpective *Top-Maſts*; on the Top of which Maſts are ſet the Flag-ſtaffs, on which the Colours, as Flags, Pendants, *&c.* hang.

TOP-MASTS of a Ship are 4; which are made faſt, and ſettled unto the Heads of the *Main-Maſt*, *Fore-Maſt*, *Miſſen-Maſt*, and *Boltſprit* reſpectively.

TOP-ROPES, are thoſe with which the *Top-Maſts* are ſet, or ſtruck. They are reeved thro' a great Block, which is ſeized on one ſide under the Cap, and then they are reeved thro' the *Heel* of the *Top-Maſt*, where is a Braſs *Shiver* placed athwart Ships; after this they are brought up and faſten'd on either ſide the Cap with a Ring: The other part of them comes down by the *Ties*, and ſo is reeved into the *Knight-head*; and when it is to be heaved, is brought to the *Capſtan*: Theſe *Top-Ropes* belong only to the *Main*, and *Fore-Maſt*.

TOPHUS, is a ſtony Concretion in any Part of an Animal Body; which is alſo frequently called a *Tophaceous* Matter.

TOPICK in Medicine, ſignifies what is outwardly applied to the Patient's Body, to cure him of his Diſtemper.

TOPICK in *Logick*, is a *Ground*, or *Subject* on which to found, or from whence to draw an Argument in Diſputation.

TOPINARIA, is the ſame with *Talpa*. *Blanchard.*

TOPOGRAPHY, is a particular Deſcription of ſome ſmall quantity of Land, ſuch as that of a Mannor, or particular Eſtate, *&c.* or ſuch as Surveyors ſet out in their Plots, or make a Draught of, for the Satisfaction, and Information of the Proprietors.

TOPPING *the Lifts*, is the ſame as haling the Top-ſail Lifts; and therefore they ſay *Top a Starboard*, or *Top a Port*; that is, hale upon the Starbard or Larboard Lift. See *Lifts*.

TORCE, a Term in Heraldry for a Wreath; which ſee.

TORCULAR *Herophili* in Anatomy, is that Place where the four Cavities of the *Dura Mater*, or thick Skin of the Brain are joined.

TORE, or *Torus* in Architecture, or as 'tis ſometimes ſpelt *Thore*, is that round Ring which encompaſſes in the Column, between the *Plinth* and the *Liſt*. This is the third Member of the Baſe of a Column; it ſeems like a round Cuſhion, ſwelling out with the Weight of the Incumbent Pillar.

TORICELLIAN *Experiment*, ſo called from its Author, and Inventor *Torricellius* an *Italian*; is when a Glaſs Tube of about 3 Foot in Length, and $\frac{1}{4}$ of an Inch Bore being ſealed (or cloſed in the Fire) at one end, is at the other quite filled with Quick-ſilver; and then being ſtopt with the Finger, hath its unſealed end thruſt down under the Surface of ſome Quick-ſilver, contained in a Veſſel; and then the Finger being removed from the Orifice, and the Tube put into an erect Poſture, the Mercury will deſcend, or run out till it remain in the Tube, to the height of between 28 and 31 Inches, leaving in the top of the Tube an apparent empty Space.

This Quick-ſilver thus ſuſpended, hath been found to encreaſe or leſſen its height in the Tube, according as the Weather alters for dry or wet; and therefore when hung in a Frame with a Plate of Diviſions for this purpoſe, 'tis called the Quick-ſilver Weather-glaſs, the *Mercurial Barometer*, or *Baroſcope*; which Words ſee.

That the Cauſe of the Suſpenſion of the Mercury in this Tube, is occaſion'd by the Weight of the Atmoſphere incumbent on the Orifice of the Tube, and the ſtagnant Mercury in the Baſon over it; is the received Opinion, and ſeems proved by theſe Experiments and Reaſons.

Firſt, That when a Tube, in which this *Torricellian Experiment* is duly made, is placed (Ciſtern and all) in the Receiver of the Air-pump; after one Suction the Mercury will deſcend, and ſo ſtill will it go lower and lower at every Suction of the Air

Air out, 'till at laſt the Surface of the Mercury within the Tube, will be a very little higher, than that which is in the Baſon: But as ſoon as the external Air is let into the Receiver again, it will by its Spring (which is always equal to the Gravity of the Atmoſphere) ſo preſs on the Surface of the Mercury in the Ciſtern, as to force it up again into the Tube with ſuch Violence as will endanger breaking it, and it will (when quiet) regain near its former height in the Tube.

2. It hath been found by repeated Trials, that the included Mercury will ſink if the Tube be carried up to the top of an high Hill, or up but to the Top of an high Tower, Steeple, *&c.* the reaſon of which appears to be, that the Column of incumbent Air which preſſed upon it before, being now leſſen'd in length by the Altitude of the Hill, muſt needs gravitate leſs than at the Bottom, and conſequently cannot bear the Mercury up ſo high in the Tube. And this Mr. *Boyle* takes to be a kind of *Experimentum Crucis*, determining plainly the Cauſe of the Mercury Suſpenſion.

3. If after the Experiment is made and the Mercury ſettled, you lift the Tube out of the ſtagnant Mercury, the external Air will preſs in with that Violence, and drive the Mercury up to the Top of the Tube ſo forcibly, as will endanger the breaking out of the ſealed end.

TORID *Zone*. See *Zone*.

TORRIFIED, *i. e.* Roaſted, it was formerly the uſual way to *Torrifie* Opium, or roaſt it againſt the Fire, before any Medicinal Preparation was made with it, in order to get out ſome malignant Parts that they tanſied were in it before: But by this Means its volatile Spirits and Sulphur in which its great Vertue conſiſts were evaporated and deſtroyed. And indeed 'tis found by Experience, that in moſt Caſes *Crude Opium* is better than any other Preparation of it whatſoever.

TORTEAUXES, a bearing in Heraldry. See *Balls*.

TORUS, in Architecture, is a round, thick Circle running round the Baſe of a Pillar, reſembling the form of a great Ring.

TOTTED, a good Debt to the King, is by the *foreign Oppoſer*, or other Officer noted for ſuch, by writing this Word *Tot* to it.

TOUT *temps priſt & uncore eſt*, is a kind of a Plea in way of Excuſe, or Defence for him that is ſued for any Debt, or Duty belonging to the Plaintiff.

TOW, whatever is drawn after a Ship, or Boat with a Rope, *&c.* is ſaid to be *Towed* after a Ship, or to be in her *Tow*.

TOXICA, are poiſonous Medicaments, wherewith *Barbarians* uſe to anoint their Arrows. *Blanchard*.

TRABEATION, in Architecture, is the ſame with *Entablature*, *viz.* the Projecture on the Top of the Walls of Edifices which ſupports the Timber Work of the Roof. *Trabeation*; or *Entablature*, is different according to the ſeveral Orders and comprehends the Architrave, Frize, and Cornice.

TRACHEA, the ſame with *aſpera Arteria*; which ſee.

TRACHOMA, is a Scab, or Aſperity of the inner Part of the Eye-lid. *Blanchard*.

TRAGEÆ, a Term in Pharmacy; the *Tragæ* differ not from Powders, but that the Ingredients whereof they are prepared, are not beat ſo ſmall: And they are applied either in Fumigations, or externally to the Body, by being put into a Linen Bag, and then into Wine or other Liquor, that they may communicate their Strength, and Qualities to it: Sometimes alſo they are compounded of ſome ſorts of Antidotes, or Counter-poiſons, and other odoriferous things, and of ſimple Medicines reduced into a Powder, with an Addition of Sugar, in order to be taken inwardly. *Blanchard*.

TRAGUS, as *Hircus* (becauſe 'tis ſometimes Hairy) is one of the Protuberances of the *Auricula*, being that next the Temple, as that which is oppoſite to it, and to which the ſoft Lobe of the Ear is annexed, is called Antitragus.

TRAJECTORY, *of a Comet*, is the Line which by its Motion it deſcribes; which *Hevelius* in his *Cometagraphia*, will have to be nearly a Right one; but it ſeems rather to be a very Excentrical Ellipſis.

The Excellent Sir *Iſaac Newton*, in *Prop.* 41. of his third Book, ſhews how to determine the Trajectory of a Comet from three Obſervations; and in his next and laſt Propoſition, how to correct a Trajectory graphically deſcribed. See *Comets*.

TRAILE-BOARD, in a Ship, is a carved Board on each ſide of her Beak, reaching from her Main Stem to the Figure, or to the Brackets.

TRAIN, is the Number of Beats which the Watch maketh in an Hour or any other certain time.

TRANCHE, a Word uſed by the *French* Armoriſts, to expreſs a manner of *Counterchanging* in an Eſcutcheon of this Form.

But our *Engliſh* Heralds Blazon it thus, he beareth, *Per Pale Argent and Azure, per Bend Counterchanged.*

TRANSCENDENTAL *Curves* are ſuch, as when their Nature, or Property comes to be expreſſed by an *Equation*, one of the variable, or flowing Quantities there, denotes a *Curve Line*; and when ſuch *Curve Line* is a *Geometrick* one, or one of the *firſt Degree*, or *Kind*; then the Tranſcendental *Curve* is ſaid to be of the ſecond *Degree* or *Kind*, &c.

TRANCENDENTAL *Quantity*. See *Quantity*.

TRANSCRIPTO *pedis finis levati mittendo in Cancellarium*, is a Writ for the certifying the Foot of a Fine, levied before *Juſtice in Eyre*, &c. into the *Chaneery*.

TRANSCRIPTO *Recognitionis factæ coram Juſticiariis itinerantibus*, &c. Is a Writ for the certifying of a Recognizance, taken before *Juſtices in Eyre*, &c. into the *Chancery*.

TRANSFUSION *of the Blood*, out of one Animal into another, is thus perform'd: Bind and lay them both down on a Table, and then making ſtrong Ligatures round each of their Necks, open the *Right Jugular Vein* and *Cartoid Artery*, of the Man, (if you can get one to try) and the *Left* of the Sheep, *&c.* (or *vice verſa*:) Then dextrouſly fitting two ſmall Quils, or Pipes, croſs-ways from Vein to Artery, ſo that the Arterious Blood of the Sheep, may run into the Veins of the Man, and the Venal Blood into his Arteries, the Sheep receiving his after the ſame manner: And when the rational and ſagacious Looks of the Sheep, and the

the Sheepiſh ones of the Man begin to appear plainly diſtinguiſhable, the Operation is well over; ſeparate them and bind up their Wounds, and 'tis done.

Of this *Transfuſion*, (if any one hath a fancy to try it) he may find a more large Account in *Philoſoph. Tranſact. N.* 20.

'Twas firſt (as is ſaid) practiſed by Dr. *Lower*; and by the Honourable Mr. *Boyle* communicated to the *Royal Society*.

And in *N.* 26. *P.*479. of *Philoſoph. Tranſact.* there is an account, that one Mr. *Gayant* of *Paris*, by Transfuſing the Blood of a Young Dog into an Old one that was exceedingly Decrepid, and bare his Age very poorly, made the Old Curr ſo Lively and Brisk, that in two Hours after the Operation was over, he leapt and friskt about with very Youthful Agility.

So that, Transfuſion of the Blood,
Which makes Fools Cattle, did him Good.
Hudibr.

TRANSGRESSIONE, is a Writ commonly called, a Writ or Action of Treſpaſs, of which *Fitz-Herbert* reckons two ſorts. One *Viſcountiel* ſo called, becauſe it is directed to the Sheriff, and is not returnable, but to be determined in the County; the form whereof, differs from the other, becauſe it hath theſe Words, *Quare vi & armis*, &c. The other is term'd a Writ of *Treſpaſs* upon the Caſe, which is to be ſued in the King's Bench, or Common Pleas, in which are always uſed theſe Wotds, *vi & armis*, See *Treſpaſs*.

TRANSIT, in *Aſtronomy*, ſignifies the paſſing of any Planet juſt by or under any Fixt Star; or of the Moon in particular, covering or moving cloſe by any other Planet.

TRANSITION, in Muſick, is when a greater Note is broken into a leſſer, to make ſmooth, or ſweeten the roughneſs of a Leap, by a gradual *Tranſition*, or paſſing to the Note next following: whence it is commonly called, *the breaking of a Note*, being ſometimes very neceſſary in muſical Compoſitions.

TRANSLATION, in Law, ſignifies the ſetting from one Place to another, as to remove a Biſhop from one Dioceſs to another, is called Tranſlation, and ſuch a Biſhop Writes not *Anno Conſecrationis*, but *Anno Tranſlationis noſtræ*.

TRANSMUTATION, in Geometry, is to reduce, or change one Figure or Body, into another of the ſame Area, or Solidity, but of a different Form, as a Triangle into a Square; a Pyramid into a Parallelopiped, &c.

TRANSMUTATION *of Metals*, is what the Alchymiſts call the *grand Operation*, or finding the *Philoſophers Stone*; which is ſuch a curious univerſal Seed of all Metals, that if you melt any Metal in a Crucible, and then put in but a little of this *Stone* or *Powder of Projection*, (as they often call it) into the melted Metal, it will immediately, (as they tell you) turn it into Gold, or Silver, according as they uſe it.

The Famous Dr. *Dickinſon* in his Book *de Quinteſſentia Philoſophorum*, tells the World he was twice ſhewed this mighty Feat, by *an Adept* that went by the name of *Mundanus*: To which I ſhall only ſay, as Mr. *Boyle* uſed to do in ſuch Caſes, *he that hath ſeen it, hath more reaſon to believe it, than he that hath not.*

You have in *Lemery*, Dr. *Dickinſon*, and others, long Accounts of the Impoſtures, and Cheats of ſeveral pretended *Adepti*: How they fix *Mercury* with *Verdegreaſe*, and then Colour it deeper (for the Verdegreaſe will give it a yellow Colour) with Turmerick Cadmia, &c. and then they would paſs it thus off for true Gold: But if you ſhould go about to try it by the *Copple*, it will all fly away in Fumes. And indeed nothing produced this way ought to be adjudged true Gold, (unleſs it have all the Properties of true Gold, for all is not ſo that Glifters, and looks yellow) that is, it muſt be able to endure *Coppelling*, *Cementation*, *Purification* with *Antimony*, and the *Depart*. It muſt have the *Malleability*, and great *Ductility* of that Metal; and eſpecially its *true Specifick Gravity*, *i. e.* it muſt be to Water, as 19, or 18 and $\frac{1}{2}$ is to 1, or elſe 'tis ſome way falſe and Counterfeit. And this laſt Teſt of Specifick Gravity, would, if not attainable, argue an apparent Impoſſibility of Tranſmutation of Metals. Nor indeed can I ſee how any one can propoſe to increaſe the Relative, or Specifick Gravity of any Body whatſoever by a certain and determinate Way; and till this is done, all other Pretences are vain; for let it look how it will, if it have leſs Specifick Gravity than 18 and a half to 1, it cannot be true Gold; and therefore muſt either be a mixture of ſome Gold and other Metals together; or elſe ſome of them under the Diſguiſe of Gold.

The trick of turning Cinnabar into Silver, is pretty enough, and ought to be known.

They bruiſe the Cinnabar groſly, and then *ſtratifie* it in a Crucible with granulated Silver: The Crucible is placed in a great Fire, and after due time for its Calcination, they take it off; and pouring the Matter out, they ſhew the Cinnabar turn'd into real Silver, tho' the Silver Grains appear in the Number and Form they were put into the Crucible. But the Miſchief of all is, when you come to handle the Grains of Silver, you find them nothing but light fraible Bladders which will crumble to pieces between your Fingers: The Silver is almoſt of it got in and incorporated with the *Cinnabar*, and the whole weighs no more, nor indeed ſo much, as it did when it was firſt put into the Crucible.

But to give you ſomething on the behalf of *Tranſmutation*, Mr. *Boyle* talks of his own ſeparating from common Mercury, near a fourth part of its weight in clear Liquor, *Sep. Chym. Pag.* 134. and tells us alſo, that two Friends of his did, by preſſing Mercury in a skilfully managed Fire, turn it almoſt Weight for Weight into Water; but they tell us not in either Experiment, the Specifick Gravity of the produced Water, nor of the remaining untranſmuted Maſs of Mercury; which unleſs one knew, there is no judging of the Reality of the *Tranſmutation*.

In his Second Eſſay on the ſucceeding Experiments he tells us, that Dr. *K.* a Perſon far both from the Temptation and Cuſtom of Lying, aſſured him he did once light on a kind of *Aqua fortis* with which he did divers times draw a *Volatile Tincture*, which could and did turn Silver into Gold; and that out of an Ounce of Gold he drew as much of this Tincture, as did Tranſmute an Ounce and a half

half Silver into that Noble Metal: But withal, that deſigning afterwards to proſecute this ſurprizing Experiment further, he could never again make ſuch an *Aqua fortis* as would draw any ſuch Tincture from Gold. Tho' Mr. *Boyle* ſeems enclined to believe the Thing poſſible, becauſe he himſelf more than once was able to deprive Gold of its yellow Colour, and to communicate it to a *Menſtruum*.

He tells us alſo in his Origin of Forms, *P.* 235, That by putting to a Calx of Gold, a good Portion of his *Menſtruum Peracutum*, with a little Spirit of Salt, it did ſlowly, and quietly diſſolve it, only at the bottom remained a white Powder which the Menſtruum would not touch, and which was Indiſſoluble in *Aqua Regalis*. This white Powder being with Borax, or ſome ſuch flux Powder melted into a Metal, was found to be white like Silver, yielding to the Hammer, Diſſoluble in *Aqua Fortis*, or Spirit of Nitre; and would there leave a true Silver Calx, odiouſly Bitter. This is a ſtrange Experiment, which had Mr. *Boyle* made any more than once, as I cannot find that he had; and had he tried the Specifick Gravity of this apparent Silver, and found it to be leſs than that of Gold, it had been no ſmall Proof of the Poſſibility. of a Tranſmutation of Metal.

But what that noble Author relates in another Place of the ſame Book, about the Tranſmutation of Water into Earth; I judge the more conſiderable, becauſe he made uſe of Hydroſtaticks, to examine his Tranſmuted Matter, *viz.*

That rain Water being diſtilled, or re-diſtilled (by a Friend of his) many times over again (near 200 Times) did after each Diſtillation, leave at the Bottom of the Glaſs Body, a *white Earth* in a conſiderable Quantity; and this was afforded (ſaith Mr. *Boyle*) more plentifully in the *latter* Diſtillation, than in the *firſt*.

This he believed to be a certain Quantity of Water, actually turned into Earth, and it was above twice as heavy (ſpecifically) as common Water, and was of ſo fixt a Nature, that it lay in a red hot Crucible for a conſiderable Time, without being diminiſhed in Weight, or emitting any manner of Smoak.

He takes notice alſo, that an Ounce of Water yielded ſix Drams of Powder, a conſiderable Quantity of Water ſtill remaining behind; and that the Glaſs in which it was diſtilled, was not in the leaſt ſenſibly Damaged thereby. Yet this great Chymiſt was not without ſome Scruples about the Experiment. For,

Firſt, He was not ſatisfied that the remaining Water, was not Lighter than before the Diſtillation.

Secondly, He was not aſſured that no Parts of the Glaſs Veſſel were Diſſolved, or incorporated with it.

Thirdly, Nor whether Water be truly an Homogeneal Body; for if it be, he thinks it Difficult, if not impoſſible to conceive that it can be Tranſmuted: For how can (ſaith he) the bare Convention of the Parts of a Fluid into a Concrete, alter the Specifick Gravity.

TRANSNOMINATIO. See *Metonymia*.

TRANSOM, is the Term which ſome give to the Vane of a *Croſs-ſtaff*, which is made to ſlide along upon the *Croſs-ſtaff*, by means of a Square Socket; and may be ſet to any of the Graduations on the Staff, in an Obſervation.

TRANSOM of a Ship, is that main Piece of Timber which lieth acroſs her Stern at her Buttock, directly under the Gun-room Port; as when a Ship is built broad or narrow at her Tranſom, ſhe is ſaid to have a broad or narrow Buttock.

TRANSPARENT, or Diaphanous Bodies are ſuch whoſe Pores probably are all right and nearly Perpendicular to the Plain of their Surface, and ſo conſequently do let the Rays of Light paſs freely thro' them, without being refracted: Whereas the Pores of *Opacous Bodies* are in crooked oblique Poſition, by which means the Beams of Light cannot paſs freely thro' them, but are variouſly refracted and loſt.

TRANSPIRATION, a Breathing through, as of Vapours through the Pores of the Skin. *Blanchard*.

TRANSPOSITION *of Equations*. See *Equation*.

TRANSVERSALIS *Colli*, is a Muſcle of the Neck, which ariſeth Fleſhy from all the Tranſverſe Proceſſes of the *Vertebræ* of the Neck, except the firſt and ſecond, and is inſerted after an oblique aſcending Progreſs to their Superior Spines; it being a Continuation of the ſame Series of Muſcular *Fibres* that compoſe the *Sacer* and *Seme-ſpinatus*: If either of thoſe *Muſcles* act, the *Vertebræ* of the Neck are moved obliquely backwards, as when we look over one Shoulder.

TRANSVERSALIS *Muſculus*, one of the Muſcles of the Abdomen, ſo called, becauſe its Fibres run acroſs the Belly: Its uſe is to compreſs the Abdomen exactly inwards, in *Expiration*.

TRANSVERSALIS *Pedis*, is a Muſcle of the Foot ſo called from its Tranſverſe ſituation; it ariſeth Tendinous from the Internal *Os Seſamoides* of the Great Toe, and becoming a Fleſhy Belly in its Progreſs over the firſt internodes of the two next Toes, it is leſſened at its Inſertion to the Inferior part of that *Metatarſal* Bone, which ſupports that Toe next the leſſer. Its uſe is to bring the leſſer Toe towards the greater.

TRANSVERSALIS *Penis* is a Pair of Muſcles ariſing near the *Erectores Penis*, and thence paſs tranſverſely to their Inſertions at the upper part of the Bulb of the Cavernous Body of the *Urethra*: They have this Name for their Situation. They are mentioned by *Lindanus* after *Aquapendens*, as *Bartholin* obſerves, *Lib.* 1. *cap.* 24.

TRANSVERSALIS *Sutura*, is a Suture which runs acroſs the Face; it paſſes from one Temple to another tranſverſely, over the Root of the Noſe, joyning the *Os Frontis*, and the *Synciput*: 'Tis the firſt of the true Sutures, and is uſually called, *Coronalis*.

TRANSVERSE *Axis*, or *Diameter*. See *Latus Tranſverſum*.

TRAPEZIUM, ſee under *Quadrilateral Figures*. For its Superficial Content. See *Area*.

TRAPEZIUS, is a Muſcle of the Shoulder-blade, which ſerves to move it upwards, backwards, and downwards.

TRAPEZOID, is a ſolid irregular Figure, having four Sides not parallel to one another.

TRAVAILING-BAROSCOPE, the ſame with *Portable Barometer*.

TRAVERSE,

TRAVERSE, a Term in *Gunnery*, ſignifying to turn a Piece of *Ordnance* which way one pleaſes upon her *Platform*.

TRAVERSE, a Sea Word uſed in theſe Senſes; they call the Way of a Ship when ſhe makes Angles in and out, and cannot keep directly to her true Courſe, a *Traverſe*.

Alſo the laying and removing a Piece of Ordnance, or great Gun, in order to bring it to bear, or lie level with the Mark, is called *Traverſing* the Piece.

TRAVERSE, in Navigation, is the Variation or Alteration of the Ship's Courſe, upon the ſhifting of Winds, *&c.*

Note, That in Sailing in reſpect of the Wind, is either *before a Wind, by a Wind, or Larging*.

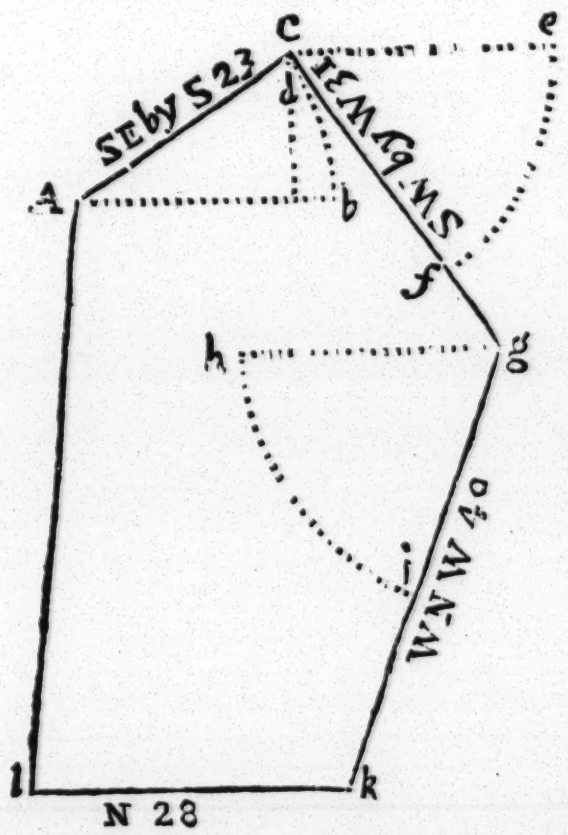
If a Ship Sail by or againſt a Wind, there ought to be an allowance for her Lee-way, and that more or leſs, according to the Growth, and Suage of the Sea, Mould of the Ship, and Sail ſhe bears, *&c.*

EXAMPLE.

Of a Traverſe.

A Ship from Latitude 47 Degrees, 00 Minutes N. Sails S. E. by S. 23 Miles, and then Sails S. W. by W. 31 Miles, and afterwards W. N. W. 40. Miles; laſtly, N. 28 Miles.

I demand the Courſe and Diſtance ſailed from the firſt Place of Departure, and the Latitude ſhe is now in.



Geometrically.

Firſt, Draw the Meridian A *b*, with 60 Degrees from the Chords, deſcribe the Arch *b c*; which make equal to 33 Degrees 45 Minutes = 3 Points; draw A *c*, and make A *d*, or A *c* equal to 23 Miles.

Secondly, Draw *d e* parallel to A *b*; from *d*, with 60 Degrees of the Chords, deſcribe *e f*, which make equal to 5 Points, draw *g f*, ſet 31 Miles from *d* to *g*.

Thirdly, Draw *g b* parallel to A *b*; with 60 Degrees of the Chords deſcribe *b i*, which make equal to 6 Points; draw *g i*, ſet 40 Miles from *g* to *k*.

Fourthly, Draw *k l* parallel to A *b*, make *k l* equal to 28 Miles; draw *l* A, that meaſured on the *Equal Parts*, gives 50, 4 Miles, and the Angle A *l k* meaſured on the Chords, gives 82 Degrees, or 7 ¼ *Points* from the *Meridian*; ſo that if ſhe had ſail'd on a ſtraight Line, and ſingle Courſe from A to *l*, that Courſe had been W. by N. ¼ Weſterly, and the Diſtance 50, 4 Miles.

By the Logarithms.

As the Radius	1 0,00000
Is to the Diſt. of the firſt Courſe 23 Mil.	1,36172
So is the S. Compl. of the Co. S. 56° 15′ -	9,91984
To the Diff. Lat. in the firſt Cou. 19, 1 M.	1,28156
Then, as the Radius	10,00000
Is to the Diſtance A *d* 23 Miles	1,36172
So is the S. 33° 45′ = ∠ *d* A *b* the firſt C.	9,74473
To the Departure in the firſt Courſe 12, 8, 1,	10646

Thus proceeding with the ſeveral Courſes, and Diſtances given, find the Departures, and Difference of Latitude to them all.

If the Courſe be between the North and Eaſt, then the Difference of Latitude is called Nothing, and the Departure Eaſting; if the Courſe be in the North-weſt Quarter, then the Difference of Latitude is called Nothing, and Departure Weſting. If the Courſe be between the South, and Eaſt, the Difference of Latitude is called Southing, and the Departure Eaſting, *&c.*

Now place all the ſaid Differences of Latitude, and Departures in a Table, the Northings all under one another, under the Title *Northing*, and the Southings, under the *Southing*; the *Eaſtings* in the *Eaſt* Column, and the *Weſtings* in the *Weſt* Column.

Then add up all the Northings, as likewiſe the Southings, and ſo the Eaſtings, and alſo the Weſtings: Laſtly, Take the Sum of the Northings, from that of the Southings, if the Southings make moſt; or the Sum of the Southings from the Northings, that you may have their Third Difference, which is the Difference of Latitude; as alſo, the Difference of the Totals, of Eaſting, and Weſting for the Departure; by which Difference of Latitude, and Departure, according to *Caſe* 5 of Right-angled Triangles, you will find the Direct Courſe and Diſtance.

Course.	Points.	Distance.	North.	South.	East.	West.
S E by S	3	23		19,12	12,78	
S W by W	5	31		17,22		25,78
W N W	6	40	15,31			36,96
North.	0	28	28,00			
From Sum			43,31	36,43	12,78	62,74
take			36,34			12,78
Rests.			6,57			49 96 Dep. West.

Departed
Difference of } Latitude { 47° 00′ North.
Present { 00° 07
47° 07′ North.

As the Difference of Latitude 7 Miles— 0,845098
Is to the Radius — 10,000000
So is the Departure 49,9 — 1,698100
To the Tan. of the Course 82,1 — 10,853002

And,

As the S. of the Course 82° 1′ — 9,995770
Is to the Departure 49,9 Miles — 1,698100
So is the Radius — 10,00000
To the Distance 50, 4 Miles — 1,702330

Example 2.

A Ship being bound to the Eastward, and finding the Wind variable, a small Gale, and smooth Water, plies upon these several Courses, with the Distances on each Course; as followeth.

The Lar-board Tack on Board, Wind from S S W *to* S, *and so to* S S E *and* E.

	Miles
South-East by East half Easterly	5
East South-East	4
East by South	7
East half Northerly	3

The Star-board Tack on Board, the Wind S E, E S E, E, *&c.*

South South-West	5
South by West	6
South	4
South South-East	7
South-East by South	3

The Direct Course and Distance from the first place of Departure is requir'd.

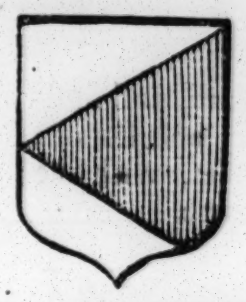
The Work by the Transverse Table.

Course.	Points	Dist.	North.	South.	East.	West.
S E by E ½ Ely	5 ½	5		2 36	4 41	
E S E	6	4		1 53	3 70	
E by S	7	7		1 37	6 86	
E ½ N'ly	7 ½	3	0 29		2 98	
S S W	2	5		4 62		1 91
S by W	1	6		5 88		1 17
South	0	4		4 00		0 00
S S E	2	7		6 47	2 08	
S E by S	3	3		2 49	1 67	
			0 29	28 72	21 70	
Sum				0 29	3 08	
				28 43	18 62	

Having set down the several Courses, and Distances, then in the *Traverse Table* find the Course on the Head of the Table, if under four Points, but at the bottom, if above four Points; and look the Distance in the Left Hand Column, and in the Square meeting will be the difference of Latitude and Departure under the respective Titles.

Thus, above 5 ½ Points, and right against 5 *m*, I find over Title Diff. Lat. 2 36 *m*, the *Difference of Latitude*, and over *Dep.* 4. 14, the *Departure*, in

the firſt Courſe, which being placed in their proper Columns, according as they are Northing or Southing, &c. Proceed in like manner with all the other Courſes or Diſtances entring and correſponding Differences of Latitude and Departures in their Columns: Then add up the Columns of Diff. of Lat. and Departure, Subſtracting the leſſer Difference of Latitude from the greater, and the leſſer Departure from the greater, and the Remainders are the whole Difference of Latitude and Departure ſhe hath made from the Place of her Departure; ſo in this Example, ſhe's 28, 43 *m* to the South of the Place of her Departure; and 18, 62 *m* Eaſt, with which by Caſe 5th I find her Courſe S E by S 2 Southerly, and Diſtancc 34 5 *m*.



TRAVERSE. There is alſo a Partition of an Eſcutcheon us'd in Heraldry of this Figure, which they call *Parted per Pale Traverſe*.

Argent and *Gules*.

TRAVERSE, is alſo a Word much uſed in Anſwer to Bills in *Chancery*; or it is that which the Defendant pleadeth or ſaith in Bar, to avoid the Plaintiff's Bill, either by confeſſing or avoiding, or by denying and *traverſing* the material parts thereof.

To traverſe an Office, is nothing elſe but to prove, That an Inquiſition made of Lands or Goods by the Eſcheator, is defective, and untruly made. And *to traverſe an Indictment*, is to take Iſſue upon the chief Matter, and to contradict or deny ſome Point of it.

TRAVERSE, in Fortification, is a little *Trench* bordered with two *Parapets*, *viz*. One on the right Side, and another on the left, which the Beſiegers make quite thwart the *Moat* of the Place, to paſs ſecure from *Flank*-ſhot, and to bring the Miners to the Baſtions.

This *Traverſe* is uſually covered on top with *Hurdles* or *Bavins* laden with Earth, for Security from the Fire-works, and differs from a *Coffer* only in this reſpect, That it is made by the *Beſiegers*, and the other by the *Beſieged*.

This Word is now often us'd for any Retrenchment or Line Fortify'd with Faſcines, Gabions Barrels, Bags of Earth, &c.

TRAVERSE-*Board*, is a little round Board hanging up in the Steerage of a Ship, and bored full of Holes upon Lines ſhowing the Points of the Compaſs; upon it, by moving of a little Peg from Hole to Hole, the Steers-man keeps an account how many Glaſſes (that is, half Hours) the Ship Steers upon any Point.

TRAUMATICKS, are thoſe things which being taking in Decoctions and Potions, fetch the ſerous and ſharp Humours out of the Body, and ſo attenuate the Blood, that it may be conveniently driven to the wounded, broken, or bruiſed Parts. *Blanchard*.

TREASON, is of two ſorts, *viz*. *High* and *Petty Treaſon*. *High Treaſon* is defined to be an Offence committed againſt the Security of the King or Kingdom, whether it be by Imagination, Word or Deed; as to compaſs or imagine the Death of the King, Queen, or Prince; or to Deflower the King's Wife, or his eldeſt Daughter unmarried, or his eldeſt Son's Wife; or levy War againſt the King in his Realm, adhere to his Enemies, counterfeit his Great Seal, Privy Seal, or Money: To Kill the King's Chancellor, Treaſurer, Juſtices of either Bench, Juſtices in Eyre, of Aſſize, or of Oyer and Terminer, being in their Place, doing their Office; diminiſhing or impairing current Money, and many others, as may be ſeen in divers Statutes particularly expreſs'd. In caſe of this *Treaſon*, a Man ſhall be Hang'd, Drawn and Quartered, and forfeit his Lands and Goods to the King. It is ſometime called *Treaſon Paramount*, *Petty Treaſon*. See the Word it ſelf in its proper place.

There is alſo mention of *Accumulative Treaſon*, and *Conſtructive Treaſon*, in the Statute 14 *Car*. 2. *cap*. 29. And here Note, That in *Majori proditione omnes ſunt principales*, there are no Acceſſaries in *Treaſon*, all are Principals. And *Voluntas non reputabitur pro facto niſi in cauſa Proditionis*, for *Petty Treaſon*.

TREASURE-TROVE, is when any Money, Gold, Silver, Plate, or Bullion is found in any Place, and none knows to whom it belongs; then the Property thereof belongs to the King, but the Civil Law gives it to the Finder, according to the Law of Nature. The Puniſhment for concealing *Treaſure found*, is Impriſonment and Fine. But if any Mine or Metal be found in any Ground, that always pertains to the Lord of the Soil, except it be a Mine of Gold or Silver, which uſed to be always to the King, in whoſe Ground ſoever it be found; But by a late Act of Parliament, the King hath only the *Præemption*.

TREBLE, is the laſt or higheſt of the four Parts in *Muſical Proportion*.

TREENELS, in a Ship, are long Pins or Nails of Wood, whence they are called Tree-nells, or Tree-nails, made out of the Heart of Oak, to faſten the Planks to the Timber; and theſe have always Oakam, driven into them to prevent any Leak.

TREES and *Shrubs*, of our Native Growth in *England*, are thus diſtinguiſhed by our moſt Judicious Botaniſt, Mr. *John Ray*.

I. *Such as have their Flower disjoined and remote from the Fruit; and theſe are.*

1. *Nuciferous ones*, or ſuch as bear Nuts, as the Walnut Tree, the Hazel Nut-tree, the Beach, the Cheſnut, and the common Oak.

2. *Coniferous ones*, or ſuch as bear a ſquammoſe or ſcaly Fruit, of a kind of Conical Figure, and of a woody or hard Subſtance, in which are many Seeds, which when they are Ripe, the Cone opens or gapes, in all its ſeveral Cells and Partitions, and ſo they drop out. Of this kind are the *Scotch* Firs, Male and Female; the Pine, which in our Gardens is called the *Scotch* Firr; the common Alder Tree, and the Birch Tree.

3. *Bacciferous ones*, or ſuch as bear Berries; as Juniper, and the Yew Tree.

4. *Lanigerous ones*, or ſuch as bear a woolly downy Subſtance; as the black, white, and trembling Poplar, Willows, and Oſiers of all kinds.

5. Such

5. Such as bear their Seeds (having an imperfect Flower) in Leafy Membranes or Caſes; as the *Horn-beam* of *Hardbeam*, called in ſome places the *Hornbeech*.

II. *Such as have their Fruits and Flowers Contiguous*; and theſe are either with *the Flower placed on the Top of the Fruit, or elſe have it adhering to the Baſe or Bottom of the Fruit.*

1. Trees and Shrubs with the Flower placed on the Top or Upper-part of the Fruit: Of theſe, ſome are *Pomiferous*, as Apples and Pears; and ſome *Bacciferous*, as the Sorb or Serviſe Tree; the White or Haw Thorn, the wild Roſe, Sweet-brier, Currants, the great Bilbery Buſh, Honey Suckle, Ivy, *&c.*

2. Trees whoſe Flower adheres to the Baſe or Bottom of the Fruit, are either ſuch as have their Fruit moiſt and ſoft when Ripe, as

1. *Pruniferous ones*, whoſe Fruit is pretty large and ſoft, with a Stone in the middle; as the black Thorn or Slow-Tree, the black and white Bullace Tree, the common wild Cherry-Tree, the Black Cherry, *&c.*

2. *Bacciferous ones*; as the Strawberry Tree, in the Weſt of *Ireland*, Miſſeltoe, Water Elder, the Dwarf a large Lawrel, the Viburnum or way-faring Tree, the Dog-berry Tree, the Sea black Thorn, the Berry-bearing Elder, the Privet Barberry, common Elder, the Holly, the Buck Thorn, the Berry-bearing Heath, the Bramble and the Spindle Tree, or Prick-wood.

Such as have their Fruit dry when 'tis Ripe; as, the Bladder Nut-Tree, the Box-Tree, the common Elm and Aſh, the Maple, the *Gaule* or *Sweet-Willow*, common Heath, Broom, Diers Weed, Furze or Gorſe, the Lime-Tree, *&c.*

TREMOR, is a voluntary Motion depraved, by which the Member is ſometimes raiſed up, and ſometimes depreſſed through the mutal Contraction between the Faculty and the Part affected.

TRENCHES, in Fortification, are certain Moats or Ditches, which the Beſiegers cut to approach more ſecurely to the Place Attack'd, and are of ſeveral ſorts, according to the different nature of the Soil; for if the adjacent Territory be Rocky, the Trench is only an Elevation of *Bayins*, *Gabions*, *Wool-packs*, or Shouldrings of Earth caſt up round about the Place: But where the Ground may be eaſily open'd, the Trench is dug therein, and border'd with a Parapet on the Side of the Beſieged. The Breadth of it ought to be from 8 to 10 Foot, and the Depth from 6 to 7.

Theſe *Trenches* are to be carried on with winding Lines, in ſome manner parallel to the Works of the Fortreſs, ſo as not to be in view of the Enemy, nor to expoſe its Length to their Shot, which they call *Enfilading*; for then it will be in danger of being *Enfiladed*, or ſcoured by the Enemies Cannon: And this carrying of the Trenches obliquely, they call, carrying the Trenches by *Coudees* or *Traverſes*.

They call it *Opening the Trenches*, when the Beſiegers begin to Work upon the Line of Approaches; and this is uſually done in the Night, and ſometimes within Musket-ſhot, and ſometimes within half or whole Cannon-ſhot of the Place, if there be no riſing Ground about it, the Garriſon Strong, and their Cannon well ſerved. The Workmen that open the Trenches, are always Supported by Bodies of Men againſt the Sallys of the Beſieged; and ſometimes thoſe bodies lie between them and the Place, as alſo on their Right and Left. The Pioneers ſometimes Work on their Knees, and the Men that are to ſupport them, lie flat on their Faces, in order to avoid the Enemies ſhot: And the Pioneers are alſo uſually covered with *Mantelets* or *Sauciſſons*. They alſo ſay, *Mount the Trenches*; that is, go upon Duty in them: And to *Relieve the Trenches*, is to Relieve ſuch as have been upon Duty there. To *Carry on the Trenches*, is to advance them towards any Place.

TREPANUM, the ſame with *Mediolus*; which ſee.

TRESPASS, ſignifies any Tranſgreſſion of the Law under Treaſon, Felony, or Miſpriſion of either; for a Lord of the Parliament to depart from thence without the King's Licence, is neither Treaſon nor Felony, but *Treſpaſs*.

But this Word is moſt commonly uſed for that Wrong or Damage which is done either to the King in his Foreſt, or by one private Man to another; and according to this Signification, it is of two ſorts; *Treſpaſs General*, otherwiſe called *Treſpaſs vi & armis*; and *Treſpaſs Special*, otherwiſe called *Treſpaſs upon the Caſe*; and this ſeemeth to be without Force, howbeit they are ſometimes confounded. How to diſtinguiſh the Forms of theſe Writs or Actions, ſee F. N. B. *Fol.* 86, 87. In an Action of *Treſpaſs*, the Plaintiff always Sues for Damages, or the Value of the Hurt done him by the Defendant. There is alſo *Treſpaſs local*, and *Treſpaſs tranſitory*. *Treſpaſs local*, is that which is ſo annexed to the Place certain, that if the Defendant joyn iſſue upon a Place, and traverſe the Place only by ſaying *abſque hoc*, That he did the *Treſpaſs* in the Place mentioned in the Declaration, and aver it, it is enough to defeat the Action. *Treſpaſs Tranſitory*, is that which cannot be defeated by the Defendant's traverſe of the Peace, becauſe the Place is not material: But the Action of *Treſpaſs quære clauſum fregit*, ought to be *Local*.

TRESSEL-TREES, in a Ship, are thoſe Timbers of the Croſs Trees that ſtand along Ships, or Fore and aft at the tops of the Maſts. See *Croſs Trees*.

TRESSURE, a term in Heraldry for an *Orle* when it is flowered; and if there be two of them, it is called a double Treſſure. See *Orle*.

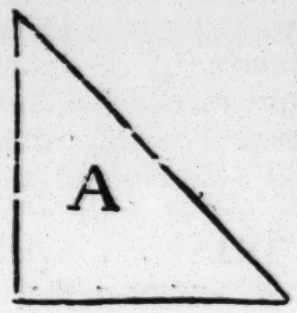
TRIA *Prima*, are Salt, Sulphur, and Mercury, the Three Hypoſtatical Principles of the Chymiſts, out of which they pretend that all mix'd Bodies are compounded, and into which they are ultimately reſolvable by Fire; but the latter is falſe, and the firſt impoſſible to be proved.

TRIAL, in Law, is uſed for the Examination of all Cauſes, Civil and Criminal, according to the Laws of the Realm, before a proper Judge: Of which there are divers kinds; as Matters of Fact ſhall be tried by the Jurors; Matters of Law, by the Juſtices; Matters of Record, by the Record it ſelf. A Lord of Parliament, upon an Indictment of Treaſon or Felony, ſhall be Tried without any Oath by his Peers, upon their Ho-

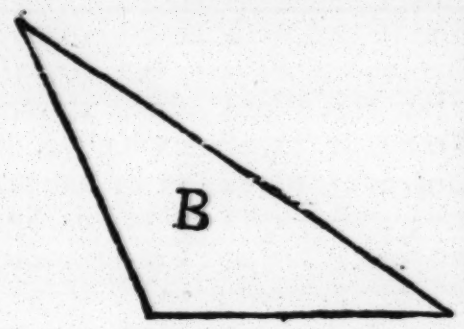
nours and Allegiance; but in Appeal at the Suit of any Subject, they ſhall be Tried *per bonos & legales homines*. If ancient Demeſne be pleaded of a Mannor, and denied, this ſhall be Tried by the Record of *Doomsday*. Baſtardy, *Excommengement*, Lawfulneſs of Marriage, and other Eccleſiaſtical Matters ſhall be Tried by the Biſhop's Certificate.

TRIANGLE, is a Figure having three Angles and three Sides only, and is either *Spherical*, (which ſee) or *Plane*; whoſe Sides are Right Lines. Every *Plane Triangle* may be conſider'd with relation either to its Angles, or its Sides. As to its Angles 'tis either,

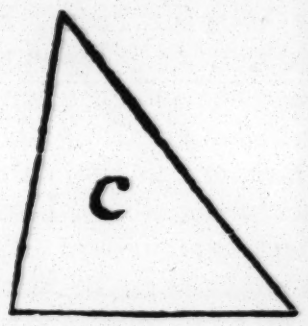
1. *Right Angled Triangle*, is that which hath one *Right Angle*, as A.



2. *Obtuſe Angled Triangle*, is ſuch as hath one Obtuſe Angle, as B.



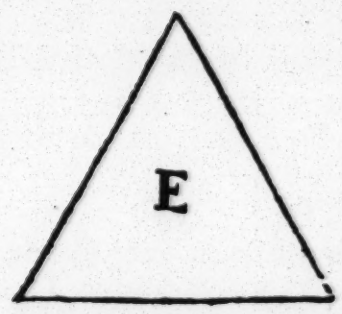
3. *Acute Angled Triangle*, is that which hath all its Angles *Acute*, as C.



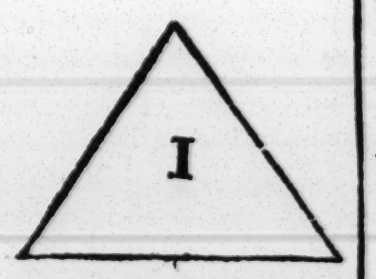
N. B. Any Triangle that is not Right Angled is called *Oblique Angled*, or *Amblygonial*.

A Triangle, as to its Sides, is either,

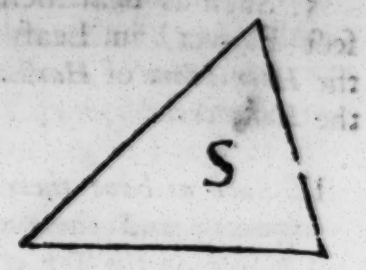
1. *Equilateral Triangle*, is that which hath all its Sides equal to one another, as E.



2. *Iſoſceles*, or an *Equilegg'd Triangle*, is that which hath only two Sides equal, as I.



3. *Scalenous Triangle*, is that which has no two Sides equal, as S.



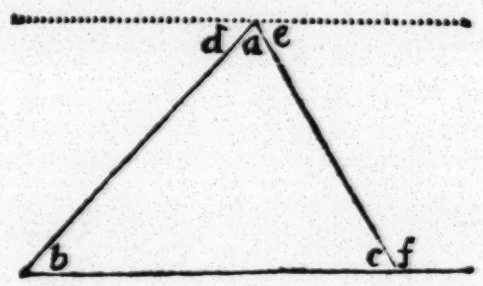
To find the *Area* of all Triangles, ſee *Area*.

Of the Properties of Plane Triangles.

PROPOSITION I.

In every Triangle, the ſum of all the three Angles is equal to two Right ones; and the external Angle made by any Side produced, is equal to the ſum of the internal and its oppoſite.

I ſay, 1. $a + b + c = 2 \sqrt{\ }$
2. $f = b + a$. $\sqrt{\ }$.



Draw the prick'd Line through the Vertex parallel to the Baſe: Then will the Angles *d* and *e* be ſeverally equal to the alternate ones *b* and *c*. (29 *è*. 1. *Eucl.*) But $d + a + e = \angle$ (by Cor. 2. 13 *è*. 1. *Eucl.*) Wherefore $b + a + c = 2 \angle$. *Q. E. D.*

And ſince $c + f$ are alſo equal to $2 \angle$ (13. *è*. 1. *Eucl.*) if *c* be taken from both, there muſt remain $f = b + a$. *Q. E. D.*

COROLLARY I.

Hence no $\triangle$ can have 2 obtuſe or 2 $\angle$.

COROL. II.

In a Right-angled $\triangle$, the 2 oblique Angles muſt make a right one between them.

COROL. III.

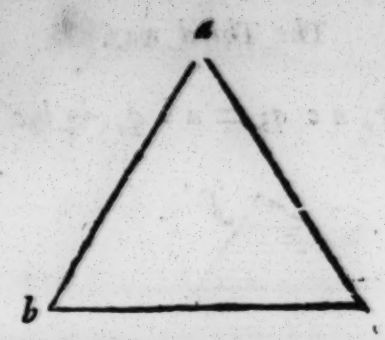
If 2 Angles in one $\triangle$ be $=$ to 2 in another, the remaining Angles muſt alſo be equal.

PROP. II.

In the ſame Triangle, equal Sides ſubtend, and are ſubtended by equal Angles.

I ſay, if $a = b$, then $a c = c b$.

Becauſe

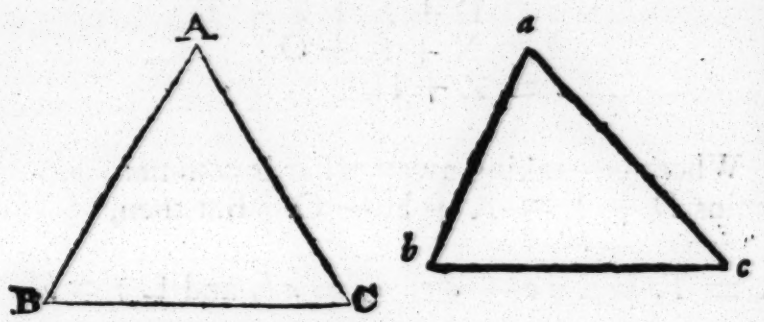


Becauſe the Angles *a* and *b* are equal, the Lines *a c* and *c b* muſt be equally inclined to the Baſe *a b*; and conſequently, be ſo at the Point *c* where they meet, and therefore *c* muſt be equidiſtant from *a* and *b*; for if *c* be nearer to, or farther from *b* than *a*, it muſt be becauſe the Angle *a* is leſſer or greater than *b*, which is contrary to the Suppoſition.

And on the other hand, if the ſides are equal, the Angles muſt; for being equal, they muſt needs be equally inclined to the Baſe *a b*, in the Point *c*, where they meet.

PROP. III.

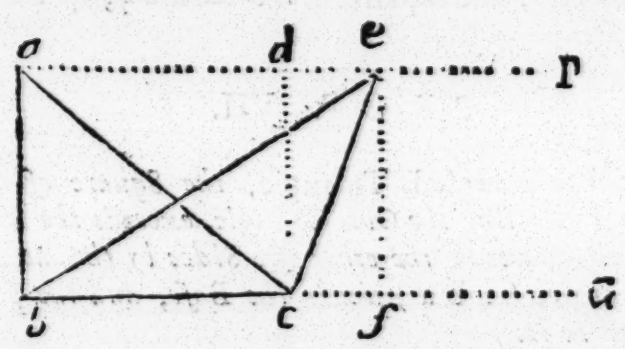
In two Triangles A B C, *and* a b c, *if all the three Sides, or two Sides and one Angle, or two Angles and one Side be reſpectively equal one to another, the whole Triangles are equal.*



For being laid one on another, they will concur.

PROP. IV.

Triangles on the ſame Baſe, and having the ſame Height, (that is, being between the ſame parallel Lines) are equal.



I ſay the Triangles *a b c*, and *e b c*, having the ſame Baſe *b c*, and between the ſame parallel Lines *a* P and *b* C, are equal.

Draw *d c* and *e f* parallel to *a b*.

1. The *Triangles d c e* and *e c f* are equal, becauſe each equal to half the Parallelogram *d f*.

2. The *Triangles a b e* and *e b f* are alſo equal, being each equal to half the Parallelogram *a f*.

3. But $\triangle a b c + \triangle c e f =$ half the $\square a f$.

4. And $\triangle e b c + \triangle c e f =$ half the $\square a f$.

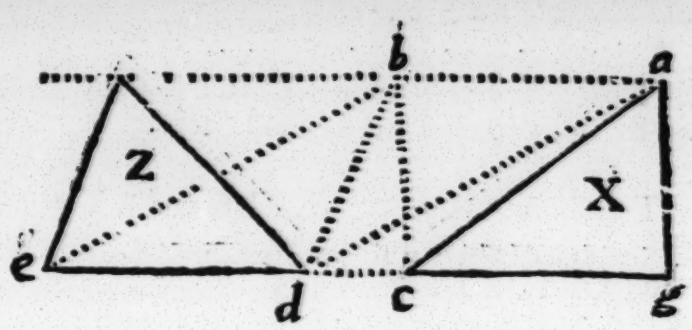
Therefore, if the $\triangle c e f$ be taken away from both Sides, the $\triangle e b c$ muſt remain $=$ to the *Triangles a b c*. *Q. E. D.*

PROP. V.

Triangles on equal Baſes, and between the ſame Parallel Lines, are equal.

I ſay $\triangle Z = \triangle X$.

Draw *b c* parallel to *a g* join'd *d a*, *d b*, and *b e*.



1. $\triangle Z = e b d$. (*per preced.*) $= a b d$, becauſe 'tis half the $\square a b e d$.

2. $\triangle a b d = a b c$ (*per preced.*) $= \triangle X$, becauſe 'tis half the $\square a b c g$.

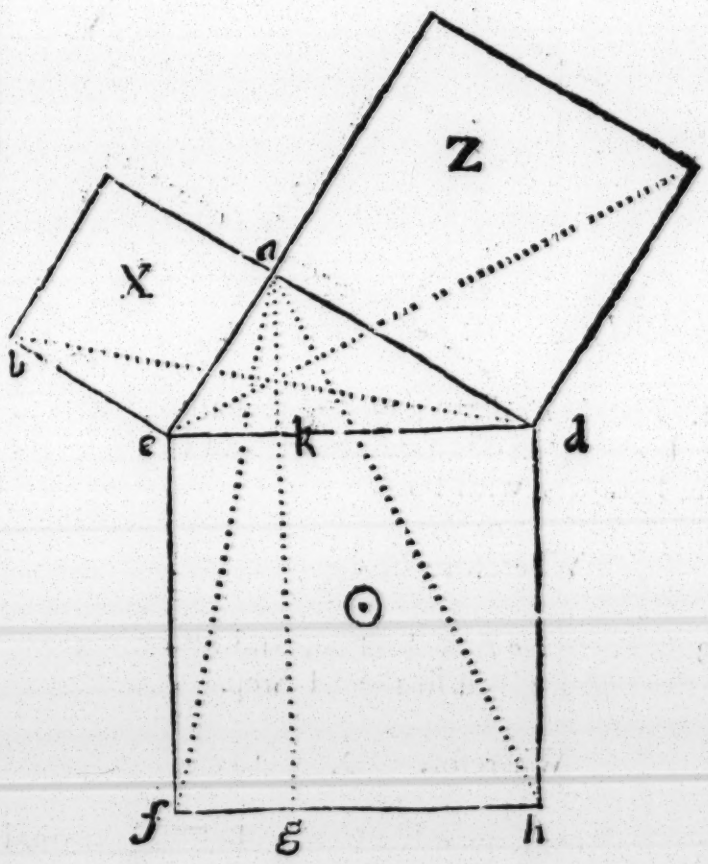
Wherefore $\triangle Z$ muſt be equal to $\triangle X$. *Q. E. D.*

COROL.

Hence follows, that if two Lines have between them equal *Triangles* on the ſame or equal Baſes, theſe Lines muſt be Parallel to each other.

PROP. VI.

I ſay the Square of the Hypothenuſe (e d) *of a Rectangled* $\triangle$ (e a d) *is equal to both the Squares of the 2 other Sides* (a e) *and* (a d.)



That is,

$$\boxed{\square q; = Z = q; + X q;}$$

1. O q; = □ kf + □ kb.

2. ½ □ kf = △ fae, and ½ □ kb = △ adb; becauſe □s on the ſame Baſes, are double to △s that have the ſame perpendicular height, or are between the ſame parallel Lines.

3. But △ fae = △ bed, and the △ hda = △ ecd, as having ſeverally two Sides and one Angle in one equal to thoſe in the other. The two equal Sides, are the Sides of the Square, and the obtuſe Angle $bed = edc$.

4. Now ½X q; = △ bed, and ½Z q; = △ dce, (by the Proof in the Second Step.)

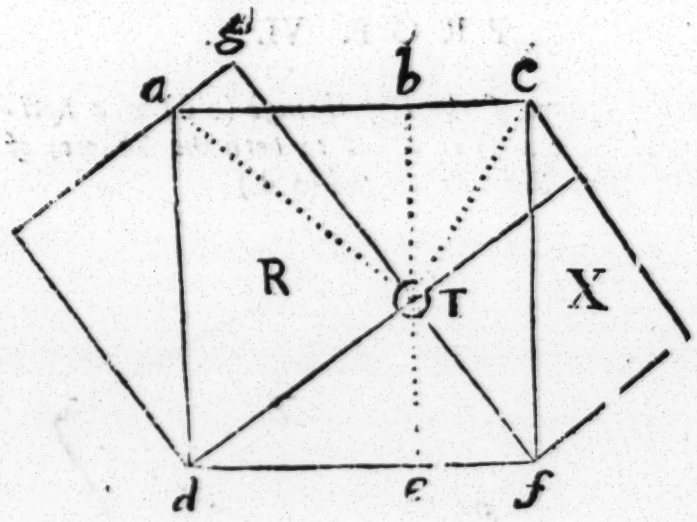
5. Therefore ½X q; = ½ □ kf, and ½Z q; = ¾ □ kb (by comparing together the 2d, 3d and 4th Steps.)

6. And conſequently, X q; = □ kf, and Z q; = □ kb, (for if the halves are equal, the wholes muſt.)

Wherefore X q; + Z q; = O q; (by the firſt Step.) *Q. E. D.*

The Second way.

I ſay the Square of df = Sum of the Squares of do and of



1. □ df = □ ae + □ ec.

2. The △ aod = ½ □ dg, and alſo = to ½ □ ae, becauſe on the ſame Baſe, and between the ſame Parallels with both.

Wherefore □ dg = □ ae.

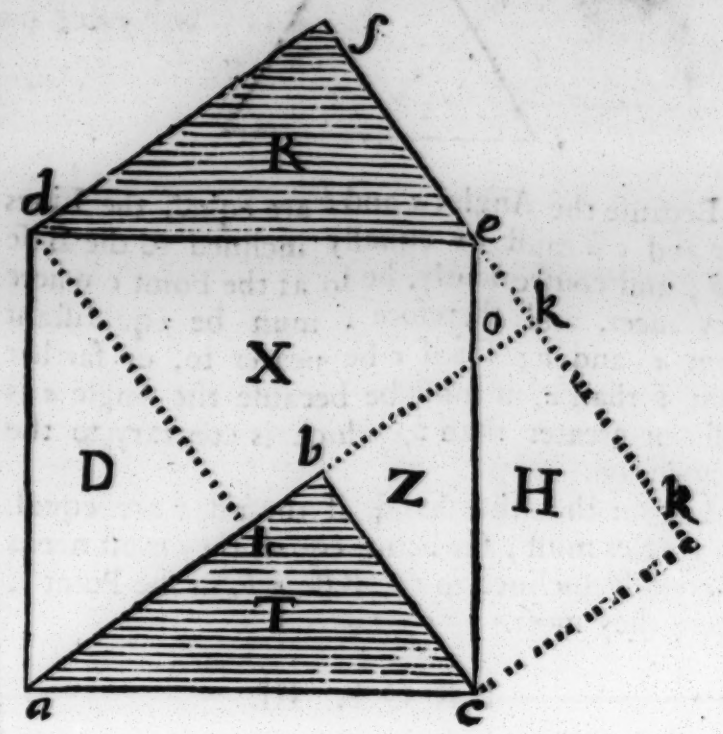
3. The △ cof = ½ □ X, and alſo to ½ □ ec for the reaſon given in the 2d Step.

Wherefore □ X = □ ec.

4. And conſequently, □ dg + □ X is equal to □ df, (by Step 1.) *Q. E. D.*

The Third way.

I ſay, $ac\ q; = ab\ q; + bc\ q;$



Make bk = to ab, and compleat all the Squares.

Then will,

□ ac = D + X + Z + T.
□ ab = X + R + O.
□ bc = Z + H.

Wherefore taking away what is common, Remains D + T = R + H + O. But then,

R = T, bec. $ae = de$, $df = ab$, and ∟ $f = b$.

Remains to be proved, that

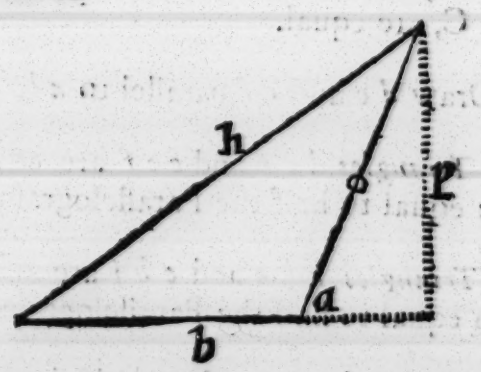
D = H + O. Which it is, becauſe D = R (as having 2 = Sides and one ∟) and R was proved = T, and T = O + H, becauſe $ac = ce$, the Angle at b = k, and the Angle $acb = eck$ (becauſe each with bce makes a ∟.)

Wherefore, the Square of ac = $ab\ q; + bc\ q;$ *Q. E. D.*

PROP. VII.

In an Obtuſe-angled Triangle, *the Square of the Side ſubtending the Obtuſe Angle, exceeds the Sum of the Squares of the other two Sides by the double Rectangle,* (2 b a) *under the Baſe, and the part added to it.*

Let fall the Perpendicular p, and produce b, till it meet with it.



Demon.

Demonſtration.

1. $b\,b$ = $b\,b + 2\,b\,a + a\,a + p\,p$.

2. And $o\,o = p\,p + a\,a$.

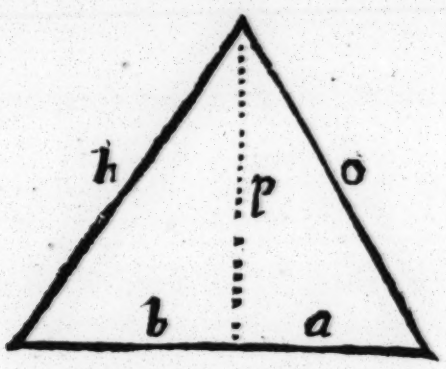
3. But $b\,b + o\,o = b\,b + a\,a + p\,p$.

Wherefore $b\,b$ exceeds the laſt Step by $2\,b\,a$. *Q. E. D.*

PROP. VIII.

In an Acute-angled Triangle, *the Square of the Side* (h) *ſubtending an* Acute, *is leſs than the Sum of the Squares of the other two Sides, by double the Rectangle under the whole Baſe,* (b + a) *and the Segment of the Baſe* (a) *which is next to the* Acute-angle.

Let fall the Perpendicular *p*.



Demonſtration.

1. $h\,h = b\,b + p\,p$.

2. $o\,o = p\,p + a\,a$.

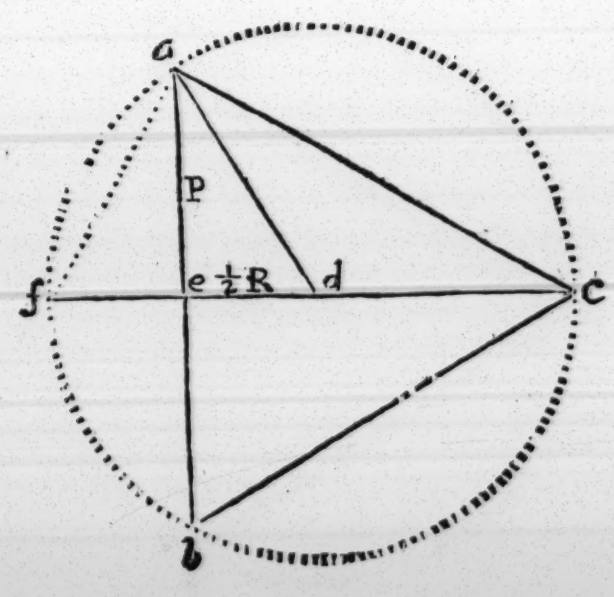
3 Q. $\overline{b + a} = b\,b + 2\,b\,a + a\,a$.

4. $b\,b + p\,p + 2\,a\,a + 2\,a\,b$, is the Sum of the Squares of the Legs.

Wherefore $h\,h$ is leſs than that by $2\,a\,a + 2\,a\,b$, which is plainly equal to the Double Rectangle under the whole Baſe, and the part *a*.

PROP. IX.

The Side a b *of an* Equilateral Triangle, a b c, *inſcribed in a Circle, is in Power Triple of the Radius; or its Square is equal to thrice the Square of the Radius,* a d.



Let the Radius be called R, and conſequently its Square R R.

I ſay, then $d\,e = \frac{1}{2}$ R, for the two Triangles *f e a*, and *e a d*, are equal, as having two Angles and one Side Equal, in both. Wherefore the Square of $e\,d = \frac{1}{4}$ R R; which being ſubtracted from R R, leaves P P = $\frac{3}{4}$ R R. Wherefore P = $\sqrt{:\frac{3}{4}}$ RR; and conſequently its double $a\,b$ = $2\sqrt{:\frac{3}{4}}$ R R; *i. e.* to the $\sqrt{:\frac{12}{4}}\sqrt{}$ R R, or to $\sqrt{:}$ 3 R R. Wherefore 3 R R = □ of $a\,b$; or $a\,b\,p$ = 3 R R. *Q. E. D.*

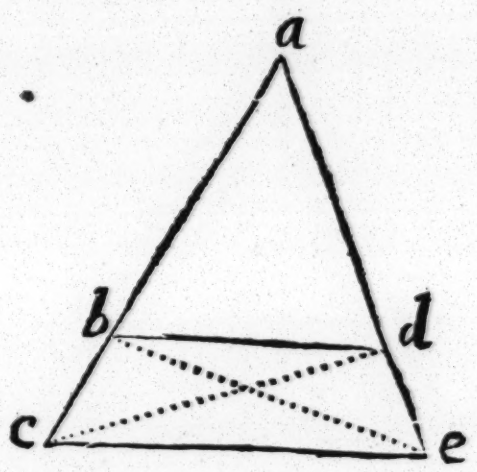
N. B. Herein is founded *Euclid*'s way of generating a *Tetrahedrum*, and inſcribing it in a given Sphere. See *Prop.* 13 & 13.

PROP. X.

The Sides of a Triangle *are cut Proportionably by a Line drawn Parallel to the Baſe.*

That is, it makes, $a\,b : b\,c :: a\,d : d\,e$.

Draw the Lines $b\,e$ and $c\,d$.



Demonſtration.

1. The *Triangles bdc*, and *bde*, are equal, becauſe on the ſame Baſe, and between the ſame Parallels. Therefore the Triangle *a b d*, will have the ſame Proportion to them both, *i. e.* $a\,b\,d : b\,d\,c :: a\,b\,d : b\,d\,e$. But the Triangle *a b d*, having the ſame height with the two equal *Triangles b d c*, and *b d e*, will be to them as its two Sides *a b* and *a d*, are to their Baſes *b c* and *d e*.

Therefore $a\,b : c\,b :: a\,d : e$.

Which *Proportionals*, may be conſidered and varied according to the ſeveral Species of *Proportion*.

As by *Inverſion*, $c\,b : a\,b :: d\,c$: the Parts of the Legs below the Parallel, are Proportional to thoſe above it.

Alſo *Alternately*, $a\,b : a\,d :: e\,b : d\,e$. The Part of one Leg above the Parallel, is to the Part of the other Leg above the Parallel, as the Parts below are to one another.

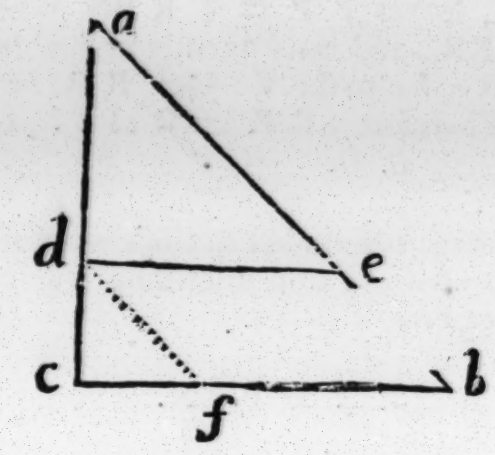
The ſame thing may be done by *Compoſition* and *Diviſion*, &c.

PROP.

PROP. XI

In a Triangle, *a Parallel to the Baſe, is to the Baſe, as the Parts above the Parallel are to the whole Legs.*

That is, $de : cb :: ad : ae :: ae : ab$.



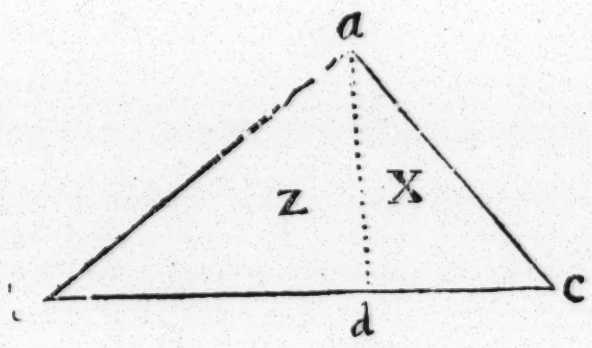
Draw df parallel to eb.

Then will $fb = de$: Therefore 'twill be $bf : fc :: da : dc$: And by *Inverſion*, $fc : bf :: dc : da$. And then by *Compoſition*, $fc + bf$ (i. e. bc) : bf (i. e. de.) $:: dc + da$ (i. e. ac:) da; or as $cb : de :: ac : da$.

Which *Inverted*, gives $de : cb :: ad : ac$. *Q. E. D.*

PROP. XII.

In a Right-angled Triangle (a b c) *a Line* (a d) *drawn from the Right-angle at the Top, Perpendicular to the Hypothenuſe* (b c) *divides the Triangle* (a b c) *into two other* Right-angled Triangles, *which are ſimilar to the firſt Triangle, and to one another.*



1. For all three Triangles have one Right-angle. And the Triangles abc, and abd, have the Angle b (common to both) and conſequently the third Angle bad, muſt be equal to c. Wherefore theſe two Triangles are ſimilar.

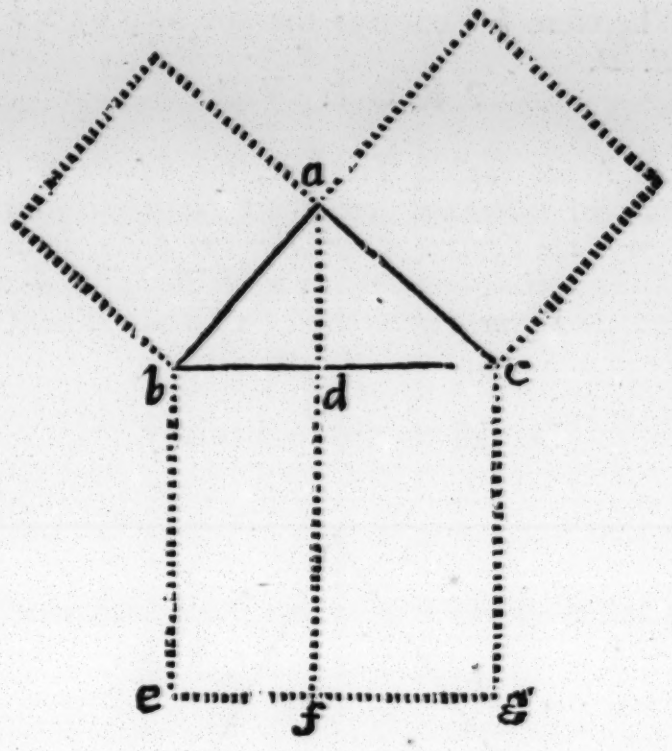
2. The Caſe is the ſame, as to the Triangles abc and adc: But the Triangles abd and adc, being ſimilar to the great one abc, muſt be alſo ſimilar to one another. *Q. E. D.*

From the Similarity of which three Triangles, it will follow, that the Sides about the Equal Angles are proportional (by 4. & 6. *Eucl.*) and thence ariſes the Proof of the next Famous Propoſition, by this means proved a fourth way.

PROP. XIII.

In every Right-angled Triangle, *the Square of the* Hypothenuſe *is equal to the Sum of the Squares of the other two Sides.*

I ſay, $\square bc = \square ba + \square ac$.



Demonſtration.

1. For the Square bg is made up of the two Rectangles bf and dg.

But $\square bf = \square ba$, *for* $cb : ba :: ba : bd$. That is, $\square ba = cb \times bd = \square bf$.

And $\square dg = \square ac$. for $bc : ac :: ac : cd$. That is, $\square ac = bc \times cd = \square dg$.

Wherefore $\square bc$ ($= \square bf + \square dg$) $= \square ba + \square ac$. *Q. E. D.*

COROLLARY.

Hence 'tis plain, That any Figure made on the *Hypothenuſe* of any *Right-angled Triangle*, ſhall be equal to two other ſimilar Figures made on the Sides. Becauſe all ſuch Figures are to one another, as the Squares of their Homologous Sides.

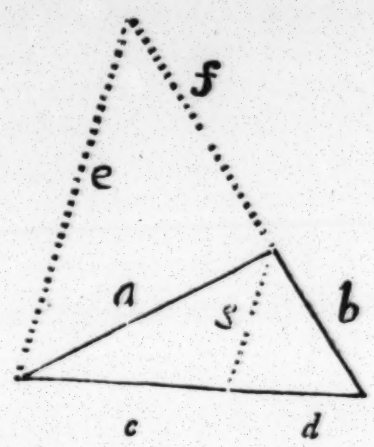
You have above three other ways of demonſtrating this admirable Propoſition, without the Doctrine of Proportion being firſt learnt.

PROP. XIV.

If any Angle of a Triangle be biſſected, the Biſſecting Line will divide the oppoſite Side in the ſame Proportion as the Legs of the Angle are to one another.

Let the Sides of the Triangle be *a*, *b*, and *c* + *d*, and the Biſſecting Line *s*,

I ſay, *a* : *b* :: *c* : *d*.



Produce the Leg *b*, till *f* = *a* the other Leg of the Angle, and draw the Line *e*. Then will the Triangle *e f a* be an *Iſoſceles*; and conſequently the Angles at the Baſe *e*, will be equal: And therefore each will be equal to half the biſſected Angle, (becauſe that is external and equal to them both:) Therefore in the firſt Triangle, the Biſſecting Line *s* is parellel to the Baſe *e*; and conſequently, *f* : *b* :: *c* : *d*.

That is, *a* : *b* :: *c* : *d*? Q. E. D.

TRIANGULAR *Compaſſes*, are ſuch as have three Legs or Feet to take off any Triangle at once; they are uſed in Maps, Globes, &c.

TRIANGULAR *Quadrant*, is a *Sector*, with a looſe Piece to make it an *Equilateral Triangle*; the Calendar is graduated on it, with the Sun's Place, Declination, and many other uſeful Lines, and by the help of a String and a Plummet, and the Diviſions graduated on the looſe Piece, it may be made to ſerve for a Quadrant.

TRIANGULARE *Oſſiculum*, the Triangular little Bone, is that which is placed betwixt the Lambdoidal Suture of the Scull, and the *Sagittalis*. *Blanchard*.

TRIANGULARIS, a Muſcle of the *Thorax*, which with its Partner, lies on each Side the *Cartilago Enſiformis*, within the Cavity of the *Thorax*, under the *Sternum*; ſometimes this appears to be three, at other times four diſtinct Muſcles on each Side. It ariſes from the inferior Part of the *Os Pectoris*, whence its upper Part aſcends, and lower deſcends to its Implantations at the Bony Endings of the fourth, fifth, ſixth, and ſometimes ſeventh and eighth Ribs, near their Conjunction with their Cartilages. Its reputed Uſe by moſt (if not all) Anatomiſts, is to contract the Breaſt.

TRIANGULUS *Septentrionalis*, or *Deltoton*, the *Triangle*, a Northern Conſtellation conſiſting of 6 Stars.

TRIBRACHYS, is the Foot of a *Latin* Verſe, conſiſting of three Syllables, and thoſe all ſhort, as *Priamus*.

TRIBRACHUS, the ſame with *Tribrachys*.

TRICEPS, is a Muſcle of the Thigh, ſo called from its three Heads or Beginnings, the firſt and largeſt of which, ariſeth broad and fleſhy from the Inferior Edges, and External Parts of the *Os Iſchium*, and *Pubis*, where they are joined to each other lying between the *Semi-tendinoſus*, and *Semi-membranoſus*, and that of the *Gracilis*, and deſcending with an Oblique Order of fleſhy Fibres, is inſerted partly Tendinous and Fleſhy, near an Hand's Length in Breadth to the *Linea Aſpera*, of the Thigh-bone, that is immediately below the Inſertion of the *Quadratus Femoris*; its inferior Part making a ſtrong round Tendon, inſerted into the ſuperior Part of the Internal and Lower *Appendix* of the Thigh-bone.

The ſecond Head, or Beginning of this Muſcle, ariſeth Tendinous from the *Os Pubis*, but in its deſcent ſoon becomes Fleſhy, and joins with the former, near to its Inſertion to the middle Part of the *Linea Aſpera* of the Thigh-bone.

The third and laſt Beginning of this Muſcle, ſpringeth from the inferior Part of the *Os Pubis*, between the Origination of its laſt deſcribed Head, and that of the *Pectineus*; and deſcending obliquely, joins with the Firſt near its Inſertion to the *Linea Aſpera* of the Thigh-bone, immediately above the Termination of the ſecond Head of this Muſcle. This moves the Thigh variouſly according to the Diverſity of its Beginnings; ſo the firſt deſcribed Part pulls the Thigh-bone upwards, inwards, and ſomewhat backwards: The ſecond and third Beginnings of it, pull it more inwards, and turn it ſomewhat outwards, as when we put our Legs acroſs each other.

TRICUSPIDES are three Valves of a Triangular Form, placed at the Mouth of the Right Ventricle of the Heart; they are made of a thin Membrane, and their Baſes are fixed to the Mouth of the ſaid Ventricle, and their Points tied by ſmall Fibres to the Fleſhy Productions; ſo that when the Heart contracts, its Point approaches its Baſis, and the Fleſhy Productions move upwards; therefore the Fibres of theſe Valves are relaxed, and the Valves lifted up by the Blood which gets underneath them, becauſe the Furrows and Fleſhy Productions keeping the Valves at a little Diſtance from the Sides of the Ventricle, give way to the Blood to paſs under them, and ſo to thruſt up the Valves, which ſhut ſo cloſely the Entry into the Ventricle, that the Blood cannot return the Way it came in, but when the Ventricle is dilated, the Fibres are pulled down, and the Paſſage made open for the Blood to enter.

TRIE, a Sea Term: See *Try*.

TRIEMIMERIS, is a Branch of the *Cæſura* of a *Latin* Verſe, when after the firſt Foot of the Verſe there remains an odd Syllable, which helps to make the next Foot; as in this Verſe.

Ille Latus Niveum molli fultus Hyacintho.

TRIGEMINUM: See *Complexus*.

TRIGILD: See *Argild*.

TRIGLYPH, in Architecture, is a Member of the *Frize* of the *Dorick Order*, ſet directly over every Pillar, and in certain Spaces in the Inter-columniations. By their Tringular Gutters (for they

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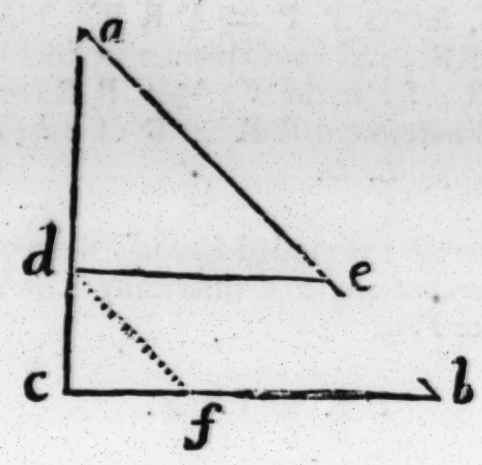

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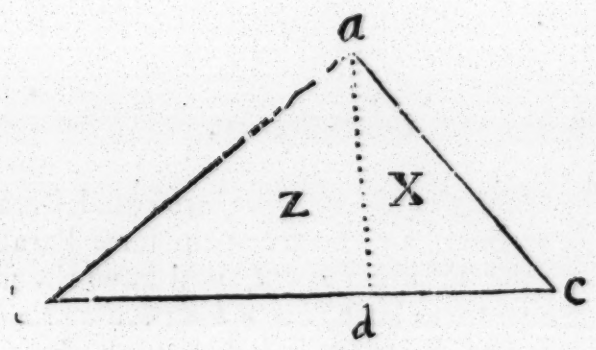

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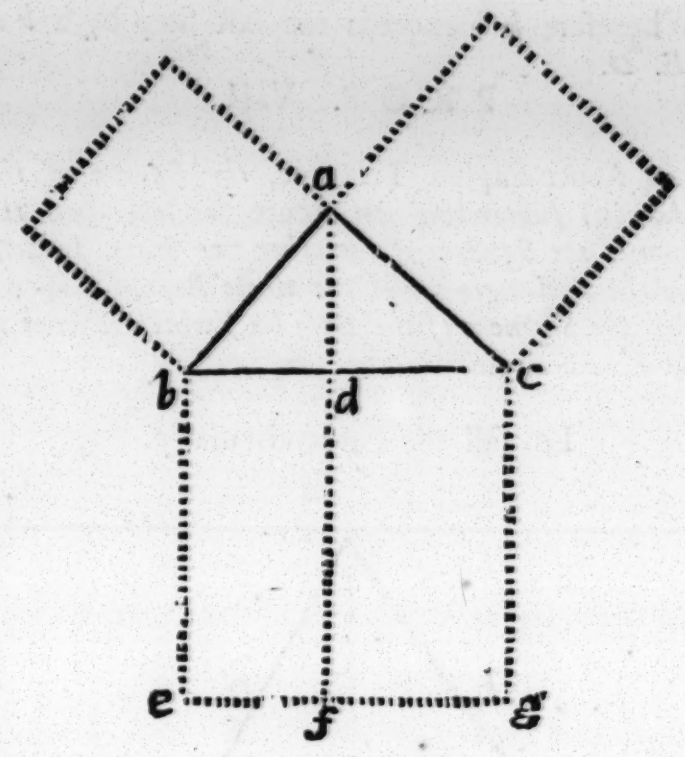

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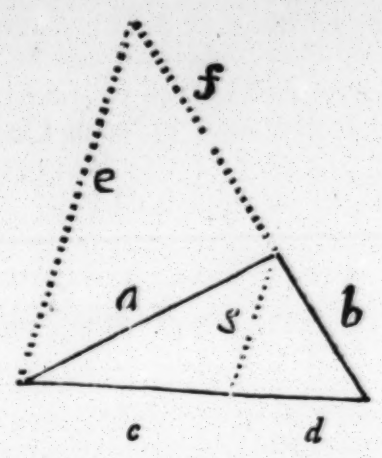
I ſay, *a* : *b* :: *c* : *d*.



Produce the Leg *b*, till *f* = *a* the other Leg of the Angle, and draw the Line *e*. Then will the Triangle *e f a* be an *Iſoſceles*; and conſequently the Angles at the Baſe *e*, will be equal: And therefore each will be equal to half the biſſected Angle, (becauſe that is external and equal to them both:) Therefore in the firſt Triangle, the Biſſecting Line *s* is parellel to the Baſe *e*; and conſequently, *f* : *b* :: *c* : *d*.

That is, *a* : *b* :: *c* : *d*? Q. E. D.

TRIANGULAR *Compaſſes*, are ſuch as have three Legs or Feet to take off any Triangle at once; they are uſed in Maps, Globes, &c.

TRIANGULAR *Quadrant*, is a *Sector*, with a looſe Piece to make it an *Equilateral Triangle*; the Calendar is graduated on it, with the Sun's Place, Declination, and many other uſeful Lines, and by the help of a String and a Plummet, and the Diviſions graduated on the looſe Piece, it may be made to ſerve for a Quadrant.

TRIANGULARE *Officulum*, the Triangular little Bone, is that which is placed betwixt the Lambdoidal Suture of the Scull, and the *Sagittalis*. *Blanchard*.

TRIANGULARIS, a Muſcle of the *Thorax*, which with its Partner, lies on each Side the *Cartilago Enſiformis*, within the Cavity of the *Thorax*, under the *Sternum*; ſometimes this appears to be three, at other times four diſtinct Muſcles on each Side. It ariſes from the inferior Part of the *Os Pectoris*, whence its upper Part aſcends, and lower deſcends to its Implantations at the Bony Endings of the fourth, fifth, ſixth, and ſometimes ſeventh and eighth Ribs, near their Conjunction with their Cartilages. Its reputed Uſe by moſt (if not all) Anatomiſts, is to contract the Breaſt.

TRIANGULUS *Septentrionalis*, or *Deltoton*, the *Triangle*, a Northern Conſtellation conſiſting of 6 Stars.

TRIBRACHYS, is the Foot of a *Latin* Verſe, conſiſting of three Syllables, and thoſe all ſhort, as *Priamus*.

TRIBRACHUS, the ſame with *Tribrachys*.

TRICEPS, is a Muſcle of the Thigh, ſo called from its three Heads or Beginnings, the firſt and largeſt of which, ariſeth broad and fleſhy from the Inferior Edges, and External Parts of the *Os Iſchium*, and *Pubis*, where they are joined to each other lying between the *Semi-tendinoſus*, and *Semi-membranoſus*, and that of the *Gracilis*, and deſcending with an Oblique Order of fleſhy Fibres, is inſerted partly Tendinous and Fleſhy, near an Hand's Length in Breadth to the *Linea Aſpera*, of the Thigh-bone, that is immediately below the Inſertion of the *Quadratus Femoris*; its inferior Part making a ſtrong round Tendon, inſerted into the ſuperior Part of the Internal and Lower *Appendix* of the Thigh-bone.

The ſecond Head, or Beginning of this Muſcle, ariſeth Tendinous from the *Os Pubis*, but in its deſcent ſoon becomes Fleſhy, and joins with the former, near to its Inſertion to the middle Part of the *Linea Aſpera* of the Thigh-bone.

The third and laſt Beginning of this Muſcle, ſpringeth from the inferior Part of the *Os Pubis*, between the Origination of its laſt deſcribed Head, and that of the *Pectineus*; and deſcending obliquely, joins with the Firſt near its Inſertion to the *Linea Aſpera* of the Thigh-bone, immediately above the Termination of the ſecond Head of this Muſcle. This moves the Thigh variouſly according to the Diverſity of its Beginnings; ſo the firſt deſcribed Part pulls the Thigh-bone upwards, inwards, and ſomewhat backwards: The ſecond and third Beginnings of it, pull it more inwards, and turn it ſomewhat outwards, as when we put our Legs acroſs each other.

TRICUSPIDES are three Valves of a Triangular Form, placed at the Mouth of the Right Ventricle of the Heart; they are made of a thin Membrane, and their Baſes are fixed to the Mouth of the ſaid Ventricle, and their Points tied by ſmall Fibres to the Fleſhy Productions; ſo that when the Heart contracts, its Point approaches its Baſis, and the Fleſhy Productions move upwards; therefore the Fibres of theſe Valves are relaxed, and the Valves lifted up by the Blood which gets underneath them, becauſe the Furrows and Fleſhy Productions keeping the Valves at a little Diſtance from the Sides of the Ventricle, give way to the Blood to paſs under them, and ſo to thruſt up the Valves, which ſhut ſo cloſely the Entry into the Ventricle, that the Blood cannot return the Way it came in, but when the Ventricle is dilated, the Fibres are pulled down, and the Paſſage made open for the Blood to enter.

TRIE, a Sea Term: See *Try*.

TRIEMIMERIS, is a Branch of the *Cæſura* of a *Latin* Verſe, when after the firſt Foot of the Verſe there remains an odd Syllable, which helps to make the next Foot; as in this Verſe.

Ille Latus Niveum molli fultus Hyacintho.

TRIGEMINUM: See *Complexus*.

TRIGILD: See *Argild*.

TRIGLYPH, in Architecture, is a Member of the *Frize* of the *Dorick Order*, ſet directly over every Pillar, and in certain Spaces in the Inter-columniations. By their Tringular Gutters (for they

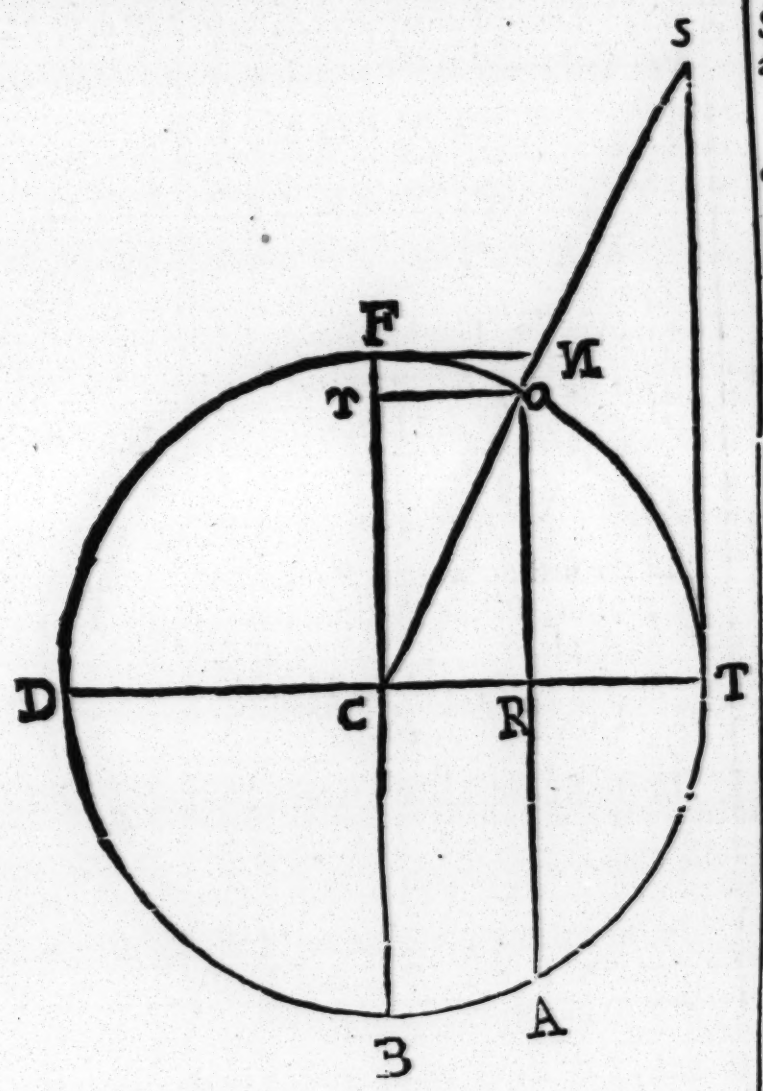
are always made with three *Glyphæ*, whence the Name;) they ſeem to have been deſign'd to convey the *Guttæ*, or Drops which hang a little under them: Some think they repreſent *Apollo*'s Lyre.

TRIGON, is a Word variouſly uſed in Mathematicks, and ſignifies a Figure with three Angles: By ſome addicted to Aſtrological Vanities, 'tis us'd for the ſame with what they as fillily call a Triplicity.

In Dialling there is ſometimes uſed an Inſtrument of a Triangular Form, which is called a *Trigon*.

TRIGONOMETRY is the Art of Meaſuring Triangles, or of Calculating the Sides of any Triangle ſought; and this is either *Plain* or *Spherical*: Of which I ſhall ſpeak diſtinctly; beginning firſt with the *Plain*.

The Art of *Trigonometry* doth much depend on the Knowledge of the following Lines in and about a Circle.



DEFINITIONS.

1. The Line D T in a Circle, is called the Diameter; one half of which, C T, as alſo C O, and C F, is called the Radius; and by ſome the whole Sine, becauſe all other Sines are taken out of it.

2. Any Right-line, as O A, joining the two Extremities of an Ark, is called the Chord, or Subtenſe, either of the Ark O T A, or of its Complement to a whole Circle O D A.

3. The Line O R, which is Perpendicular to the Radius C T, or which is juſt half the Chord O A, is called the Right-ſine, or moſt uſually the Sine of the Ark O T, or of the Ark O D, ſo that a Right-ſine is half the Chord of double the Ark.

4. The Difference of any Ark from a Quadrant, be it more leſs, is called its Complement. Thus O F is the Complement of the Ark O T, being what it wants of being a Quadrant; and O F is alſo the Exceſs by which the Ark O D exceeds a Quadrant; the Line *r o* is the Right Sign of the Complement, and therefore 'tis called the Co-Sine or Sine-Complement of the Ark O T; as O R is the Co-Sine of the Ark F O.

5. A Line, as T S, touching the Circle in the Point T, and Perpendicular to the Radius C T, is called a Tangent: And if a Right Line be drawn through O from the Centre of the Circle C, meeting with the Tangent in S, that Line S C is called a Secant, and they both limit one another, ſo as to be the Tangent and Secant of the Ark O T: F N is the Co-Tangent, and C N the Co-Secant of the ſame Ark; but they are the Tangent and Secant of the Complemental Ark O F.

6. The Line R T intercepted between the Right Sine and the Tangent, is called the Verſed Sine, and by ſome *Sagitta*.

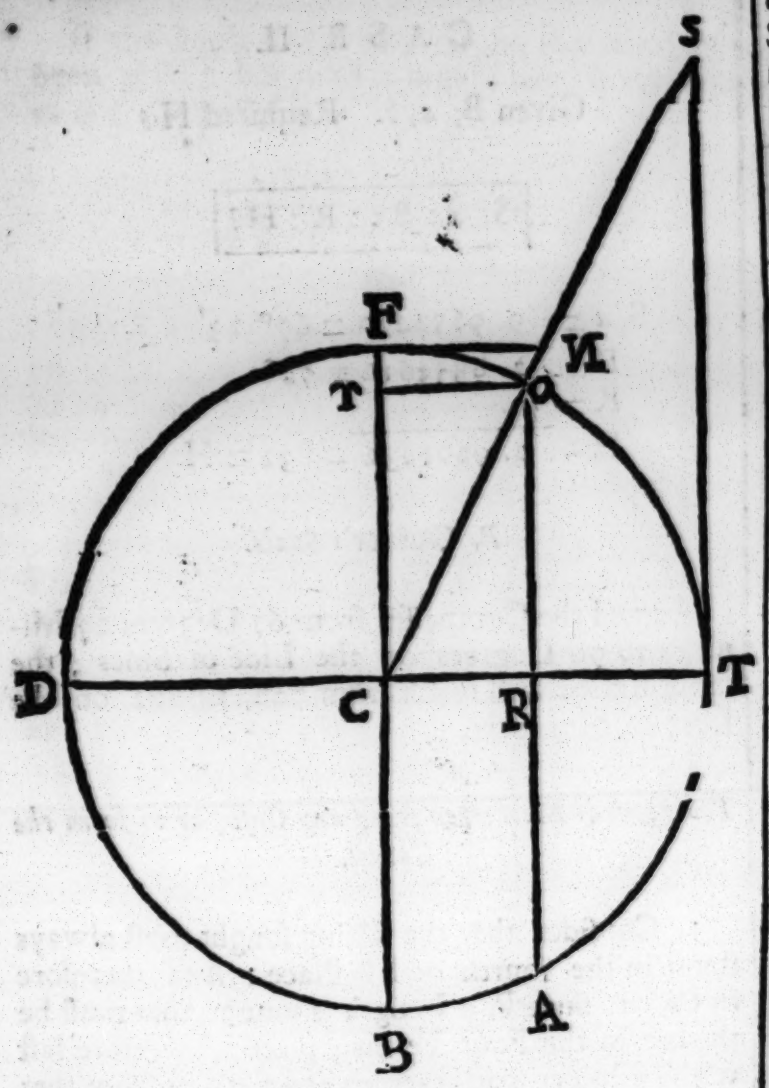
7. Whatever Number of Degrees an Ark wants of a Semi-circle, is called its Supplement.

8. The Line C R, which is the Part of the Radius C T lying between the Centre and the Right Sine, is always equal to, and may be taken for the Co-Sine *r* O; and C *r* is equal to the Right Sine O R.

9. If any Ark be leſs than a Quadrant, as T O, the Difference between the Radius and the Co-Sine, is the Verſed Sine R T; but if it exceed a Quadrant, as the Ark D F O doth then the Sum of the Radius and Co-Sine, is the Verſed Sine: Thus D C + C R = D R the Verſed Sine of the Ark D F O.

10. The Radius with the Sine and Co-Sine of any Ark (as T O) do make a Right-angle Triangle, as O C R, which is ſimilar to the Triangle C S T, made by the Radius, the Tangent, and the Secant. Alſo the Radius, the Co-Tangent, and the Co-Secant, make another Triangle ſimilar to the two former.

Hence



Hence 'tis plain,

1. That as the Co-Sine Is to the Sine : : So is the Radius To the Tangent. That is, C R : R O : : C T : T S.

2. As Radius Is to the Sine : : So is the Secant To the Tangent. That is, C O : O R : : C S : S T.

3. As the Sine Is to the Radius : : So is the Radius To the Co-Secant. That is, O R : O C : : F C : C N.

4. As the Tangent Is to the Radius : : So is Radius To the Co-Tangent; As S T : T C : : F N.

Therefore the Rectangle between the Tangent and Co-Tangent of any Ark is equal to the Square of the Radius.

11. Every Triangle has six Parts, of which three are Sides, and three Angles; and of these if we have three given, we can find the rest, (except in the Case where the three Angles only of a plain Triangle are given.)

For from thence the Sides cannot be found, because two Triangles may be Equiangular, and yet have the Sides by no means of the same length. We can find the rest, I say, if supposing the Radius divided into any Number of equal Parts, we can but discover how many of such parts any Sine, Tangent, or Secant of any Ark or Angle doth contain. Now this is ready done to our Hands, in the Table of Sines, Tangents, and Secants, which we have, with prodigious Industry, in Books ready calculated for this purpose.

12. When therefore any Triangle is given to be resolved, the first thing we have to do, is to consider, That there is in the Table of Logarithms, Sines, Tangents, and Secants, a Triangle exactly similar, and equal to that which we are required to solve, and whose Sides are to one another in the very same Proportion of those of the Triangles proposed.

12. We must understand whatever *Ratio* one Side of the Triangle given, hath to the other Side about the same Angle, considered as Lengths estimated or numbered by any known Measure, as suppose Inches, Yards, Miles, Leagues, *&c.* the very same hath the two Sides about the same Angle in the Triangles in the Tables, or in the Tabular Parts: Which two things well understood, do lead us into the whole Mystery of Trigonometrical Calculations.

13. *Trigonometry*, is either *Plain* or *Spherical*; and both may be resolved by the means of four *Propositions*, which because of their excellent Use, are called *Axioms*.

14. The first of which relates to *Rectangle Plain Triangles*; and is this:

AXIOM I.

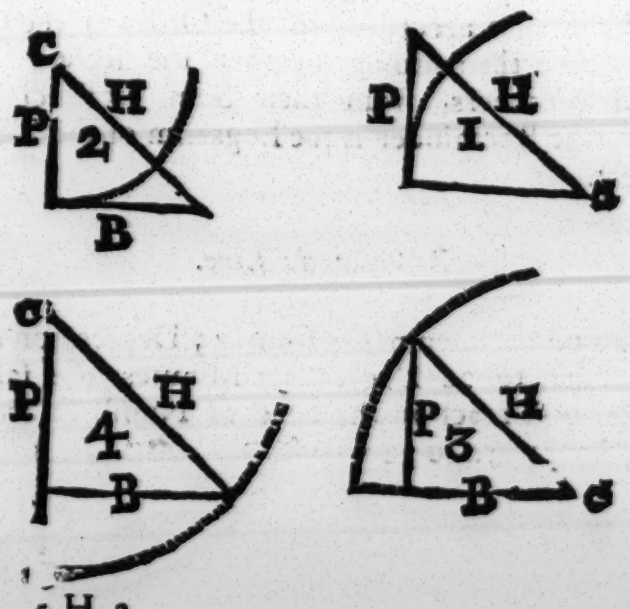
In a Right-angle Triangle, *if either of the Legs be supposed to be the Radius of a Circle, the other Leg will be the Tangent of the opposite Angle, or of the Angle at the Centre; and the Hypothenuse will be the Secant of that Angle: But if you imagine the Hypothenuse to be the Radius of a Circle, then each Leg will be the Sine of its opposite Angle, or of the Angle at the Centre; as is plain from the adjoining Figures.*

In the first of which, B (the Base) being made the Radius, P (the Perpendicular) is the Tangent of the Angle at *a*, the Centre of the Circle, which is opposite to P, and the Hypothenuse is the Secant of the same Angle.

In the second Figure, where P is made the Radius, B is the Tangent of the opposite Angle at the Centre *c*.

In the third Figure, where H the Hypothenuse is made the Radius, P is the right Sine of the opposite Angle at the Centre. And,

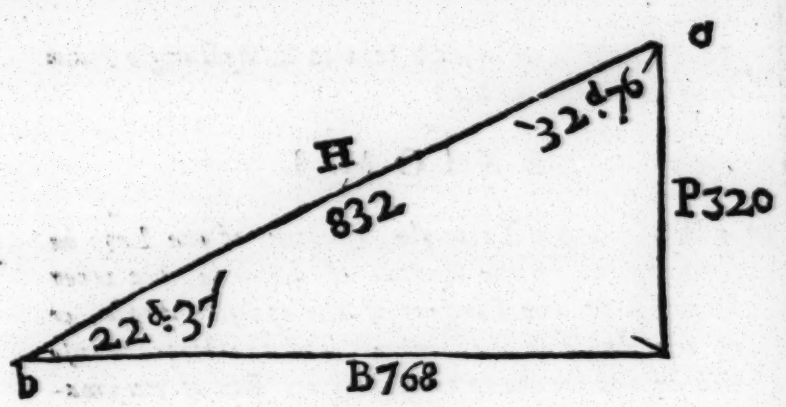
In the fourth Figure, H being also made Radius, but C the Centre of the Circle, B will be the Sine of its opposite Angle *c*.



5 H 2 Th

The Seven Caſes of Plain Triangles.

	Given	Required.	Proportions.	Given	Required.
1	B, *a*, *b*	P	R : B :: Tan. *b* : P	*c* : √ √	*c*
2	B, *a*, *b*	H	S, *a*, B :: R : H	*c* : √ √	*b*
3	B, H	√ √	H : R :: B : S, *a*	*c* : √ : *b*	√ √
4	B, H	P	H : R :: B : S, *a* Then R : T : *b* :: B : P Or R : B :: T : *b* : P	which finds the √ *a*,	
5	B : P	√ √	B : R :: P : T : *b*	*c* √ :	√ √
6	B : P	H	B : R :: P : T : *b* Then S : *b* P :: R : H	by the laſt. *c* √ :	*b*
7	H √ √	B	R : H :: S, *a* : B	*b* √ √	*c* √



The Calculation of the Seven Caſes of Right-angle Plain Triangles.

CASE I.

Given B, *a*, *b*. Required P?

Canon | R : B :: T : *b* : P? |

R = 10.
B = 2. 8853612 = 768
T, *b* = 9. 6197205 = 22° 37′
P = 2. 5050817 = 320 = P?

The General Rule for all Operations in Trigonometry, is, to write down the Numbers found in the Tables according to the Order of the Canon: And then adding together the ſecond and third Numbers, from their Sum ſubſtract the Firſt, the Remainder is the Logariſm of the Term ſought.

By Gunter's *Line.*

Extend the Compaſſes from 45 Degrees on the Tangents, to 22 Degrees 37 Minutes, the ſame Extent will reach in the Line of Numbers from 768, backward to 320.

CASE II.

Given B, *a*, *b*. Required H?

| S, *a* : B :: R : H? |

S, *a* = 9. 9652480 = 67° 23′
B = 2. 8853612 = 768
R = 10.
H = 2. 9201132 = 832 = H.

By Gunter's *Scale:*

Extend the Compaſſes from 67 Degrees 23 Minutes to 90 Degrees on the Line of Sines; the ſame Extent will reach from 768, to 832 on the Line of Numbers.

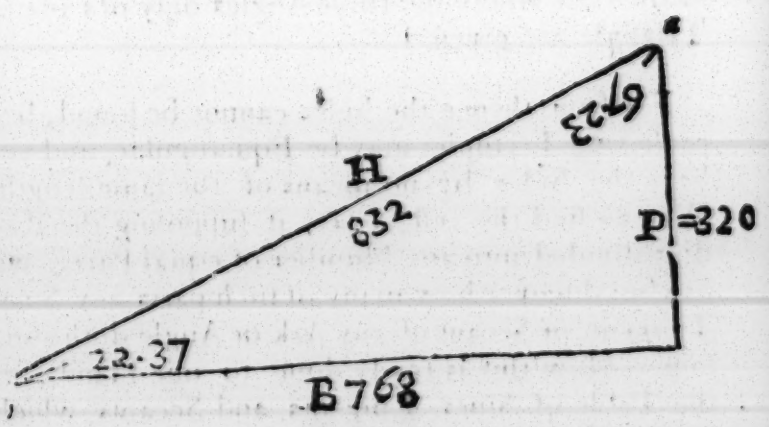
The general Method to ſtate any Caſe, or to form the Canon.

1. Conſider that the Thing ſought muſt always ſtand in the fourth or laſt Place: And therefore *in Caſ.* 1. ſince P, a Length is ſought, that muſt be the laſt of the Four Terms; place it therefore laſt with an Interrogation-point after it, to ſhew that it is required or ſought.

2. In the Golden-Rule the ſecond and fourth Terms being always of the ſame Nature or Kind, and P being a Length ſought, and B the only Length given; B is neceſſarily determined to be in the ſecond Place: Write it down therefore in that Place with four Points after it thus : : to ſhew that the Proportion disjoins or breaks off there.

3. Conſider that the Hypothenuſe not being either given or ſought, the firſt Axiom determines you to work by Tangents: And the Side given B being ſuppoſed Radius, the Proportion muſt be; As B conſider'd as Radius, Is to its ſelf conſidered as a Length given : : So will P conſidered as the Tangent of the Angle *b*, be To its ſelf conſidered as a Length ſought. That is,

| R : B :: T, *b* : P? |



If

If the Angle *b* had been ſought, that muſt have been placed laſt, and it would have ſtood thus; as in *Caſe* the Fifth.

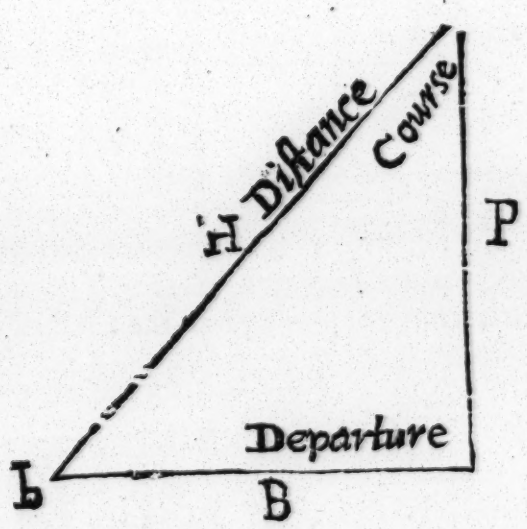
B : R : : P : T, *b*?

But if the Hypothenuſe had been in the Queſtion, either given or required, you muſt have worked by Sines, and the Hypothenuſe will be always Radius; as in *Caſe* 2. where H is ſought.

For H being required, it muſt ſtand in the laſt Place; and ſince B a Length is given of the ſame Nature with H, that muſt be in the ſecond Place: And then ſay by *Axiom* 1, As B conſidered as the Sine of the given Angle *a*, Is to its ſelf conſidered as a Length: : So is H conſidered as Radius, To its ſelf as a Length ſought: That is,

S, *a* : B : : R : H?

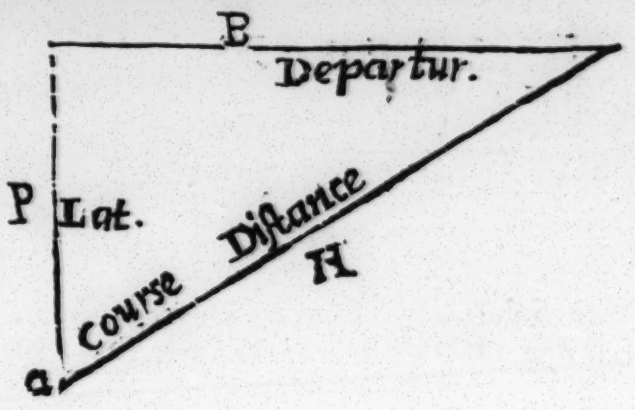
And to ſhew the extenſive Uſe of this Doctrine of *Plain Trigonometry*, the General Triangle above deſcribed and numbred, may either firſt relate to the Sea, and then theſe 7 Caſes will be all the Caſes of *Plain Sailing*; and alſo of Mr. *Wright*'s, or, as 'tis commonly, tho' falſly call'd, *Mercator*'s too; Regard being firſt had to the Way of Working by Meridional Parts, &c.



For, in this Triangle the Angle *a*, is the Angle of the Rhumb, or the Angle which the Line of the Ship's Courſe makes with the Meridian, and therefore uſually by the Sailors called, *The Courſe*; and the Side P repreſents the Meridian of any Place, a-croſs which the Ship is ſuppoſed to ſail; and conſequently on it muſt be accounted the Difference of Latitude between the two Places *a* and *b*. The Angle *b* is the Complement of the Courſe, or what that Angle wants of 90 Degrees, and conſequently known when the Courſe is ſo. The Baſe repreſents the Difference of Longitude, or the Departure Weſt, or the Weſting of the Ship in Compariſon of the Place at *a* that ſhe is ſuppoſed to have parted from: And the Hypothenuſe H, repreſents the Diſtance ſailed, or *run* (as the Seamen call it) or how many Leagues or Miles the Ship hath ſailed from the Place *a* to the Place *b*.

This being underſtood, if this firſt Caſe be made a Caſe of *Plain Sailing*, there will be given Courſe and Departure; required Difference of Latitude, and the Canon is;

As Radius is to the Departure in Miles: : So is the Co-Tangent of the Courſe, To the Difference of Latitude in Miles.



N. B. Here the Ship being at *a*, is ſuppoſed to ſail South-Weſtward (or to ſpeak exactly, W. S. W.) and therefore her Difference of Latitude is reckoned to the South, and her Departure to the Weſt: But by inverting the ſame Triangle, you may ſuppoſe the Difference of Latitude North, and the Departure Eaſt; for the North is accounted to lie right before you, and conſequently the Eaſt to the Right-hand, and the Weſt to the Left; wherefore the Courſe now is E. N. E.

2. If you would apply the Doctrine of *Trigonometry*, to the Calculation of Heights, Depths, Diſtances, the ſame Triangle and Numbers will do; regard being had to the Nature of the Terms required and ſought.

For the Perpendicular P, will repreſent any Altitude; and B will repreſent a Diſtance from the Foot of it meaſured on the Ground: The Angle at *b* is found by the Quadrant, or ſome ſuch Inſtrument; and conſequently you may find P by *Caſe* 1. For,

As Radius is to the Diſtance, from the Foot of the Object: : So is the Tangent of the Angle of Altitude, To the Height of the Place, *i. e.*

R : B : : T, *b* : P?

Or, ſuppoſe the Diſtance B were required from above, by taking the Angle *a*, and finding the Length of P, by a String and Plummet. Then will

R : P : : T, *b* : P?

This being premiſed as to the general Uſe of *Trigonometry*, let us proceed to

CASE

CASE III.

Given B, H. Required the Angles *a*, *b*,

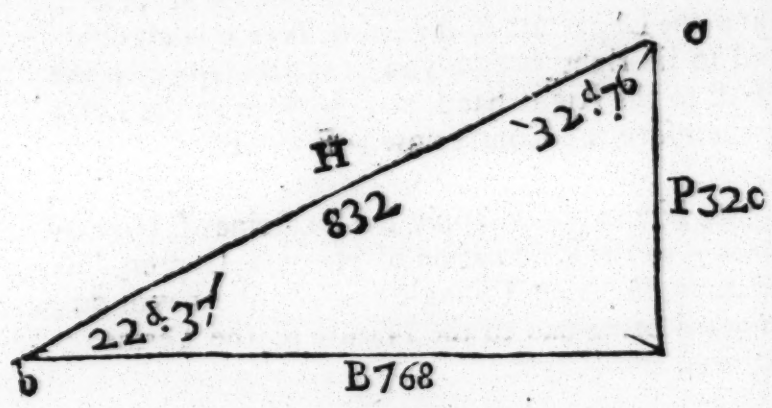
H : R :: B : S, *a*?

H = 2. 9201233 = 832
R = 10. 0000000
B = 2. 8853612 = 768
S, *a* = 9. 9652379 = 67° 23′
= Angle *a*

Which Subſtracted from 90 Degrees, gives the Angle *b* = 22 Degrees, 37 Minutes.

By Gunter's *Scale.*

The Extent from 832, back to 768, in the Line of Numbers will reach from 90 Degrees to 67 Degrees 30 Minutes in the Line of the Sines.



CASE IV.

Given B, H. Required P?

Having found *a* by the foregoing Caſe, this will be the Theorem :

R : B :: T : *b* : P?

Or,

R : T, *b* :: B : P?

R = 10.
T, *b*, = 9. 6197205 = 22° 37′
B = 2. 8853612 = 768
P = 2. 5050817 = 320.

By Gunter's *Scale.*

The Extent from 45 Degrees in the Tangent-line, back to 22 Degrees 37 Minutes, will reach in the Line of Numbers from 768, back to 320.

CASE V.

Given B, P. Required √ √?

B : R :: P : T, *b*?

B = 2. 8853612 = 768
R = 10.
P = 2. 5051500 = 320
T, *b* = 9. 6197888 = 22° 37′ = *b*.

Which 22 Degrees 37 Minutes ſubſtracted from 90 Degrees, leaves *a* = 67 Degrees 23 Minutes.

By Gunter's *Scale.*

The Extent from 768 back to 320, in the Line, will reach from 45 back to 22 Degrees 37 Minutes in the Tangents.

CASE VI.

Given B, P. Required H?

Having found *b* by the foregoing Caſe, this will be the Theorem :

S, *b* : P :: R : H?

S, *b* = 9. 5849685 = 22° 37′
P = 2. 5051500 = 320
R = 10.
H = 2. 9201815 = 832 = H?

By Gunter's *Scale.*

The Extent from 22 Degrees 37 Minutes, forwards, to 90 Degrees in the Line of Sines, will reach from 320, to 832 in the Line of Numbers.

CASE VII.

Given H and √ √. Required H?

R : H :: S, *a* : B?

R = 10.
H = 2. 9201233 = 832
S, *a* = 9. 9652480 = 67° 23′
B = 2. 8853719 = 768 = B.

By Gunter's *Scale.*

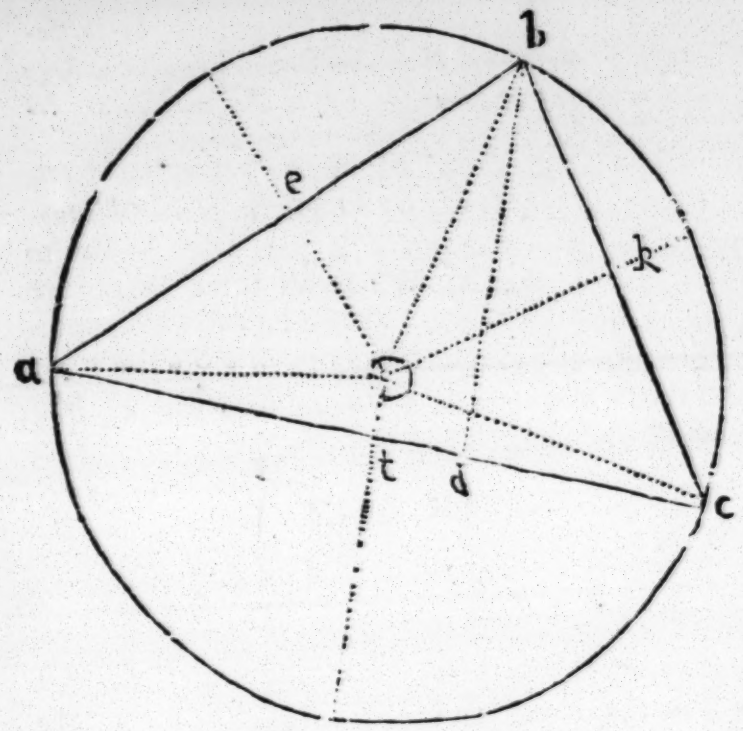
The Extent from 90 Degrees in Line of Sines back to 67 Degrees 23 Minutes, will reach in the Line of Numbers from 832 backwards to 768.

The

The Resolution of Oblique Plain Triangles.

AXIOM II.

In every Triangle, a, b, c, *the Sides are in Proportion to one another, as the Sines of their opposite Angles.*



Let fall from the Angle *b*, a Perpendicular to the Base *a c*: For then the whole will be resolved into 2 Right-angle Triangles, and consequently by Axiom the First *a b* : R :: *b d* : S, *a*; also *b c* : R :: *b d*: S, *c*; wherefore *a b*: *b c* :: S *c* : S, *a*: by Reciprocallity of Proportion.

Otherwise thus:

Draw a Circle about the Triangle, from whose Centre O, let the Prependiculars O *e*, O *k*, and O *t*, be let fall to the three Sides of the Triangle, and the Lines *o a*, *o b*, and *o c*, be drawn to the three Angles.

The Sides of the Triangle will be bisected by the Perpendiculars, and consequently *a e* will be = *e b*, *b k* = *k c* and *c t* = *t a*; wherefore as the whole Line *a b*, Is to *b c* : : So will the half Side *a c* be, To the half *k c*; but *a e* and *k c*, are the Sines of the Angles at the Centre *a o e* and *k o c*, which Angles at the Centre are severally equal to the Angles of the Triangle *c* and *a*, because they stand on half the Arks that the Angles of the Triangle do; wherefore *a b* : *b c* : : S, *c* : S, *a*.

Let H, B, and O, be the Sides of an Oblique Plain Triangle; *a*, *b* and *c*, its three Angles; here because there is no Right-angle, three Things must be always given, that is, either two Sides and one Angle, one Side and two Angles, or else all the three Sides.

From whence will arise the three former of the six following Cases.

	Given.	Requir'd.	Proportions.
1	H. O. *c*	*b*.	O, S *c* : : H : S, *b*. Note, that the Angle *b* is ambiguous, and you must collect from the Circumstances of the Triangle, whether it be Obtuse or Acute.
2	H. O. *c*.	B.	Here first find the Angle *b* by *Case* 1. thence *a* will be known by taking the Sum of *b* + *c* from 180°. Then S, *c* : O : : S, *a* : B. Or S, *b* : H : : S, *a* : B.
3	*c*, *b*, O.	H.	S, *c* : O : : S, *b* : H.
4	H. *a*. O	*c*, *b*.	A + O : H — O : : T ½ Z of the opposite Angles, To T ½ X of the opposite Angles, and ½ Z + ½ X = *b*, and ½ Z — ½ X = *c*.
5	H. *a*, O.	B.	Find the Angles by the former Case, and then S, *b* : H : : S, *a* : B; or S, *c* : O : : S, *a* : *b*.
6	H. O. B 3 Sides.	3 Angl.	B . H+O : : H — O : X. And then ½ B + ½ X = C B and ½ B — ½ X = B *b*. Then will H : R :: C B : Co-sine Angle C; and O : R : : *b* B : Co-sine Angle *b*; Axiom 1.

And the three last are solved by the Help of the two following Axioms.

AXIOM III.

As the Sum of the Legs about the Angle given, Is to their Difference : : *So is the Tangent of half the Sum of the other two Angles, To the Tangent of half their Difference.*

Now the Sum of the other two Angles is known, being what the given Angle wants of 180 Degrees, and their Difference is now found; add therefore their half Sum, and half Difference together, and it gives you the *greater of the two Angles sought*; and half the Difference subtracted from the half Sum, leaves the lesser Angle sought. And thus having found the Angles; if the Side opposite to the former given Angle be sought, it will be found easily by *Pardie's Axiom*, That the Sides are as the Sines of the Angles.

The Demonstration of the *Third Axiom*, is briefly thus.

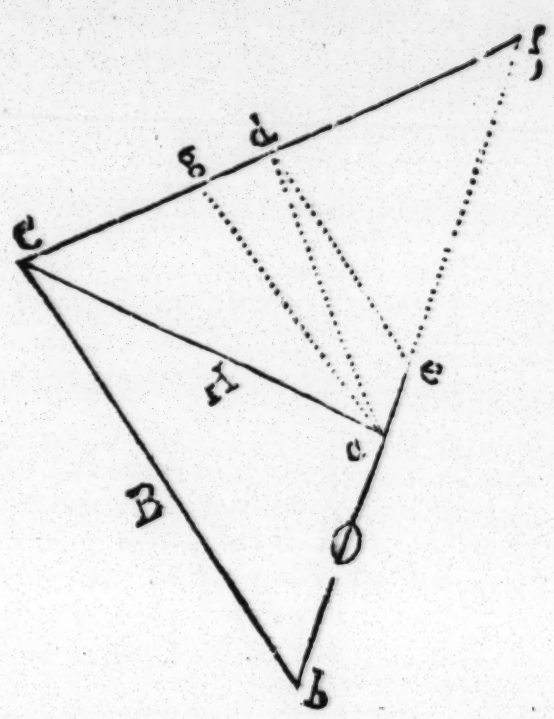
Demonstration.

I say the Sum of the Legs of any Angle *a*, Is to their Difference : : As the Tangent of half the Sum of their opposite Angles, Is to the Tangent of half their Difference.

Produce

Produce O, one of the given Legs of the Angle given, till *a f* become equal to H or C *a*, and then biſect *b f* in *e*, join *c f*, and biſect it alſo in *d*: Draw *a d*, which will be perpendicular to *c f* (2. 16.) and draw *d e*, which will be parallel to *c b*. (6. 92.) Then will the Angle *c a d* = *d a f*; i. e. to the half of *c a f*, which external Angle *c a f* = *c* + *b*: That is, to the Sum of the oppoſite Angles required.

Draw then *g a* parallel to *c b*; ſo will the Angle *g a c*, be equal to the alternate one *c*. And if from half the Sum of the oppoſite Angles, you take the leſſer Angle; *i. e.* If from *c a d*, you take *g a c*, there will remain the Angle *g a d*, equal to half the Difference of the oppoſite Angles.



And ſo alſo, if from *b e*, half the Sum of the Legs, you take O the leſſer Leg, there will remain *a e* equal to half the Difference of the Legs. And then ſince the Triangle *c a d* is Right-angled, if *a d* be made Radius, *c d* will be the Tangent of the Angle *c a d*; (*i. e.* the Tangent of half the Sum of oppoſite Angles;) and in the little Triangle *g a d*, *g d* will be the Tangent of the Angle *g a d*; (*i. e.* The Tangent of half the Difference of oppoſite Angles.) But the Segments of the Legs of any Triangle cut by Lines parallel to the Baſe, being proportionable, *e b* : *e a* :: *c d* : *d g*; That is, in Words, *Half the Sum of the Legs, Is to half their Difference* :: *As the Tangent of half the Sum of the oppoſite Angle, Is to the Tangent of half their Difference*; but Wholes are as their Halves: Wherefore the Sum of the Legs, Is to their Difference:: As the Tangent of half the Sum of the oppoſite Angles, Is to the Tangent of half their Difference. *Q. E. D.*

Whence the two following *Caſes* will eaſily be ſolved.

CASE I.

Given H, O and *a*. Required *c*, *b*?

For H + O : H — O :: as T, half Z oppoſite Angles, Is to T, half X oppoſite Angles; and then half Z + half X = *b*, and half Z — half X = *c*.

CASE II.

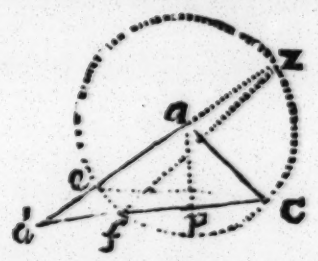
Given H O, and *a*. Required B?

Firſt find the Angles by the former *Caſe*, and then S, *b* : H :: S, *a* : B; or S, *c* : O :: S, *a* : B; by the *Second Axiom*.

AXIOM IV.

The Baſe, Is to the Sum of the Legs :: *As the Difference of the Legs, Is to the Difference of the Segments of the Baſe made by a Perpendicular let fall from the Angle oppoſite to the Baſe.*

For there is alſo another Caſe, in *plain Oblique-Triangles*, which requires a particular Axiom to ſolve it; and that is, Where all three Sides are given to find the Angles. Here let fall a Perpendicular from any Angle to its oppoſite Side as *a p*;



and then ſay, As the Side *d c*, Is to *d a* + *a c*, the Sum of the other two Sides :: So is the Difference of thoſe two Sides *d a* — *a c*, To a fourth Number. Half of which added to half *d c*, gives you the Segment of the Baſe *d p*; and if ſubtracted from half *d c*, it will leave the other Segment *p c*. And when thoſe Segments are thus found, the Angles are eaſily had thus; *d a* : *Radius* :: *d p* : Co-ſine of the Angle *d*, And *a c* : *Radius* :: *p c* : Co-ſine of the Angle C.

The Demonſtration of which laſt Axiom, is thus.

Demonſtration.

On the Centre *a*, with the Diſtance *a c*, deſcribe a Circle, which will interſect both the other Sides of the Triangle, and then *z d* will repreſent the Sum of the Legs *d a* and *a c*; *d e* will repreſent their Difference, and *d f* will repreſent the Difference of the Segments of the Baſe made by the Fall of the Perpendicular *a* P.

Then I ſay, *d c* : *d z* :: *d e* : *d f*; That is, *The Baſe, Is to the Sum of the Legs* : : *As the Difference between the two Sides, Is to the Difference of Segments of the Baſe*; as is apparent from *Prop.* 67. of *Pardie's* Sixth Book, after drawing the prick'd Lines *e c* and *f z*.

And then the Caſe will ſtand thus.

CASE III.

Given H, O, B, all three Sides. Required the Angles? See the Figures before.

I ſay, by this *Axiom*, B : H + O :: H — O : X, which expreſſes the Difference of the Segments of the Baſe, = *e f* in the Figure.

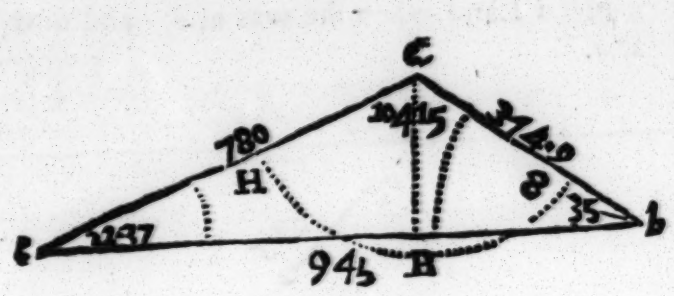
And

And then having found X; half B + half X = *d p* the greater Segment, and half B — half X = *p c*, the leſſer, by which means the two Right-angled Triangles *a d p*, and *a p c*, will be ſolved eaſily: For *d a*: *Radius*:: *d p*: Co-ſine of the Angle *d*; And *a c*: *Radius*:: *p c*: To the Co-ſine of the Angle *c*.

The Operation of the Six Caſes of Oblique-angled Triangles.

CASE I.

Given H, O, *c*. Required *b*?



O : S, *c* :: H : S, *b*?

The Numbers of the Triangles, are as follows.

√ *c* = 22° 37′
√ *b* = 53 08
√ *a* = 104 15 Or, its Suppl. = 75° 45′

H = 780
O = 374·9
B = 945
O = 2.5739154 = 347·9

S, *c* = 9.5849685 = 22° 37′
H = 2.8920946 = 780

Sum = 12.4770631

S, *b* = 9.9031477 = 53° 8′

CASE II.

Find firſt the Angle *b*, by *Caſe* 1. then will *a* be known.

Given H, O, *c*. Required B?

S, *c* : O :: S, *a* : B?

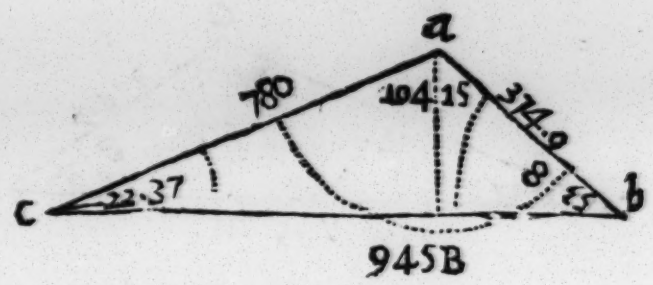
S, *c* = 9.5849685 = 22° 37′
O = 2.5739154 = 374 9
S, *a* = 9.9864273 = 104 15

Sum = 12.5603427

B = 2.9753742 = 945

CASE III.

Given *c*, *b*, O. Required H?



S, *c* = 9.5849685 = 22° 37′
O = 2.5739154 = 374 9
S, *b* = 9.9031084 = 53 8

Sum = 12.4770238

H = 2.8920553 = 780

CASE IV.

Given H, *a*, O. Required *b*, *c*?

H + O : H — O :: T, ½ Z. op. √ √ : T, ½ X op. √ √

H + O = 11540 9
H — O = 405 1
Half Z oppoſite Angles = 37 52

H + O = 3.0625820 = 1154 9
H — O = 2.6074550 = 405 1
T half Z = 9.8907254 = 37 52

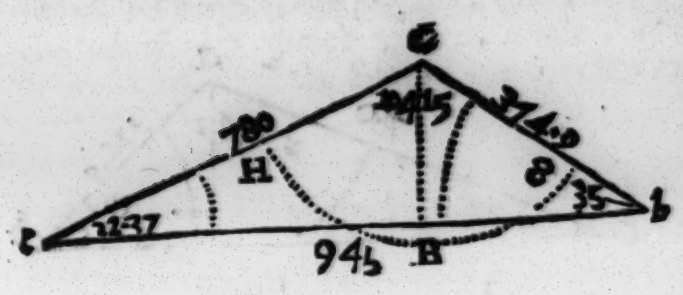
Sum = 12.4981804

T, half X. 9.4355984 = 15° 15′

Then will half Z + half X = 53 Degrees 7 Minutes = *b*; And half Z — half X = 22 Degrees 37 Minutes = *c*.

CASE V.

Given H, *a* O. Required B ?



Find the Angles *b* and *c*, by *Case* 4. then,

S, *b* : H :: S, *a* : B?

S, *b* = 9.9031084 = 53° 8′

H = 2.8920946 = 780
S, *a* = 9.9864273 = 104° 15′*

Sum = 12.8785219
B = 2.9754135 = 945

* This is the Sine of 74.45, the Supplement of 104.15, to a Semi-circle.

CASE VI.

Given H, O, B. Required Three Angles ?

B : H+O :: H−O : X.
½ B + ½ X = C B and ½ B − ½ X = B *b*.
H : R :: B *c* : Σ *c*; and O : R :: B *b* : Σ *b*.

B = 2.9754318 = 945

H+O = 3.0622058 = 1154.9
H−O = 2.6074540 = 405.1

½ B = 472 ½ 5.6696058 =
½ X = 247 ½
2.6942280 = 495

H = 2.8920453 = 780′

½ B + ½ X = 750
½ X − ½ = X225 R = 10.
B C = 2.8573225 = 720

Σ *c* = 9.9652672 = 23° 37′

O = 2.5739154

R = 10.
B *b* = 2.3521825

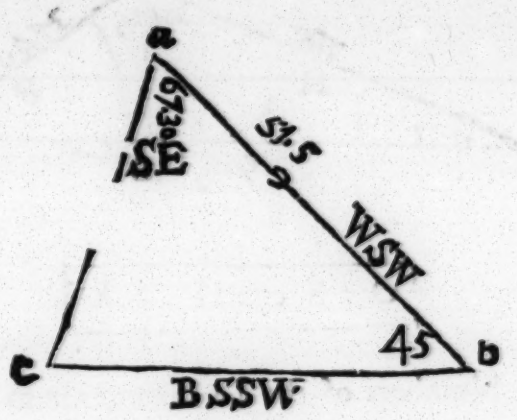
Σ *b* = 9.7782671 = 53° 08′

And when thus the Nature, Reaſon, and Method of Operation in the Calculating of the Sides and Angles of Oblique Triangles, is fully underſtood; its Application, Uſe, and Practice, will be very eaſie and plain, tho' its Extent be very large and ample. For,

Firſt, If you have a Mind to apply it to what they call *Oblique Sailing*, or the Doctrine of *Oblique Plain Trigonometry*, applied to *Sailing*; your former Triangle and Caſes will reach all that you can deſire.

As ſuppoſe a Ship Coaſting along by the Shore from the Place *b*, ſets an Head Land by her Compaſs, (as *c*) and finds it to bear from her S. S. W. then ſhe ſails on, W. S. W. 51. 5 Miles or Minutes to *a*; and then finds that the Head Land bears from her full S. E.

'Tis required to determine her Diſtance from this Head Land when ſhe was at *b*, and now ſhe is at *a*.



First, To Plot the Triangle.

Draw a ſtreight Line, as B, repreſenting the firſt bearing of the Head Land, which was S. S. W. Then from 6 Points take 2, and there remains 4 = 45°; becauſe the Ship ſailed Weſt South Weſt, make the Angle *b* equal to 45°, and ſo will the Line O repreſent the Diſtance ſailed, and *b* will be the Courſe. Prick off the Diſtance run, *viz.* 51. 5 Miles from *b* to *a* Then becauſe the Ship ſailed W. S. W. the contrary Rhumb from *a* to *b*, muſt be E. N. E. And ſince the South-Eaſt Rhumb makes with that an Angle of 67° 30′, you muſt make the Angle at *a*, juſt 67° 30′. So with the Line H, when drawn, interſect the Line B in the Point of the Situation of the Head Land *c*; and by that means will the Triangle be compleated.

This being done, if you pleaſe, (tho' Plotting the Triangle is not of abſolute Neceſſity, but very uſeful and inſtructive) then conſider, that it muſt be a Caſe of *Oblique Plain Triangles*, where is given the Angle *a* and *b*, and the Side O. Required H and B ?

To find H, ſay, (becauſe *c* is alſo known if *a* and *b* are)

S, *c* : O :: S, *b* : H?

Operation.

S, c = 9.9656153 = 67° 30′
O = 1.7118072 = 51. 5 Miles.
S, b = 9.8494850 = 45°.
Sum = 11.5612922
H = 1.5956769 = 39. 4 Miles.

And to find B, you may ſay,

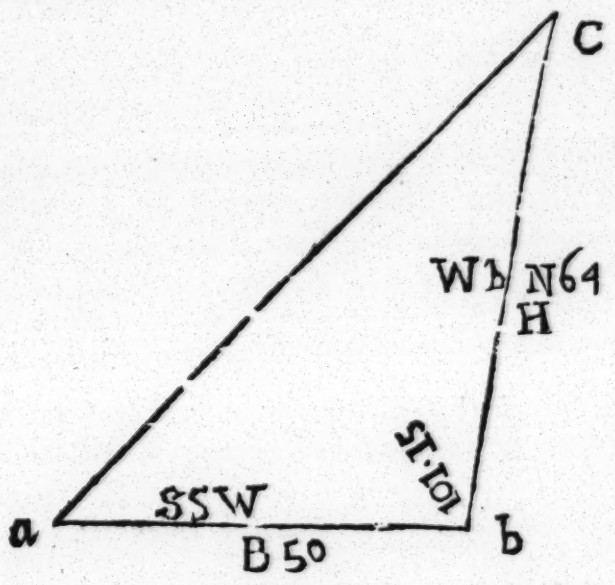
As S, b : H :: S, a : B?

Or,

As S, c : O :: S, a : B?

I ſhall give but one Inſtance more in this Matter, which is this.

Suppoſe a Ship ſail S. S. W. 50 Leagues, and then W. by N. 64 Leagues: What was her direct Courſe, and what is her Diſtance from the Place ſhe went from?



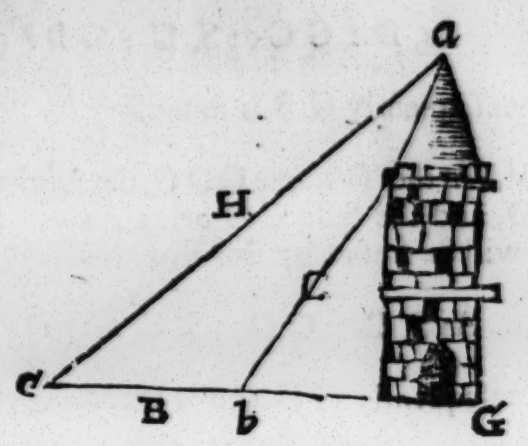
To Plot the Caſe.

Let b be the Place from whence the Ship ſailed, and let B repreſent the S. S. W. Rhumb, and the Diſtance thereon run = 50 Leagues, from b to a.

Then, ſince the firſt Courſe was two Points, and the Second ſeven Points from the Meridian, make an obtuſe Angle at b, equal to 9 Points, 101° 15′: And on the Leg H. ſet 64 Leagues, then drawing the Side a c, the Triangle will be formed.

In which you have two Legs, H and B forming the Angle a, and that Angle given. And this is *Caſe* 4. of *Plain Oblique Triangles*.

Secondly, If you would apply this Part of *Trigonometry* to the Meaſuring of inacceſſible Diſtances, Heights, &c. at Land; the Practice will be very eaſie.



Suppoſe a Tower, Steeple, &c. as a G, whoſe Height you would take, but can meaſure no nearer than from c to b, but know the Length B, is = 100 Yards.

Here you can take the Angle a b G, with your Quadrant, and conſequently the Obtuſe Contiguous one, c b a, is known.

The Angle c is known after the ſame way by the Inſtrument: Wherefore having in the Obtuſe Angled Triangle H O B, the Baſe B, and the Angles c and b, you muſt find O by *Caſe* 3. of *Oblique Plain Triangles*: For ſince c and b are known their Sum ſubſtracted from 180, will leave c a b, known. Therefore ſay,

As S, a : B :: S, c : O?

And when it is thus known or found, having in the Right-angled Triangle, b a, G, the Hypothenuſe O, and the Angle b.

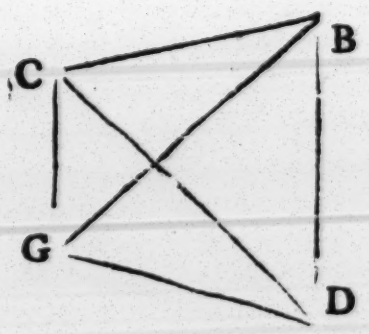
By *Caſe* the 7th of Right-angled Triangles.

As R : O :: S, b : a G?

The Altitude of the Tower ſought.

Thirdly, Suppoſe an inacceſſible Diſtance, as B D, which imagine to be the Diſtance between two Forts, Baſtions, &c. on the Wall or Line of an Enemies City or Camp; and that becauſe of the Cannon, &c. you can go no nearer than the Line G C, but can meaſure from G to C, and at each Station take Angles with an Inſtrument.

Having taken then by the Theodolite, &c. the Angles G C D, and C G D, and meaſured G C: And alſo having taken the Angles C G D, and B C G. This premiſed, which is eaſily done by the Inſtrument.



You have in the Triangle C B G, the Side C G, and the two Angles G, and G C B: Wherefore, alſo the Angle C B G. Say therefore,

As, B : G C :: S, C : G B?

And consequently G B is found.

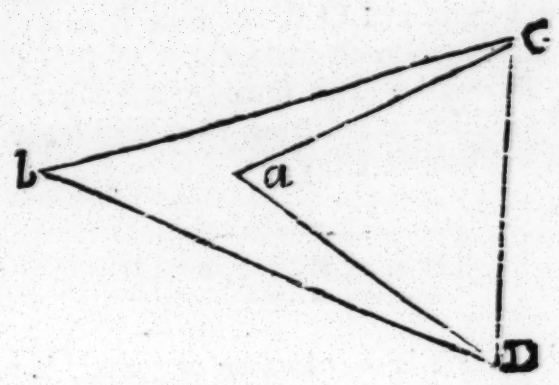
Again, in the Triangle C D G, the Angles G C D, C G D, and the Side C G being given, the Side, G D, will be found by this Proportion.

As S, D : C G :: S, C : G D?

And consequently G D also is found.

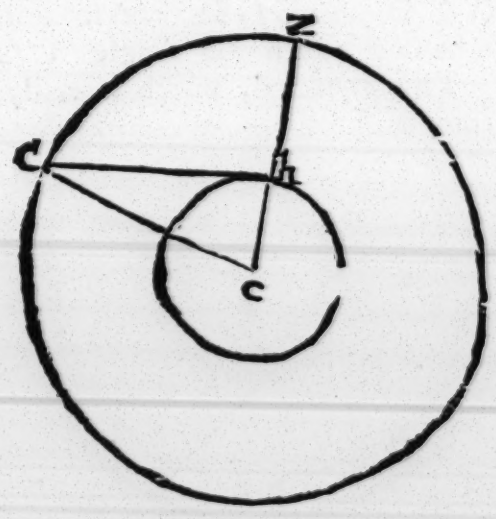
And now having in the Triangle G B D, the two Sides G B and G D, and the included Angle G; you can first find the remaining Angles severally by *Axiom* 3. and then the Side B D by *Axiom* 2.

Or, If not being able to get nearer than the Point *a*, you could not measure sideways as before, but only backward to *b*, or forward from *b* to *a*: You may then easily gain the Length from D to C.



For placing the Instrument at *a*, you can take the two Angles *b a* D and *b a* C, and take also C *a* D; measure then from *a* to *b*, and at *b* take also the two Angles *a b* D, and *a b* C. Then can you easily gain the Sides *a* C, and *a* D, in the two Triangles *b a* C, and *b a* D; and having before taken by the Instrument the Angle C *a* D, you may find the Side C D in that last Triangle *a* C D, by the second and third *Axioms* of *Plain Oblique Trigonometry*. Also,

Fourthly, On the Application of this Part of *Trigonometry*, to the Doctrine of *Astronomy*, depends the Method for finding the Parallax and Distance of a Planet, or Star.



Let *c* be the Centre of our Earth, and *h* a Point on its Surface; at which, an Observer at *h* takes with an Instrument the Angle ☾ *h z*, or the Distance of the Meridian Moon ☾, from her Zenith at *z*.

Her true Distance from the Zenith, is known by the Astronomical Tables; which is the Angle ☾ *c z*: But the observed Angle ☾ *h z*, being external to the Triangle, ☾ *h z*, will be = to ☾ + *c*.

Where take *c* from it, and the Remainder is the Angle *h* ☾ *c* = to the Moon's Parallax, whose Subtense is *h c* = to the Earth's Semidiameter.

Suppose that *h c* be 4000 Miles; then in the Triangle ☾ *h c*, there are all the Angles, and the Side *h c* known.

Wherefore,

As S, ☾ : *h c* :: S, *h* : ☾ *c*?

Which is the Moon's Distance from the Centre of our Globe.

And also, as

S, ☾ : *h c* :: S, *c* : ☾ *h*?

The Moon's Distance from the Place of Observation.

TRIGONOMETRY *Spherical.*

Definition 1.

A *Spherical Triangle* is made by, or contained under the Arks of three great Circles of the *Sphere*.

Definition 2.

A *Spherical Angle*, is the mutual Inclination or Aperture of the Planes of two great Circles.

Properties of Spherick Triangles.

1. When one Circumference of a Circle cuts, crosses, or falls on another, the Sum of the Angle made thereby is equal to two right ones.

2. When two Circumferences of Circles cros each other, tho' opposite or vertical Angles are always equal.

3. In every *Spherical Triangle*, the greater Angle is opposite to the greater Side.

4. An *Isosceles Spherical Triangle*, hath its Angles at the Base equal to each other; the *Converse* of which also is true, That if the Angles at the Base are equal, the Triangle is an *Isosceles*.

5. If two *Spherical Triangles* are mutually *Equilateral*, they are also *Equiangular* and *Similar* one to another.

6. If two *Spherick Triangles* have in each one Angle and two Sides including it; or if they have one Side and two Angles adjacent respectively equal, the whole Triangles are equal.

7. Any two Sides of a *Spherick Triangle*, are longer than the Third; because the Ark of a great Circle is the nearest Distance between any two Points on the Sphere.

8. All

8. All great Circles muſt cut each other into two equal Parts, becauſe their common Interſection is a Diameter of the Sphere; and conſequently, the two Points of Interſection are at the Diſtance of a Semicircle from each other.

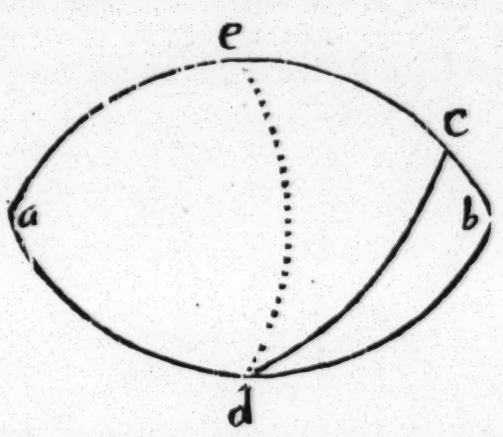
COROLLARY.

Hence 'tis plain, That every Side of a Spherick Triangle muſt be leſs than a Semicircle.

9. The oppoſite Angles at the Interſection of two Circles are always equal, becauſe the ſame Planes conſtitute both Angles; that is, the Angle *a* is equal to the Angle *b*: See Figure below.

10. In a *Spherical Triangle*, if the Sum of the Legs of any Angle be greater, equal, or leſs than a Semicircle; the internal Angle at the Baſe is accordingly greater, equal, or leſs than the outward and oppoſite one; and conſequently, the Sum of the two internal Angles at the Baſe is greater, equal or leſs than two Right Angles.

DEMONSTRATION.



If *a c* + *c d* be greater than *a b*, *d c* muſt be longer than *c b*, and conſequently, the Angle *b* (= *a*) will be bigger than the Angle *c d b*. *Property* 3. But if *a c* + *c d* be equal to a Semicircle, then *d c* will be equal to *c b*, and the Angle be = Angle *c d b*. And in the Triangle *d c b*, becauſe *d c* + *c d* is leſs than *a b*; therefore *a c* is greater than *c d*, and conſequently the external Angle *a d c* is greater than the Angle *a*; that is, than the Angle *b*, the internal Angle at the Baſe.

Alſo, ſince the Angle *a d c* + the Angle C *d b* = two Right Angles, therefore the Angle *a d c* + the Angle *a* is great than two Right Angles, *&c.*

11. In an Iſoſceles Sph. Triangle, if one of the equal Legs is greater, equal, or leſs than a Quadrant, the Angle is accordingly greater, equal, or leſs than a Right one.

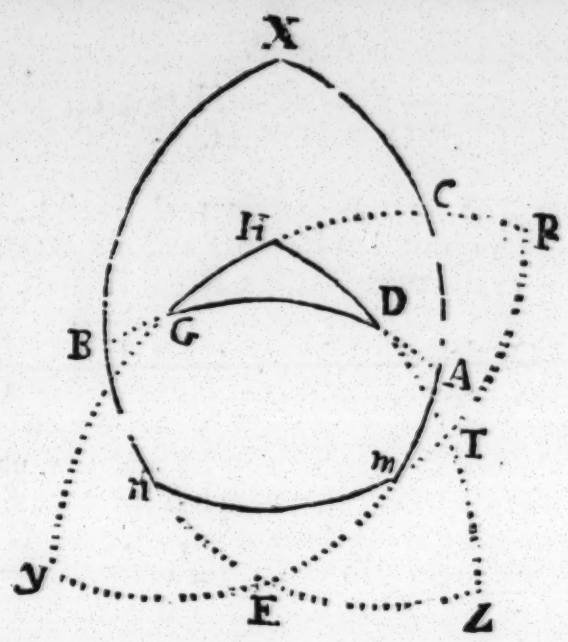
12. The Sum of the three Sides of every Sph. Triangle, is leſs than a Circle.

For *c d* is leſs than *c b* + *b d*, wherefore *a c* + *d c* + *d a*, muſt be leſs than the Sides *a c b* + *a d b*: See the Figure above.

13. The Meaſure of any *Spherick Angle*, is an Ark of a great Circle deſcribed from the Angular Point, and preciſely 90 Deg. diſtant from it; that is, making the Angular Point the *Pole* of that Circle.

14. The Poles of the Sides of any Triangle G H D, do on the Surface of the Globe, conſtitute another Triangle *n x m*, which may be called Supplemental to the Triangle G H D; for the Supplements of the Angles and Sides of the Triangle *n x m*, are equal to the Sides and Angles of the Triangle G D H.

DEMONSTRATION.



From the Points G H D, as Poles deſcribe three great Circles *x* A *y*, R T *m n*, *x* B *n z*, then is *y m* = Quadrant = A *x*; becauſe *m* is the Pole of H G *y*, and *x* or E the Pole of G A, therefore *m x* = A *y* = Supplement of C A = Angle H G D, and *z n* is Quadrant = B *x*, therefore *n x* = B *x* = Supplement of Angle G H D, and *n* T = Quadrant = *m* R, therefore *n m* = T R = Supplement of the Angle D H G.

Note, That the Triangle *n* E *m* conſtituted between the three next Poles, has its three Sides and Angles equal to the Angles and Sides of the Triangle G H D, ſave that the greateſt Side *n m* is the Supplement of the greateſt Angle H, and the Angle E the Supplement of the Side G D.

15. Any Angle of a Triangle, with the Difference of the other two, is leſs than two Right Angles. For, *x n* is leſs than *x m* + *m n*:

That is,

$$2\angle - D < 2\angle - G + 2\angle - H.$$

Therefore,

$$G + H - D < 2\angle.$$

For ſince $2\angle - D < 2\angle - G + 2\angle - H$:

That is,

$$2\angle - D < 4\angle - G - H,$$

By transfering D, G, and H, 'twill be $2\angle + G + H < 4\angle + D$; then by taking away $2\angle$ from both Sides, and transfering D, you'll have $G + H - D < 2\angle$. *Q. E. D.*

16. If

16. If two Triangles are mutually Equiangular, they are alſo mutually Equilateral; for becauſe they are Equiangular, their Supplimental Triangles are Equilateral, (by 14th) and therefore Equiangular (by 15th) and therefore the propoſed Triangles are Equilateral (by 14th.)

17. *Firſt*, The 3 Angles of every Triangle are greater than 2 Right Angles, and leſs than 6 Right ones.

For $nx + mx + mn < 4\ \angle$ (by 12.)

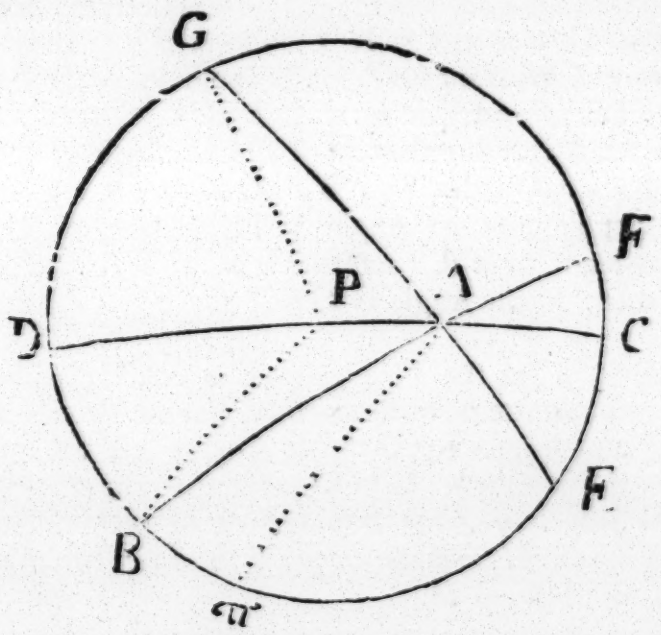
That is,

$$6\ \angle - D - G - H < 4\ \angle,$$
$$i.e.\ 2\ \angle < D + G + H.$$

2*dly*, The Sum of the internal Angles, is leſs than the Sum of the Internal and External, both which, in all, make but ſix Right Angles.

18. Of ſeveral Arks of great Circles falling from the ſame Point of the Sphere's Surface on another Circle, the greateſt is that which paſſes through the Pole of the Circle, and the next to this, is greater than that which is farther off.

For ſuppoſe P the Pole of the Circle C ϖ D, and ϖ the Pole of D P C; then is A D > A B > A E > A C; and the Arch B ϖ C > B P > B D.



19. A great Circle paſſing through the Poles of another great Circle, cuts it at Right-angles; and on the contrary, if it cuts it at Right-angles, it paſſes through its Poles. Thus the Angle P B D = ∠ = P G D = P D B, alſo = to ϖ A C.

20. In an oblique angled Triangle, if the Angles at the Baſe are *like*, or of the ſame kind, *i.e.* both Acute, or both Obtuſe; the Perpendicular falls within the Triangle, and the Quadrantal Ark without: But if they be *unlike*, the Perpendicular falls without, and the Quadrant within. For the Triangle E A F has the Angles E and F Acute, and the Perpendicular A C falls within, and the Quadrant A ϖ without. Alſo the Triangle B A G hath B and G obtuſe; and the Perpendicular A D within, and the Quadrant A ϖ without: But the Triangle B A E has the Angle B, E of different kinds, and the Perpendicular A C without, and the Quadrant A ϖ within.

Alſo, by the ſame Figure is manifeſt, how the *Ambiguities* of Right-angled Triangles may be ſolved, *viz.*

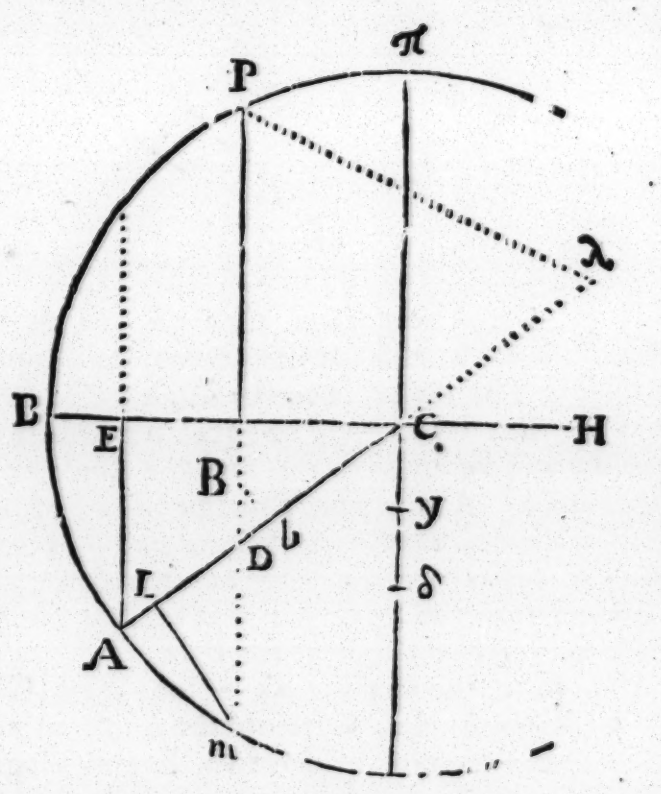
SOLUTIONS.

1. The Legs of the Right-angle are of the ſame kind with the oppoſite Angles. So in the Triangle B D A, becauſe D A is greater than a Quadrant D P, the Angle D B A is greater than the Right-angle D B P: And in the Triangle B C A, becauſe A C is leſſer than the Quadrant P C, the Angle C B A is leſſer than the Right-angle C B P.

2. If the Legs (and conſequently the Angles) are of the ſame or different kinds; the Hypothenuſe is accordingly leſſer or greater than a Quadrant: So in the Triangles E D A, E C A, the Hypothenuſe A E is leſſer than a Quadrant; but in the Triangle B D A, the Hypothenuſe A B, is greater than the Quadrant B P.

3. If the Hypothenuſe is leſs or greater than a Quadrant, either Leg, with its adjacent Angle, is accordingly of the ſame or different kind, as follows from the two laſt.

For the viewing the Sines, Co-ſines, and other Right-Lines of Arks, which are not viſible in a common Sphere; Let the Arks of three great Circles of Card Paſte-board be put together, as in an Armillar Sphere.

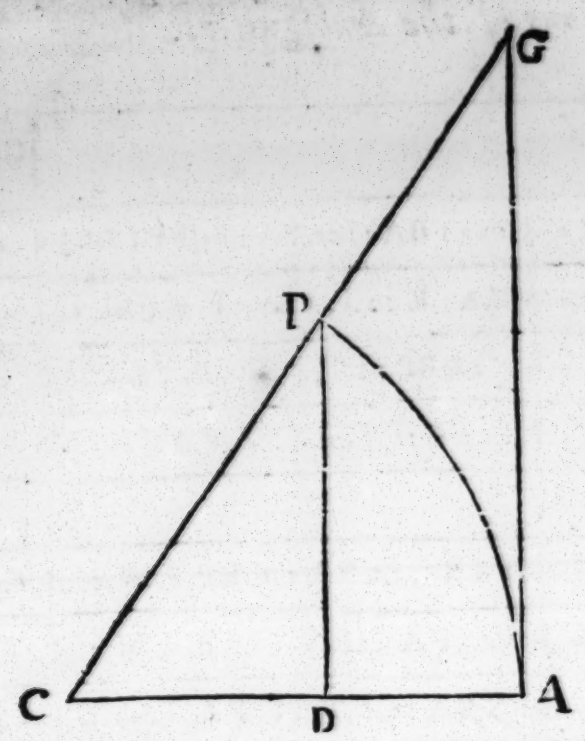


As ſuppoſe the two Arks B P, B A, and that B P H, the Plane of the greater Ark were turn'd round B H, till that a Right-Line falling from P perpendicular to the Plane B A H, may fall on the ſame Point of the Line C A, ſuppoſe on D; for in that Poſition P A B will be a Spherick Triangle Right-angled at A, and B P the Hypothenuſe, B A the Baſe, P A the perpendicular Arch.

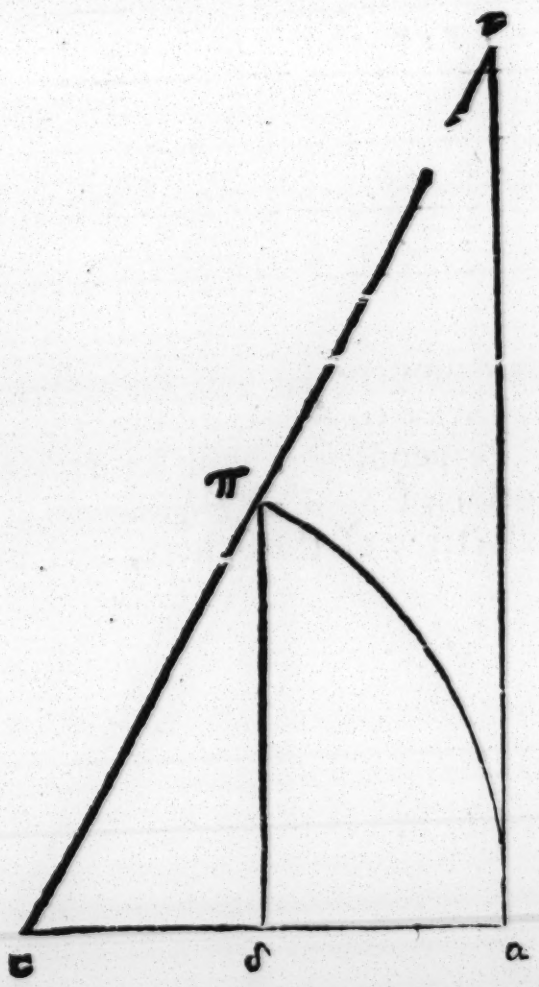
And ſuppoſe P A (in the next Figure) be equal P A of the Triangle, and fitted according to its Letters therein, and draw A E, P F Perpendicular to B C; ſo A E, P E, P D, will be Sines of the Arks B A, B P, P A, and their Co-ſines will be E C, F C, D C.

Theſe

Theſe things being done and conceived, the two firſt Axioms of *Sperick Trigonometry* will preſently appear, and alſo the Demonſtration of the 16 Caſes of Right-angled Triangles, without any other Figure or Production of Sides, as is uſual.



To that End, let the Ark $\varpi\alpha$ (*Fig.* 3.) be alſo fitted in the Solid, according to its Letters; (*as you will find it very well done in Mr.* Heynes's *Trigonom.*) Then in the two Right-angled Spherick Triangles. P B A, ϖ B α, having the ſame Acute Angle B, at the Baſe.



AXIOM I.

The Sines of the Hypothenuſes are proportional to the Sines of the Prependiculars.

P F : P D :: ϖ C : $\varpi\delta$.

AXIOM II.

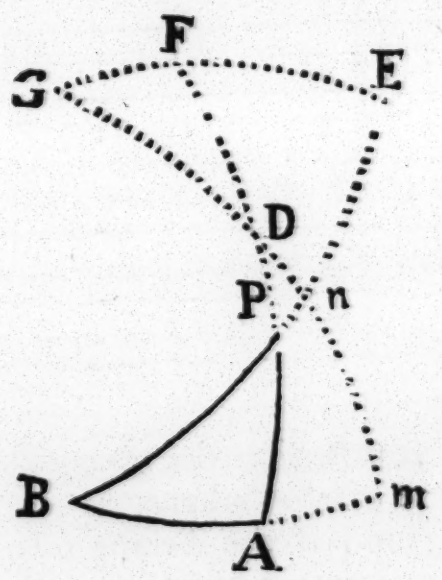
The Sines of the Baſes are proportional to the Tangents of the Perpendiculars.

A E : A G :: α C, $\alpha\gamma$.

For the two Right-angled Triangles F P D, C $\varpi\delta$, are ſimilar; as alſo E A G, and C $\alpha\gamma$.

And for the Solution of the following *Caſes*, I ſuppoſe B A P (in this Figure) a Right-angled Triangle, and its Sides produced to Quadrants B N, B M, A D.

Suppoſe alſo, P E, P F, N G, and E G, Quadrants. Then is N E equal to B P, and the Complement of B A equal to A M, equal to *b* A D M, and F E equal to Angle F P E, equal to Angle B P A, and G D equal to N M, equal to Angle B, and the Angles at A, M, N, E, and F, right.



N. B. The Reaſon of producing the Sides of the Triangle B A P to Quadrants, is, becauſe by this Means the Angles may be turned into Sides, and the Hypothenuſes into Saſes and Perpendiculars *& è contra*: And from hence it comes to paſs, that the Parts of the Triangle given, do ſometimes fall in Co-ſines and Co-Tangents, inſtead of Sines and Tangents.

Here follow the Proportions for *Right-angled Triangles.*

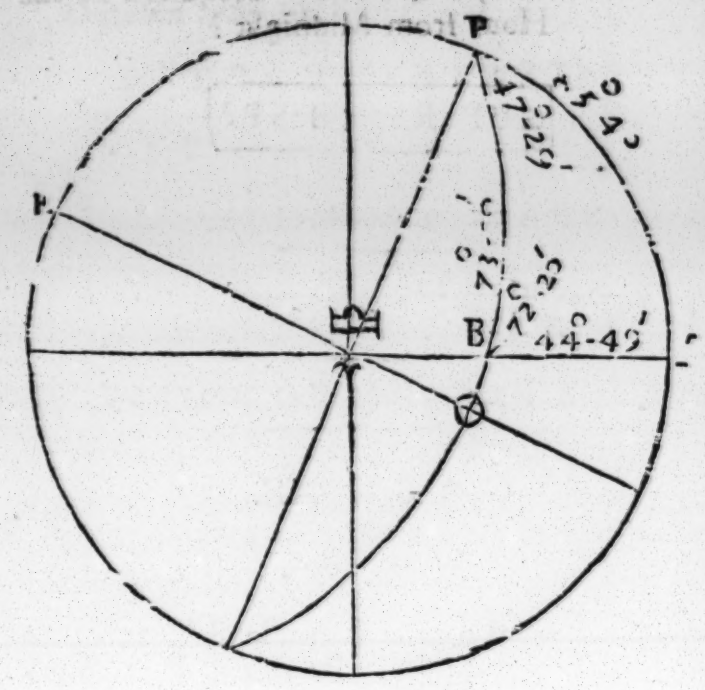
The Propoſitions for the Solution of the Sixteen Caſes of Right-angled Spherick Triangles, *with their Solutions of the Ambiguities.*

	Given.	Req.			Given.	Req.
1	B A, P A	B P	S, D A : R. S, A M :: S, D P : S, P N (by *Ax.* 1.)	*i. e.* R : *cs* : B A :: *cs*, P A : *cs*, B P. (*Sol.* 2.)	*c c*	*h.*
2	B A, P A	B	S, B A : S, B M :: T, P A : T, M N (by *Ax.* 2.)	*i. e.* S, B A : R :: T, P A : T, B. (*Sol.* 1.)	*c c*	*L.*
3	B P, P	B	S, P E : S, P N :: T, F E : T, D N (by *Ax* 2)	*i. e.* R : *cs*, B P : : T, P : *ct*, B. (*Sol.* 1.)	*h L.*	*L.*
4	B P, P	B A	S, G E : S, G F :: T, E N : T, F D ;	*i. e.* R : *cs*, P :: T, P B : T, P A (*Sol.* 3.)	*h L.*	*L adj.*
5	B P, P	B A	R : S, B P : : S, P ; S, B A (by *Ax* 1.) *Sol* 1.		*h L.*	*c op.*
6	P A, P	B P	S, G F : S, G E : : T, D F : T, N E ;	*i. e. cs*, P : R :: *t*, P A : *t*, B P. (*Sol.* 5.)	*L adj*	*h.*
7	P A, P	B	S, P F : S, P D : : S, F E : S, D N ;	*i e.* R : *cs*, P A : : S, P : *cs*, B. (*Sol.* 1.)	*L adj*	*L.*
8	B A, B	P A	S, B M : S, B A :: T, M N : T, P A ;	*i. e.* R : S, B A :: T, B : T, P A. (*Sol.* 1.)	*L adj*	*c*
9	P A, B	B A	T, M N : S, B M : : T, P A : S, B A,	*i. e.* T, B : R :: T, P A : S, B A. (*Ax.* 2.) *Ambig*	*L op*	*c.*
10	P A, B	B P	S, B : R :: S, P A : S, B P (*Ax.* 1) *Ambiguous.*		*L op.*	*h*
11	P A, B	P	S, P D : S, P F : : S, D N : S, F E ;	*i. e. cs*, P A : R :: *cs*, B : S, P *Ambiguous*	*L op*	*L.*
12	P A, B P	P	T, N E : S, E G : : T, F D : S, F G :	*i e.* T, B P : R : : T, P A : *cs*, P. (*Sol.* 3.)	*h.*	*L adj*
13	P A, B P	B	S, B P : S, B N : : S, P A : S, N M ;	*i. e* S, B P : R : : S, P A : S, B. (*Sol.* 1.)	*h.*	*L op.*
14	P A, B P	B A	*cs*, P A : R :: *cs*, B P : *cs*, B A. (*Sol.* 2.)		*h.*	*c.*
15	B, P	B P	T, F E : S, E P : : T, D N : S, P N ;	*i. e. t*, P : R : : *c t*, B : *cs*, B P.	*L L*	*h*
16	B, P	P A	S, F E : S, F P : : S, D N : S, D P ;	*i. e.* S, P : R : : *cs*, B : *cs*, P A. (*Sol.* 1.)	*L L*	*c.*

N. B. If you Project the given Triangle within a Primitive Circle, according to the Doctrine of the Sphere, as was ſhewed under *Spherick Geometry*, all Ambiguities will vaniſh ; and if the Triangle be Oblique, the Perpendicular will be drawn alſo: And this is a very good Way to gain a clear Notion of *Spherical Trigonometry* ; which cannot be underſtood throughly, without the Doctrine of the Sphere, and its ſeveral Projections be firſt learn'd.

Examples,

Examples of the Sixteen Cases of Right-angled Spherical Triangles.



For the Sun's Declination.

CASE I.

Given the Compliment of the Sun's Amplitude B A, and the Latitude P A: Required the Suns Diſtance from the Pole P B, which is the Compliment of his Declination?

R : Σ B A :: Σ P A : Σ B P?

R. = 10. 0000000

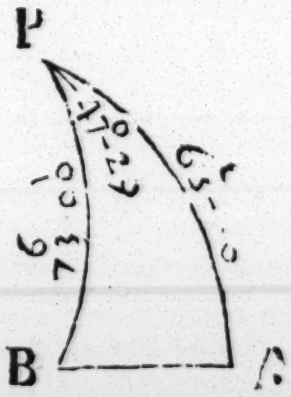
Σ B A = 9. 8508702 = 44° 49'
Σ P A = 9. 6149441 = 65 40

Σ P B = 9. 4658143 = 73

Wherefore the Sun's Declination is 77 Deegrees, = ⊙ B.

CASE II.

Given as before B A and P A. Required B, the Angle of the Suns Poſition?



S, B A : R :: T. P A : T, B?

S, B A = 9. 8480909

Radius = 10.
T, P A = 10. 3446523
T, B = 10. 4965614 = 72° 20'

CASE III.

Given B P, equal to the Sun's Diſtance from the Pole, and P the Sun's Hour from Midnight. Required B, the Angle of the Sun's Poſition?

R : Cos. B P :: T, P : *t*, B?

Radius = 10.

Σ B P = 9. 4659353
T, P = 10. 0376939

t, B. = 72° 20' = 9. 5036292

CASE IV.

For the Latitude.

Given B P equal to the Sun's Diſtance from the Pole, and P the Hour from Midnight. Required P A the Latitude?

R. Σ P :: T, B P : T, P A?

Radius = 10.

Σ P = 9. 8298212
T, B P = 10. 5146610

T, P A = 10. 3444822 = 65° 40'

CASE V.

For the Sun's Amplitude.

Given as before B P and P. Required B A, equal to the Sun's Amplitude?

R : S, B P :: S, P : S, B A.

Radius = 10.

S, B P = 9. 9805963
S, P = 9. 8675151

S, B A = 9. 8481114 = Co-Amplitude

Wherefore, the Sun's Amplitude will be 45° 11'.

CASE VI.

For the Sun's Declination.

Given P A equal to the Latitude, and P the Hour from Midnight. Required B P equal to the Diſtance from the Pole, or the Sun's Co-Declination?

Σ B : R :: T, P A : T, B P?

Σ P = 9. 8298212

Radius = 10.
T, P A = 10. 3446523

T, B P = 10. 5148311 = 73°

CASE VII.

For the Angle of the Sun's Position.

Given as before P A, and P. Required B?

R. Σ P A :: S, P : Σ, B?

R. = 10.

Σ P A = 9. 6149441
S, P = 9. 8675151

Σ B = 9. 4824592 = 72° 20'

CASE VIII.

For the Latitude.

Given B A equal to the Sun's Amplitude, B equal to the Sun's Position. Required P A the Latitude?

R : S, B A :: T, B : T, P A?

Radius = 10.

S, B A = 9. 8480909
T, B = 10. 4968908

T, P A = 10. 3449817 = 65° 40'

CASE IX.

Given P A equal to the Latitude, and B the Angle of Position. Required B A equal to the Amplitude?

T, B : R :: T, P A : S, B A?

T, B = 10. 4968908

Radius = 10.
T, P A = 10. 3446523

S, B A = 9. 8477615 = 40° 49'

CASE X.

For the Sun's Distance from the Pole.

Given P A and B, as before. Required B P, the Sun's Distance from the Pole?

S, B : R :: S, P A : S, B P?

S B = 9. 9790192

Radius = 10.
S, P A = 9. 9595964

S, B P = 73° 0' = 9. 9805772 = Co-Declin.

Wherefore the Declination is 17 Degrees.

CASE XI.

For the Hour from Midnight.

Given, as before, P A and B. Required P, the Hour from Midnight?

Σ P P : R :: Σ B : S P?

Σ P A = 9. 6149441

Radius = 10.
Σ B = 9. 4821283

S, P = 9. 8671842 = 47° 29'

CASE XII.

For the Hour.

Given P A, equal to the Latitude B P, equal to the Sun's Amplitude. Required P = Sun's Hour from Midnight?

T, B P : R :: T, P A : Σ P?

T, B P = 10. 5146610

Radius = 10.
T, P A = 10. 3446523

Σ P = 9. 8299913 = 47° 21'

The Hour from Midnight 47° 29' = 3 H. 10'.

CASE XIII.

For the Angle of Position.

Given, as before, P A : P B. Required B, and the Angle of the Sun's Position?

S, B P : R :: S, P A : S, B?

S, B P = 9. 9805963

Radius = 10.
S, P A = 9. 9595964

S, B = 9. 9790001 = 72° 20'

CASE XIV.

Given Latitude and Declination. Required the Sun's Amplitude?

Given, as before, P A and P B. Required B A = Sun's Amplitude?

P A : R :: Σ B P : Σ B A.

Σ P A = 9. 6149441

Radius = 10.
Σ B P = 9. 4659353

Σ B A = 9. 8509912 = 44° 49'

Equal to the Co-Amplitude, wherefore the Sun's Amplitude = 45° 11'.

CASE

CASE XV.

Given B the Angle of the Sun's Poſition, and P the Hour from Midnight. Required B P the Sun's Diſtance from the Pole?

T, P : R :: *s*, B : Σ BP?

T, P = 10. 0376939

Radius = 10.
s, : B = 9. 5031092

s, : BP = 9. 4654053 = 73°

CASE XVI.

Given as before B, the Angle of Poſition, and P the Hour from Midnight. Required P A = the Latitude of any Place?

S, P : R :: Σ B : Σ PA?

S, P = 9. 8675151

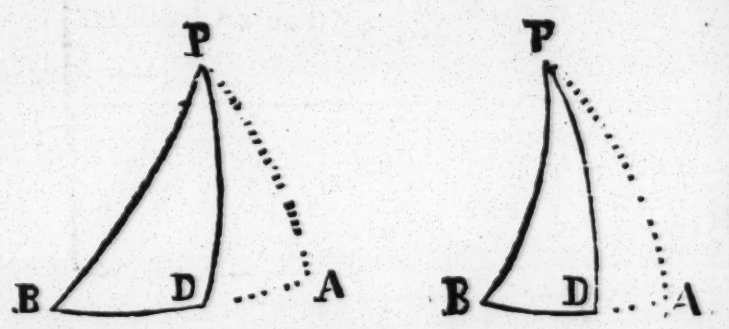
Radius 10.
Σ, B = 9. 4821283 = 72° 20′

Σ, PA = 9. 6146132 = 24° 19′

Oblique Spherical Triangles, may be reduced to two Right-angled Spherical ones, by letting fall a Perpendicular, which either divides the Oblique Triangle propoſed into two Right ones, or makes two Right ones, by adding a Right-angle Triangle to it.

In *Oblique Triangles* there are 12 *Caſes*, 10 of which (by this Preparation) may be ſolved by the two firſt *Axioms*, or by Rules deduced from them.

RULE I.



The Co-ſines of the Angles at the Baſe, are proportional to the Sines of the Angles at the Vertex. For by *Caſe* 7. of *Right-angled Spherick Triangles*.

R : *cs*, PA :: S, BPA : *cs*, B?
R : *cs*, PA :: S, DPA :: *cs*, D?
Therefore *cs*, B : S, BPA :: *cs*, D : S, DPA?

RULE II.

The Co-ſine of the Sides are proportional to the Co-ſines of the Baſes. For by *Caſe* 1. of *Right-angled Spherick Triangles*.

R : *cs*, PA :: *cs*, BA : *cs*, BP?
R : *cs*, PA :: *cs*, CA : *cs*, DP?
Therefore, *cs*, BA : *cs*, BP :: *cs*, DA : *cs*, DP?

RULE III.

The Sines of the Baſes are reciprocally proportional to the Tangents of the Angles at the Baſes. For by *Axiom* 2.

S, BA : R :: T, PA : T, B?
S, DA : R :: T, PA : T, D?
Therefore S, BA × T, B = R × T, A = S, DA × T, D?
Conſequently S, BA : S, DA :: T, D : T, B?

RULE IV.

The Tangent of the Sides, are reciprocally proportional to the Co-ſines of the Angles at the Vertex. For by *Caſe* 4.

T, BP : R :: T, PA : *cs*, DPA?
T, DP : R :: TPA : *cs*, DPA?
Therefore T, BP : T, DP :: *cs*, DPA : *cs*, BPA?

AXIOM III.

In any Triangle the Sines of the Sides are proportional to the Sines of the oppoſite Angles. For by *Axiom* 1.

S, BP : R :: S, PA : S, B?
S, DP : R :: S, PA : S, D?
Therefore S, BP : S, DP :: S, D : S, B?

In letting fall your Perdendicular, obſerve this Rule.

Let it fall from the End of a given Side, and oppoſite to a given Angle.

For by ſo doing, you have enough given in one of the Right-angled Triangles to dertermine any of its unknown Parts.

The two firſt Caſes are ſolved each by one Operation by the third Axiom; the other eight Caſes are ſolved each by two Operations.

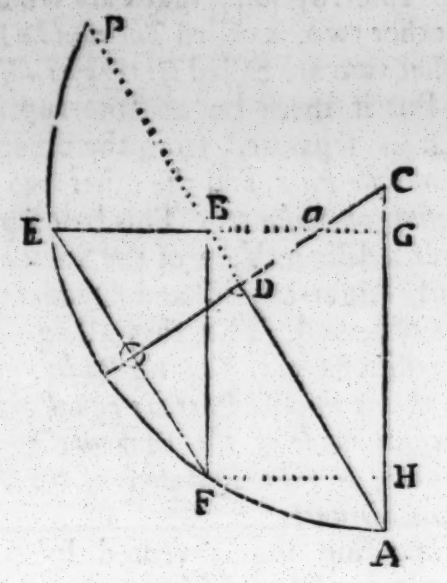
Obſerve alſo, the Addition or Subſtraction both of the Segments of the Baſe, and Angles at the Vertex, according as the Perpendicular falls within or without the Triangle.

Proportions for the Solving the first Ten Caſes of Oblique Spherick Triangles.

Caſe.	Given.	Req.	Proportion.
1	BP. PD. B.	D.	S, PD : S, B :: S, BP : S, D. *Ambiguous.*
2	BP. B. D.	PD.	S, D : S, BP : S, B : S, PD. *Ambiguous.*
3	BP. PD B.	BD.	R : *cs*, B :: T, BP : T, BA, by Caſe 4th of Right-angled Spherick Triangles. Then *cs*, BP : *cs*, BA :: *cs*, DP : *cs*, DA, by *Rule* 2d. Then BA ± DA = BD, according as the Perpendicular falls within or without the Triangles; which is doubtful, unleſs the Kind of the Angle D is known.
4	BP. PD. B.	P.	R : *cs*, BP :: TB : *ct*, BPA, by *Caſe* 3d. And then, T, DP : T, BP :: *cs*, BPA : *cs*, DPA, by *Rule* 4th. Then BPA ± DPA : = PBD. Here alſo, the falling of PA is doubtful, unleſs you know the Kind of the Angle D.
5	BP, B, D.	P.	*cs*, BP : R :: *ct*, B : T, BPA, by *Caſe* 3d. Then, *cs*, B : S, BPA :: *cs*, D : S, DPA, by *Rule* 1. then, if B and D are {alike / unlike} BA ± DPA = BD.
6	BP, B, D.	BD.	*cs*, B : R :: *ct*, BP : *ct*, BA, by *Caſe* 4th. Then T, D : T, B :: S, BA : S, DA, by *Rule* 3d. And then, if B and D are {alike / unlike} BPA ± DA = BPD.
7	B, P. BP.	D.	*cs*, BP : R :: *ct*, B : T, BPA, by *Caſe* 3d. Then *s*, BPA : *s*, DPA :: *cs*, B : *cs*, D, by *Rule* 1. If BPA > BPD, and B {acute / obtuſe}, D is {obtuſe / acute} But if BPA > BPD, and B {acute / obtuſe}, D is {acute. / obtuſe.}
8	B, P. BP.	DP.	*cs*, BP : R :: *ct*, B : T, BPA, by *Caſe* 3d. Then *cs*, DPA : *cs*, BPA :: T, BP : DP, by *Rule* 4th. Then, if DPA is {like to / unlike} B, DP is {< / >} than a Quadrant.
9	BP. BD. B.	DP.	*cs*, B : R :: T, BP : T, BA, by *Caſe* 4th. Then *cs*, BA : *cs*, BP :: *cs*, DA : *cs*, DP, by *Rule* 2d. Then, if DA is {like / unlike} (PA) > B, BD is {< / >} than a Quadrant.
10	BP. BD. B.	D.	*cs*, B : R :: T, BP : T, BA, by *Caſe* 4th. Then S, DA : S, BA :: T, B : T, D, by *Rule* 3d. Then if BA is {< / >} BD, D is {like / unlike} B.

LEMMA.

The Difference of the verſed Sines of two Arks multiplied by half the Radius, is equal to the Sine of half the Sum of thoſe Arks multiplied by the Sine of half the Difference of the Arks.



Suppoſe, A F, A E, the two Arks; the Difference of the verſed Sines is A G — A H = G H = B F, and the Sine of half the Sum of the Arks is A D, for E P = F A, the Sine of half the Difference of the Arks is F O. Now the Triangles A C D, E F B are Similar, (for the Triangles *a* C G, E *o a* are Similar, therefore the Angle C equal to the Angle E) therefore, as A C : A D : : F E : F B, or $\frac{1}{2}$ A C : A D : : $\frac{1}{2}$ F E (*i. e.* F *o*) : F B; therefore $\frac{1}{2}$ A C × F B = F O × A D. For ſince A C : A D : : F E : F B; therefore A C × F B = A D × F E; and conſequently $\frac{1}{2}$ A C × F B = $\frac{1}{2}$ A D × F E: that is = A D × $\frac{1}{2}$ E F : = A D × O F. *Q. E. D.*

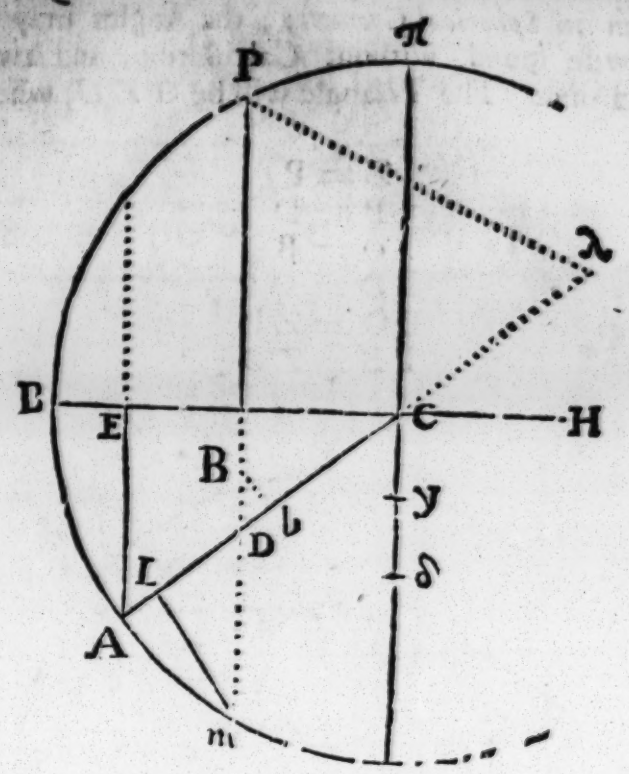
AXIOM IV.

The Rectangle, or Product of the Sines of the Legs, Is to the Square of the Radius : : As the Difference of the verſed Sines of the Baſe, and of the Difference of the Legs, To the verſed Sine of the Vertical Angle.

Demonſtration.

Reſume the foreſaid Circles of Paſteboard, and ſuppoſe there B the Angle required, B A, B P, (equal B M) its Legs, P A the Baſe to be any way oblique to the Plane B A, and not perpendicular as before. Then will B P A be an oblique Triangle.

Let fall P B perpendicular to B *m*, and π *y* perpendicular to C *a*, and B *b* to *b* A, and *m* L perpendicular to *c* A; therefore B *b* is perpendicular to *c* A, and *b* L equal *b* A — L A equal to the verſed Sine of the Baſe, leſs the verſed Sine of the Difference of the Legs.



But A E : A C : : *b* L : B *m*.

And *m* F : *a c* : : B *m* : *y a*.

Therefore multiplying the Correſpondent Terms of both Proportions,

A E × *m* F : A C × *a* C : : (*b* L × B *m* : B *m* × *y a*
b L : *y a*.

CASE XI.

The Three Sides of any Spherick Triangle being given, to find an Angle.

The Rectangle of the Sines of the Legs, Is to the Square of the Radius : : As the Sine of $\frac{1}{2}$ *Baſe more* $\frac{1}{2}$ *diff. of the Legs multiplied by the Sine of* $\frac{1}{2}$ *Baſe leſs* $\frac{1}{2}$ *diff. of the Legs, Is to the Square of the Sine of* $\frac{1}{2}$ *the Angle required.*

Demonſtration.

A E × *m* F : Rq : : (by *Ax.* 4. *b* L : *y a*) *b* L × $\frac{1}{2}$ R : *y* R × $\frac{1}{2}$ R; (*i. e.* by the foregoing *Lemma*, and the firſt in Mr. *Caſwell*'s Trigonometry.)

A E × *m* F : R *q* : : S, $\frac{1}{2}$ Baſe × $\frac{1}{2}$ diff. *c r* × S, $\frac{1}{2}$ Baſe — $\frac{1}{2}$ diff. *c r* to S *q* $\frac{1}{2}$ Angle.

Example in Numbers.

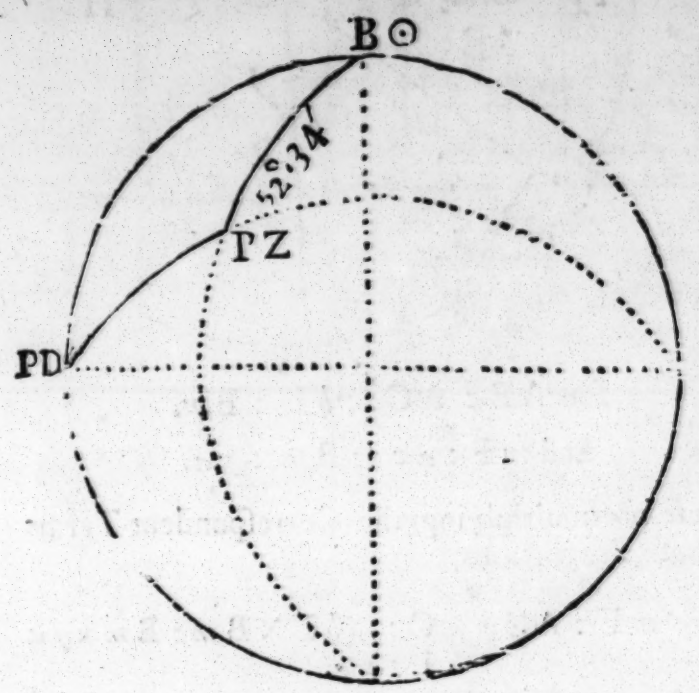
Suppoſe B P equal 60°. 10′, D P equal 46°. 42′, B D equal 87°. 30′ were given, and the Angle P required?

$\frac{1}{2}$ the Baſe is	43°. 45′
$\frac{1}{2}$ the Diff. of the Sides is	6. 44
$\frac{1}{2}$ the Baſe + $\frac{1}{2}$ Diff. of the Sides is	50. 29
$\frac{1}{2}$ the Baſe — $\frac{1}{2}$ Diff. of the Sides is	37. 01
Rad. Sq.	20.0000000
S, $\frac{1}{2}$ Baſe + $\frac{1}{2}$ diff. *c r* × S, $\frac{1}{2}$ Baſe — $\frac{1}{2}$ diff.	19.6669325
Sum	39.6669325
Subſtract the □ of the Sine of the Legs	19.8002534
Remainder = Sq. of the Sine of $\frac{1}{2}$ ∠ P	19.8666791
The $\frac{1}{2}$ of which is the Sine of 59°. 03′	9.9333395
That is $\frac{1}{2}$ the Angle required.	
Therefore being doubled is	118°. 06′ = P.

If

If these Data's were projected by the Directions given in *Spherical Geometry*; the Angles may be likewise found, without Calculation, and 'twill stand thus. The Triangle will be ⊙ Z D, where

Z = P
P = D
⊙ = B
BD = ⊙P
PD = ZP
PB = Z⊙



CASE XII.

The three Angles being given, to find a Side.

The Angles adjacent to the Side requir'd, call Legs; and the Angle oppoſite, call Baſe: Then work as in the 11th *Caſe*.

For, ſuch is the Operation in the Supplemental Triangle, whoſe Angles and Sides are equal to the Supplements of the Sides and Angles of the Triangle propoſed: But Arks and their Supplements, have the ſame Sines and Tangents.

Example in Numbers.

In the Triangle B D P, there is given the

Angle { P = 143.0, *the Sun's Azimuth from the North.*
B = 15.04, *the Angle of the Sun's Poſition.*
D = 30.00, *the Hour from Noon.*

Required the Side P D, which is the *Complement of the Latitude?*

Com. *Angle* P =	37° 00′	*Ar. co.* of the Sines.		0.220537
Angle D =	30 00			0.301030
Angle B =	15 04	= *Angle op.*		
Sum =	82 04			
½ Sum =	41 02	Sines		9.817233
½ Sum — *Angle op.*	25 58	Sines		9.641323
The Sum of the 4 Logarithms equal				19.980113
Its half is the Co-ſine of 12° 13′				9.990056

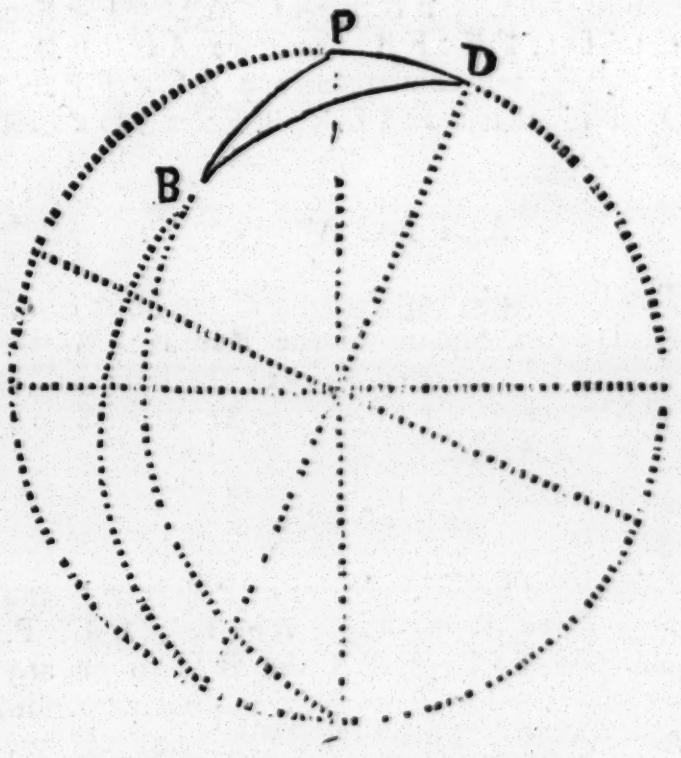
Which doubled, gives 24° 26′ equal P D equal *Complement of Latitude*: Wherefore the Latitude muſt be 65°. 34′.

In a Spherick Triangle, that is Right-angled or Quadrantal, the two Parts which are adjacent to the Right-angle or Quadrant, together with the Complements of the other three, are called, by my Lord *Napier*, *The Five Circular Parts*. And if the three Parts which enter the Queſtion, (*viz.* 2 given, and 1 required) have no Interruption, (now tho' a Right-angle or Quadrant come between, 'tis not counted an Interruption) that Part which is between the other two, is called *The middle Part*, and then the other two are called *Extreams adjacent*, or *conjunct*. But if there be an Interruption, that Part which is ſeparated from the other two, is called *The middle Part*, and the other two, are *Extreams oppoſite*, or *disjunct*. This being premiſed, *Napier*, after a diligent View of the Solutions of all the Caſes of Right-angled and Quadrantal Triangles, has obſerved, That they all agree in one or two Propoſitions, *viz.* *That the Radius multiplied by the Sine of the middle Part, is equal to the Rectangle or Product made of the Tangents of the Extreams conjunct, or to the Rectangle of the Co-ſines of the Extreams disjunct.*

This Propoſition was invented by the Lord *Napier*, purely for Eaſe of Memory, and has been applied in all its Caſes by moſt Authors; as particularly, by Sir *Iſaac Newton*, *Norwood*, Sir *J. Moor*, *Ward*, &c.

Some more Examples of Oblique Spherick Triangles in Numbers.

In the Oblique Triangle B P D, (See the Figure following.)



Suppoſe there be given the Sides.

P D = 24°. 20′, { *the Complement of the Sun's Latitude.*

B D = 73°. 00′, { *the Complement of the Sun's Declination, or his Diſtance from the North Pole.*

P B = 52°. 34′, { *the Complement of the Sun's Altitude.*

'Tis required to find the Angle.

B P D, { *the Sun's Azimuth from the North Part of the Meridian.*

½ the

½ the Base is	36°	30′
½ the Diff. of the Side is	14	07
½ the Base + ½ the Diff. of the Sides is	50	37
	22	23
The Radius Square.	24.	000000
S, ½ Base + ½ Diff. *cr* × S, ½ base— ½ diff. *cr*.	19	469525
Sum	39	469525
From which Subtr. the □ of the Sines of the Legs.	19	514701
Rem.=Sq. of the Sine of ½ the Angle P.	19	954824
Its ½ is the Sine of 71° 40′ = ½ the Angle required	9.	977412

Therefore being doubled, is 143° 20′ = Angle P.

For practical Operations in this Case, nothing is more easy and expeditious than the following Method, of which I shall give two useful Examples: One for the *Azimuth*, as above; the other for the *Hour of the Day*.

1. In the Triangle D P B, let the same things be given, and the Angle P, or *Azimuth* requir'd.

P D = 24° 20′	*Ar. co. of the Sines.*	0	385056
B P = 52 04		0	103146
B D = 73 00 = Base.			
Sum = 149 54.			
Sum = 74 57	*their Sines*	8	984842
½ S — Base = 1 57		9	531822
Sum =		19	001872
Its half is the Co-sine of 71° 32′		9	500936

Which being doubled, gives 143° 04′ for the Angle P, or the Azimuth from the North.

2. In the Triangle D P B, the Sides being given, and the Angle D, which is the Hour from Noon requir'd.

P D = 24° 20′	*Ar. co. of the Sines*	0	385056
B D = 73 00		0	019404
B P = 52 34 Base.			
Sum = 149 55			
½ Sum = 74 57	*their Sines*	9	984842
½ Sum — Base = 22 23		9	580698
The Sum of the four Logarithms =		19	970000
Its half is the Co-sine of 14° 58′		9	985000

Which doubled, is 29° 56′ = Angle D; and being reduced into Time, gives 1 Hour and above 59 Minutes from Noon, which was requir'd.

TRILATERAL, in Geometry, is the same with a three-sided Figure.

TRIMM *of a Ship*, is her best Posture, Proportion of Ballast, and hanging of her Masts, &c. for sailing; and therefore, to find the best way of making any Ship to sail swiftly, is called finding her *Trimm*. And this depends very much on Experience and Judgment, and several Trials and Observations which the Commander may make Aboard.

TRINE, is an Aspect of the Planets, when at the Distance of 120 Degrees or 4 Signs from each other, and noted thus △.

TRINGLE, in Architecture, is a little Member fix'd exactly upon every *Triglyph*, under the Plat-band of the Architrave, from whence hang down the *Guttæ* or Pendant-Drops in the *Dorick Order*.

TRINOMIAL-*Root*, in Mathematicks, is a Root consisting of three Parts connected together by the Sign +; as $a + b + c$: See *Binomial*.

TRIP: The Seamen say a Ship goes with her *Top sails a-Trip*, when she carries them hoisted up to the highest, and when the Wind blows not too hard, but a gentle, or *Loom-gale*.

TRIPARTITION, is Division by 3, or a taking the third Part of any Number or Quantity.

TRIPLICATE *Ratio*, must be well distinguish'd from *Triple*, and is the Ratio of Cubes one to another.

Thus in these Geometrical Proportionals 2, 4, 8, 16, 32, as the Ratio of the first Term (2) is to the third (8) Duplicate of the first to the second, or as 4 the Square of 2, to 16 the Square of 4; so the Ratio of 2 to 16 the fourth Term, is *Triplicate*; or as 8 which is the Cube of 2, to 64 the Cube of 4. And this *Triplicate Ratio* is compounded of all the preceding Ratio's.

TRIPPING; a Term in Heraldry: See *Passant*.

TRIPTOTES, in Grammar, are such defective Nouns as have but three Cases, as *Sordem*, *Sordis*, *Sorde*, and *Tantundem*, &c.

TRIS-DIAPASON, or *Triple-diapason*, a Chord in Musick, otherwise called a Triple, Eighth, or Fifteenth.

TRISE; the Sea Word for hailing up any thing by a dead Rope, or one that doth not run in a Block, but 'tis done by Hand or by main Strength: Thus if any Cask, Chest, or other Goods hath only a Rope fastned to it, and so without a Tackle is pulled up into the Ship by Hand, they say it is *Trised up*.

TRISMUS, is the grinding of the Teeth, or a Convulsion of the Muscles of the Temples, whereby the Teeth gnash whether one will or no. *Blanchard*.

TRISYLLABLE, is a Word consisting of but three Syllables.

TRITÆOPHYES, is an Ague that comes every third Day. *Blanchard*.

TRITÆUS, is the same with *Febris Tertiana intermittens*. *Blanchard*.

TRITONE, a Term in Musick, which signifies a greater Fourth.

TRITURATION, is a pounding in a Mortar, &c. whereby Medicines are reduced to Powder, that they may be the better mixed.

TROCANTER, the same that *Rotator*.

TROCHILE, in Architecture, is that hollow Ring or Cavity which runs round a *Column* next to the *Tore*; vulgarly 'tis call'd the *Casement*: 'Tis frequently bordered or rather shut in with *Lists*. 'Tis often called *Scotia*, from its shady dark Appearance.

TROCHISCI, *Trochisks*, are round or other figur'd Medicinal things, made of Powders, mix'd with viscous Extracts, and made up into Paste, and then into round, triangular, &c. little Bodies, which are to be dried up in the Shade. They are much the same with Tablets and Lozenges.

TROCHLEA, a Term in Anatomy, the same with *Bathmis*.

TROCHLEA, is alſo one of the Mechanick Powers, and is what we uſually call the *Pulley*.

TROCHLEARIS, is the upper or greater oblique Muſcle of the Eye: See *Obliquus Superior*.

TROCHOID, the ſame with *Cycloid*; which ſee.

TROCHOLICKS, is by ſome taken for that Part of the Mechanicks which ſhews the Properties of all circular Motions.

TROMA, is a Wound from an external Cauſe.

TROMBOSIS, is a Trembling, or a Depravation of the voluntary Motion of the Members. *Blanchard.*

TROPES, are when Words are changed from their proper Signification, and applied to other things than what they naturally mean.

TROPICAL *Year*: See *Year*.

TROPHY, in Architecture, is an Ornament which repreſents the Trunk of a Tree charged or encompaſſed all round about with *Arms* or *Military* Weapons, both *Offenſive* and *Defenſive*.

TROPICKS, are Circles ſuppoſed to be drawn parallel to the *Equinoctial* at 23° 30′ diſtance from it, one towards the North, called the *Tropick of Cancer*; and the other towards the South, call'd the *Tropick of Capricorn*, becauſe they lie under theſe Signs.

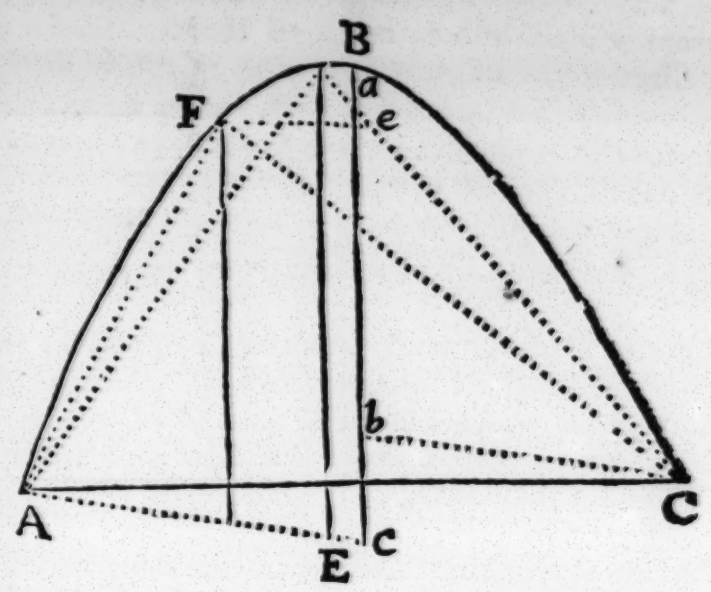
Mr. *Halley*, in *Philoſ. Tranſ.* N° 215. by three ſubſequent Obſervations made near the Tropick at proper Intervals of Time, ſhews a Method to find the Moment of the Sun's Ingreſs into the Tropical Signs, capable of all the Exactneſs the moſt Accurate can deſire; and that without any Conſideration of the Parallax of the Sum, of the Refractions of the Air, of the greateſt Obliquity of the Ecliptick, or Latitude of the Place, premiſing the following *Lemmata*, *viz.*

1. That the Motion of the Sun in the Ecliptick, about the time of the Tropicks, is ſo nearly equable, that the Difference from Equality is not ſenſible, from five Days before the Tropicks, to five Days after; and the Difference ariſing from the little Inequality that there is, never amounts to above $\frac{1}{4}$ of a ſingle Second in the Declination, and this by reaſon of the Nearneſs of the *Apogæon* of the Sun to the *Tropick of Cancer*.

2. That for five Degrees before and after the Tropicks, the Differences whereby the Sun falls ſhort of the Tropicks, are as the verſed Sines of the Sun's Diſtance in Longitude from the Tropicks; which verſed Sines in Arches under five Degrees, are beyond the utmoſt Nicety of Senſe, as the Squares of thoſe Arches. From theſe two follows,

3. That for five Days before and after the Tropicks, the Declination of the Sun falls ſhort of the utmoſt Tropical Declination, by Spaces which are in duplicate Proportion, or as the Squares of the Times by which the Sun is wanting of, or paſt the Moment of the Tropick.

Hence 'tis evident, that if the Shadows of the Sun, either in the Meridian, or any other Azimuth, be carefully obſerved about the time of the Tropick, the Spaces whereby the Tropical Shade falls ſhort of, or exceeds thoſe at other times, are always proportionable to the Squares of the Intervals of Time between thoſe Obſervations and the true time of the Tropick; and conſequently, if the Line, on which the Limits of the Shade is taken, be made the Axis, and the correſpondent Times from the Tropick, expounded by Lines, be erected on their reſpective Points in the Axis as Ordinates, the Extremities of thoſe Lines ſhall touch the Curve of a Parabola, as in the following Figure, where *a*, *b*, *c*, *e*, being ſuppoſed Points obſerved, the Lines *a* B, *b* C, *c* A, *e* F, are reſpectively proportional to the times of each Obſervation, before or after the Tropical Moment in *Cancer*.



This being premiſed, the true time of the Tropick by three Obſervations, is found from this Geometrical Problem.

Having three Points in a Parabola, A, B, C, or A, F, C, given, together with the Direction of the Axis, To find the Diſtance of thoſe Points from the Axis.

Of this there are two Caſes; the one when the time of the ſecond Obſervation B is preciſely in the Middle-time between A and C: In this caſe, putting *t* for the whole time between A and C, then A *c* the Interval of the remoteſt Obſervation A from the Tropick is found by the following Analogy:

$$2ac - bc : 2ac - \tfrac{1}{2}bc :: \tfrac{1}{2}t \text{ (or AE)} : Ac,$$

the time of the remoteſt Obſervation A from the Tropick.

But the other Caſe, when the middle Obſervation is not exactly in the Middle between the other two times, as at F, is ſomething more operoſe, and the whole Time from A to C being put $= t$, and from A to F $= S$, $ce = c$, and $bc = b$, the Theorem will ſtand thus $\frac{ttc - bSS}{2tc - 2bS} = Ac$, the Time ſought.

To illuſtrate this Method of Calculation, he gives the two following Examples.

Anno 1500, *Bernard Walther*, in the Month of *June*, at *Nuremberg*, obſerved the Chord of the Diſtance of the Sun from the *Zenith*, by a large Parallactick Inſtrument of *Ptolemy*, as follows.

$$June \left\{ \begin{matrix} 2.\ 45467 \\ 9.\ 44934 \\ 16.\ 44990 \end{matrix} \right\} \text{ and } June \left\{ \begin{matrix} 8.\ 44975 \\ 12.\ 44883 \\ 16.\ 44990 \end{matrix} \right.$$

In both which Caſes, the middle Time is exactly in the Middle between the Extreams, and therefore in the former three, $ac = 533$, $bc = 477$ and *t*, the Time between being 14 Days; by the firſt Rule, the Time of the Tropick will be found by this Proportion. As

As 589 : 827 $\frac{1}{2}$ :: $\frac{1}{2}$ *t* (or 7 Days) : 9 d. 2 h. 2′. Whence the Tropick *Anno* 1500, is concluded to have fallen *June* 11 d. 20 h. 2′.

In the latter three, *a e* equal 107, *b c* equal 15, and the whole Interval of Time is 8 Days equal *t*; whence,

As 199 : 206 $\frac{1}{2}$ :: 4 Days : 4 d. 3 h. 37′, which taken from the 16 Day at Noon, leaves 11 d. 20 h. 23′ for the Time of the Tropick agreeing with the former to the third Part of an Hour.

Anno 1636, *Gaſſendus* at *Marſeilles* obſerved the Summer Solſtice by a *Gnomon* of 55 Foot high, in order to determine the Proportion of the *Gnomon* to the Solſtitial Shade; and he left theſe Obſervations, ſerving for the ſecond Rule.

June 19	Shadow	31766	Parts whereof the *Gnomon* was 89428.
June 20		31753	
June 21	Sh. N.	31751	
June 21		31759	

Theſe being divided into two Sets of three Obſervations each, *viz.* The 19th, 20th, and 22d; and the 19th, 21ſt, and 22d, there will be in the firſt three, *c* equal 13, *b* equal 7, *t* equal 3 Days, S equal 1; and in the ſecond, *c* equal 15, *b* equal 7, *t* equal 3, and S equal 2. Whence, according to the Rule, the 19th Day at Noon, the Sun wanted of the Tropick a Time proportionate to one Day, as *t t c*—S S *b* to 2 *t c*—2 *b* S; that is, as 110 to 64 in the firſt Sett, or 107 to 62 in the ſecond Sett, that is, 1 d. 17 h. 15′ in the firſt, or 1 d. 17 h. 25′, in the ſecond Sett; whence it may be concluded, that the Moment of the Tropick was on *June* 10 d. 17 h. 20′ in the Meridian of *Marſeilles*.

The great Advantage of this Method is, That any very high Buildings ſerves for an Inſtrument, or the top of a high Tower or Steeple, or even any high Wall whatſoever, that may be ſufficient to intercept the Sun, and caſt a true Shade. Nor is the Poſition of the Plane on which you take the Shade, or that of the Line thereon, on which you meaſure the Receſs of the Sun from the Tropick, very material; but in what way ſoever you diſcover it, the ſaid Receſs will be always in the ſame Proportion, by reaſon of the ſmallneſs of the Angle, which is not 6 Minutes in the firſt five Days: Nor need you enquire the Hight or Diſtance of your Building, provided it be very great, ſo as to make the Spaces you meaſure, large and fair. But it is convenient, that the Plane on which you take the Shade, be not far from perpendicular to the Sun, at leaſt not very oblique; and that the Wall which caſts the Shade, be ſtrait and ſmooth at top, and its Direction nearly Eaſt and Weſt. And it will be requiſite to take the Extream greateſt or leaſt Deviation of the Shadow of the Wall, becauſe the Shade continues for a good time at a ſtand without Alteration, which will give the Obſerver leiſure to be aſſured of what he does, and not be ſurprized by the quick tranſient Motion of the Shade of a ſingle Point at ſuch a Diſtance.

The principal Objection is, That the *Penumbra* or Partile Shade of the Sun, is in its Extreams very difficult to diſtinguiſh from the true Shade, which will render this Obſervation hard to determine nicely.

But if the Sun be tranſmitted through a *Teleſcope*, after the manner uſed to take his *Species* in a *Solar Eclipſe*, and the upper half of the Object-glaſs be cut off by a Paper paſted thereon, and the exact upper Limb of the Sun be ſeen juſt emerging out of, or rather contiging the Species of the Wall, (the Poſition of the Teleſcope being regulatd by a fine Hair extended in the *Focus* of the Eye-glaſs) then by this Means the Limit of the Shade may be obtained to the utmoſt Exactneſs.

TROVER, in Law, is an Action which a Man hath againſt one, that having found any of his Goods, refuſes to deliver them upon Demand. Of late, Actions of Detinue are much turn'd into Actions upon the Caſe, *Sur* Trover & *Converſion*.

TROUGH *of the Sea*, is the Hollow or Cavity made between any two Waves or Billows in a rowling Sea; and when a Ship lies down there, they ſay, *She lies in the Trough of the Sea*.

TRUCKS, belonging to the Carriage of a Piece of Ordnance, are the Wheels which are on the Axletree to move the Piece.

TRUE *Conjunction*: See *Conjunction True*.

TRUE *Place* of a Planet or Star, is a Point of the Heavens ſhewn by a right Line drawn from the *Centre of the Earth* through the *Centre of the Planet* or *Star*; whereas its *apparent Place*, is that which is found by a right Line drawn from the *Obſerver's Eye* through the Centre of the Planet or Star. And this Point in the Heavens is referred to the Ecliptick or Zodiack, by the Planet or Star's Circle of Longitude.

TRUNCATED *Pyramid* or *Cone*, is one whoſe Top is cut off by a Plane parallel to its Baſe; and therefore the Figure of the truncated Top muſt always be ſimilar to the Baſe.

How to find its *Solidity*, ſee in the Word *Fruſtrum*.

A Truncated Cone, or the *Fruſtrum* of that Body, is called ſometimes a *Curti-Cone*.

TRUNK *Roots* of a Plant, are little Roots which break or grow out of the Trunks of Plants; and are of two kinds.

1*ſt*, Such as Vegetate by a direct Deſcent, the Place of their Eruption being ſometimes all along the Trunk, as in *Mints*, *&c.* and ſometimes only in the utmoſt Point, as in *Brambles*.

2*dly*, Such as neither aſcend nor deſcend, but ſhoot forth at Right-angles with the Trunk; which therefore, tho' as to their Office they are true Roots, yet as to their Nature they are a middle Thing between a Trunk and a Root. Dr. *Grew Anat. of Plants*, p. 27.

TRUNNIONS of a Piece of Ordnance, are thoſe Nobs or Bunches of the Guns Metal which bear her up upon the Cheeks of the Carriages.

TRUSSES, are Ropes faſtned to the Parrels of a Yard in a Ship, ſerving either to bind faſt the Yards to the Maſts, when the Ship rowls, lying either *a Hull*, or an Anchor; or to hale down the Yards in a Storm or Guſt of Wind: They belong to the Main-yard, Fore-yard, and Miſſen, and are all brought to upon occaſion.

TRY; a Ship is ſaid to *Try*, when ſhe hath no more Sails abroad but her Main-ſail: When her *Tacks* are cloſe aboard, the *Bowlings* ſet up, and the *Sheats* haled cloſe aft; when alſo the Helm is tied cloſe down to the Board, and ſo ſhe is let lie in the Sea. And ſometimes when it blows ſo hard, that they cannot maintain the Main-ſail, as they ſay; that is, cannot bear it out, they make her *lie a Try* under a *Miſſen-ſail* only.

TUBÆ *Fallopianæ*, are two ſlender Paſſages, proceeding from the Womb, which when they are a little removed from it, grow gradually wider: They have large Holes or Orifices, which almoſt lie ſhut, the extream Edges falling flat; yet if they be diligently opened and dilated, they repreſent the extream Orifice of a Trumpet. Their Uſe is to receive the Eggs from the Teſticles, and carry them into the Womb, according to the Excellent *R. de Graef*; the Truth whereof is evident from the Inſpection of Rabbets diſſected.

TUBER, properly, is a ſubterraneous Muſh-room, or a *Truffle*; but by Botanick Writers, is often uſed to ſignifie the round turgid Roots of ſome Plants: Which therefore they call *Turberoſe Roots*, or *Knobby Roots*, as Mr. *Ray* Engliſhes it.

TUBEROUS: See *Tuber*.

TUBULI *Lactiferi*, certain Lactiferous or Milk-carrying Pipes, which are as it were the Store-houſe wherein the Milk is kept, and thro' which, as by Conduits, it flows to the Nipples of the Breaſts of Females when they give Suck.

TUBULI *Vermiculares*, are certain ſmall winding Cavities formed on the outſides of the Shells of Marine Shell-Fiſhes, in which ſome ſmall Worms inhabit and breed.

Theſe are very frequently found on ſuch *Foſſil Shells* as are dug up almoſt every where out of the Earth; and therefore help to demonſtrate, that they are real Shells, and not *formed Stones*, as ſome will have it.

TUCK *of a Ship*, is the truſſing or gathering up of her Quarter under Water; which if ſhe lie deep, makes her have a Broad, or as they call it, *Fat Quarter*, and hinders her Steering, by keeping the Water from paſſing ſwiftly to her Rudder; and if this Truſſing lie too high above the Water, ſhe will want bearing for her Works behind, unleſs her Quarter be very well laid out.

TUMOR; by this Word, which in general ſignifies any Swelling, the Chirurgeons underſtand a *Diſeaſe* or morbid Affection, incident moſt uſually to the Organical Parts of the Body, increaſing their Quantity preternaturally by Means of ſome ſuperfluous Humours coming thither from other Parts.

TUNICLE, in Anatomy, ſignifies a Membranous Coat.

TUNNAGE: See *Tonnage*.

TURBITH *Mineral*, or Yellow Precipitate of Mercury, is thus made. Put any Quantity of good Quickſilver into a Glaſs Retort, and pour on it four times its Weight of Oil of Vitriol. Set the Retort in Sand, and when the Mercury is diſſolv'd, which 'twill hardly be in ten Hours time, diſtil off the Humidity gently at firſt, but make a ſtrong Fire at laſt, to drive out all the Spirits. When you break the Retort, you will find in it a white Maſs, which powder in a Glaſs Mortar, and then pouring warm Water upon it, it will preſently turn *Yellow*; it muſt be waſhed ſeveral times, and dried in the Shade, and then 'twill Vomit and Purge ſtrongly.

TURIONES; amongſt Botanick Writers, are the firſt young tender Shoots or Tops which any Plants do annually put forth of the Ground.

TURN, a Term belonging to the Movement of a Watch, and ſignifies the entire Revolution of any Wheel or Pinion.

The number of *Turns*, which the *Pinion* hath in one *Turn* of the *Wheel*, is commonly ſet down as a *Quotient* in common Arithmetick, thus, 5) 60 (12 where the *Pinion* 5 playing in a *Wheel* of 60, moveth round 12 times in one *Turn* of the *Wheel*.

Now, by knowing the Number of *Turns*, which any *Pinion* hath in one *Turn* of the *Wheel* it worketh in, you may alſo find how many *Turns* a *Wheel* or *Pinion* hath, at a greater Diſtance: as the *Contrate-wheel*, *Crown-wheel*, &c.

For, 'tis but Multiplying together the *Quotients*, and the Number produced, is the Number of *Turns*, as in this Example.

5) 55 (11
5) 45 (9
5) 40 (8

The firſt of theſe three Numbers hath 11 *Turns*, the next 9, and the laſt 8. If you multiply 11 by 9, it produceth 99; that is, in one *Turn* of the Wheel 55, there are 99 *Turns* of the ſecond *Pinion* 5, or the *Wheel* 40, which runs concentrical, or on the ſame *Arbor* with the ſecond *Pinion* 5. If you multiply 99 by the laſt Quotient 8, it produces 792, which is the Number of *Turns* the third *Pinion* 5 hath.

TURN, is the Sheriff's Court, kept twice every Year, *viz.* within a Month after *Eaſter*, and within a Month after *Michaelmas*. *Magna Charta*, *cap.* 35. From this Court are exempted only Archbiſhops, Biſhops, Earls, Barons, all religious Men and Women, and all ſuch as have Hundreds of their own to be kept. It is a Court of Record, in all things that pertain to it: It is alſo the King's Leet through all the Country, and the Sheriff is Judge; and this Court is incident to his Office.

TURN-*Pikes*, in the Art of War, are Spars of Wood of 12 or 14 Foot long, and about 6 Inches Diameter in a ſexangular Form: They are bored with Holes, one right under another, about an Inch Diameter; the Axis of each Hole muſt be ſix Inches one from another, but to go by Turns from each ſide, the Pickets that are driven into the Hole, are 6 or 5 Foot long, pointed with Iron, and with Wedges or Nails faſten'd hard into the Holes.

Two of theſe faſten'd together with an Iron Chain and Staple, ſome 6 Inches long, will be of great Uſe to ſtop the Enemies in the Breaches, or elſewhere. But thoſe that are intended to be thrown in Breaches, muſt be made of Oak, and need not be ſo big, or the Pickets ſo long.

TURNO *Vicecomitum*, is a Writ that lies for thoſe that are called to the *Sheriff's Turn* out of their own Hundred.

TUSCAN *Order* of Architecture; ſo called, becauſe invented in *Tuſcany*, an eminent Part of *Italy*. 'Tis the moſt plain of all the 5, and is ſeldom us'd but in ſome Country Building, where there is no need of any *Order* but one; or elſe in ſome very great Building, ſuch as an *Amphitheatre*, or the like, where all the Orders are deſign'd to be uſed.

The Columns here, together with Baſe and Capital, are to be 7 Modules in Length, and to have their Thickneſs diminiſh'd by degrees to a quarter Part. When theſe Columns ſtand alone, the Spaces between them, or the *Inter-columns*, ought to be very large.

Their *Pedeſtals* ought to be one Module high; and the *Baſe* of the *Column* ought to be of the Height of half its Thickneſs; and that Height divided into two equal Parts, makes the *Orle* or *Plinth*,

Plinth, which is made with a kind of Compass; the other is divided into 4 Parts, of which, one is for the *List*, the other for the *Tore*, or thick round Circle of the Pillar.

The *Base* hath a *Saille* or Bearing out, which is the 16th Part of the Diameter of the Column.

The *Capital* is an Height half the Thickness of the Column at the *Base*; and is divided into three equal Parts (according to *Ozanam*), of which, one is for the *Abacus*, the other for the *Oeuf*, as they call it in *French*, *i. e.* the *Ornament*; and the third Part being divided into 7 Divisions, the first makes the *List* under the *Ornament*; and the other six serve for the *Gorgerin Collier*, or *Frise*. The *Astragal* is the Height of the *List* below the *Ornament*.

TUSCAN *Work*, in Architecture, is the most simple and rude of the Five ancient Orders of Pillars: See *Column* and *Order*.

TWIGILD: See *Angild*.

TWILIGHT, is that dubious half Light which we perceive before the Sun-rising, and after Sun-setting. 'Tis occasion'd by the Earth's Atmosphere and the Splendor of the Æther which environs the Sun. The Ethereal accended Atmosphere of the Sun, not setting so soon as, and rising before the Sun; and the Sun's Rays also illuminating the Earth's Atmosphere, before the Body of the Sun it self can appear, occasions a Light always preceding at the Rise, and subsequent to the Setting of that Planet. Which, tho' because of many accidental Variations in both the Sun's and Earth's Atmosphere, it cannot be always of the same Degree of Duration or Brightness; yet it usually holds in the Evenings, 'till the Sun is about 18 Degr. below the Horizon, and appears so long before his Rise in the Morning: And therefore will be least under the Equator, where the Sun rises and sets at Right-Angles to the Horizon; and so will increase more and more, according as the Position of the Sphere grows more oblique: For, in our Latitude, for a good Part of the Year, the Sun is never above 18 Degrees below the Earth; and consequently, all that Time we have no Night, but continual Twilight.

TYMPAN, in Architecture, is that Part of the Bottom of the *Frontons*, which is enclosed between the *Cornices*, and answers the Naked of the *Frise*.

TYMPAN *of an Arch*, is a Triangular Table placed in its Corners.

The most simple of these *Tympans* have only a Table hollow'd, sometimes with the Branches of Lawrel, Olive-Tree, or Oak, or with Trophies, and are conformable to the *Dorick* and *Ionick* Orders. But the richest are adorn'd with flying Figures, as *Fame*; or sitting Figures, as those of the *Cardinal Virtues*, and are proper for the *Corinthian* and *Composit* Orders.

Tympan, is also attributed to the Pannels of Doors in Joyners Work, and to the *Dye* or Square of Pedestals.

TYMPANITES, *Tympanias*; the Disease call'd the *Tympany* is a fix'd, constant, equal, hard, resisting Tumour of the *Abdomen*, which being beat or struck, yields a Sound. It proceeds from a stretching Inflation of the Parts, and of the Membranaceous Bowels, whose Fibres are too much swoln with Animal Spirits, and hindred from receding by the Nervous Juice, which obstructs the Passage; to which Distemper there is consequently added, as the Complement of all, an abundance of flatulent Matter in the Places that are empty. *Blanchard.*

TYMPANUM, or rather *Tympani Membrana*, the Drum, or the Skin of the Drum of the Ear, is a small, thin, orbicular, transparent, nervous and dry Membrane, of most exquisite Sense, stretched over the Cavity of the inner Part of the Ear, and dividing between the inward and outward Ear. Some will have it spring from the *Pericranium*, others from the *Dura-mater*, others from the *Pia-mater*, and others from the softer Process of the auditory Nerve there expanded; and there are some Anatomists, which believe it hath a Substance proper to its self, made in the first Formation of the Parts, and springing from nothing else. It is very *dry*, that it may give the better Sound; and *strong* to bear external Injuries the better. It is enchased in a Channel made in the circumference of the outer End of the Bone that joins to the Cartilage which forms the largest Part of the *Meatus Auditorius*; and it hath a Cord which runs a-cross it behind, which some take for a Ligament to strengthen it; but *Verney* saith, 'tis a Branch of the 7th Pair of Nerves which supplies Twigs to the Muscles that move the *Tympanum*, which are two in Number. When this *Membrana Tympani* is taken away, there appears a Cavity on the inside of it, which is properly the *Tympanum*; but *Verney* will call it the *Barrel*. It's about a Quarter of an Inch long, and half an Inch wide; 'tis compassed round with Bone, and clad within with a Membrane, which is interwoven with a great Number of Vessels. How Sounds are distinguish'd by means of this *Membrana Tympani*, and the four Bones, *Malleolus*, *Incus*, *Stapes*, and the *Os Orbiculare*, you will find at large under the Word *Ear*.

TYMPANUM, in Mechanicks, is a Cylinder, but larger and shorter than the common Axis or Cylinder, which is the *Axis in Peritrochio*, and 'tis usually placed upon that Axis, and is much the same with the *Peritrochium*, which is a kind of Wheel placed on the Axis, in whose Circumference are Staves or Levers to turn the Axis easily about, in order to raise the Weight required.

TYPHODES, is a Symptomatical, continued burning Fever; as it were from the Inflammation of the Bowels. *Blanchard.*

TYPHOMANIA, is a *Delirium* with a Phrensy and a Lethargy. *Blanchard.*

TYPUS, or *Periodus* and *Circuitus*, is the Order that intermitting Fevers observe, consisting of Intension and Remission, of Encreasing and Decreasing, according to some kind of Regularity; and accordingly denominating the kind of the Fever by its *Type*. *Blanchard.*

TYROSIS, is when Milk which is eaten, curdles in the Stomach into a Substance like Cheese. *Blanchard.*

VACATION, by the Lawyers, is all the reſpective Time betwixt the End of one Term, and the Beginning of another.

It ſignifies alſo the time from the Death of a Biſhop, or other Spiritual Perſon, 'till the Biſhoprick, or other Dignity, be ſupplied with another.

VACUUM, is by Phyſiologiſts, ſuppoſed to be a Space devoid of all Body: And this they diſtinguiſh into a *Vacuum Diſſeminatum*, or *Interſperſum*; *i. e.* ſmall void Spaces interſperſed about between the Particles of Bodies:

Or, a *Vacuum Coacervatum*, which is a larger void Space made by the meeting together of the ſeveral Interſperſed or Diſſeminate Vacuities before mentioned.

That there is a *Vacuum*, at leaſt a *Diſſeminate* one, ſeems clear from the following Arguments.

1. That without ſuppoſing ſome Interſperſed Vacuities among Bodies, 'tis very hard to account for Motion: For, if there be an abſolute *Plenum*, the leaſt Body in Nature cannot move, but all Bodies that are, muſt move with it; and yet into what Places they ſhould move, when all Things are already full, is as hard to conceive, as the former.

2. Without allowing a *Vacuum*, how can there be any ſuch thing as either *Rarefaction*, or *Condenſation*? For, if all Space is adequately full of Body, nothing can poſſibly ever take up a greater or leſſer Room than it had at firſt; and yet we find by evident Experience, that Air is capable of a very great Degree of Compreſſion, and that Water can be rarified into Air, or Vapour, and then take up vaſtly larger Room, than it did before.

3. Sir *Iſaac Newton* found, that the Weight of Bodies doth by no means depend on their Forms or Textures, but that all Bodies at equal Diſtances from the Earth, do equally gravitate towards it in Proportion to the Quantity of Matter in them, which is every where as their Weight: Wherefore, *there muſt of Neceſſity be a Vacuum*: For, if all Places were full, there could be no Difference in the Specifick Gravity of Bodies, but Air would be intenſively as heavy as Gold; and ſo Gold could not deſcend in Air, and much leſs any lighter Body than it, which would contradict all the received Laws of Hydroſtaticks, though confirm'd by Ten thouſand Experiments.

In VADO *exponere*, is to Pawn, or leave any equivalent as a Pledge, or Surety of returning Money borrowed or owing.

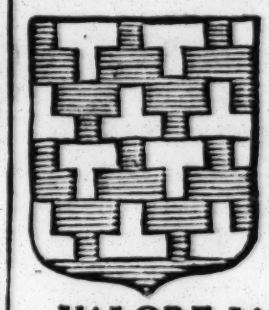
VADIUM *Mortuum*, a Term in Law, ſignifying a Mortgage, Lands or immoveable Goods ſo pawn'd, or engaged to the Creditor, that he has a Right to the mean Profits for the Uſe of his Loan or Debt.

Per VADIUM *ponere*, in Law, ſignifies to take Security, Bail, or Pledges, for the Appearance of a Delinquent in ſome Court of Juſtice.

VAGINALIS *Gulæ*, the perforated Muſcle of the *Gula*, as *Willis* calls it; who ſays, The whole *Oeſophagus* ſeems to conſiſt of two Muſcles; which make four Parallelograms with their oppoſite Fibres decuſſating each other: But in Men it is far otherwiſe; in whom the Fibres of this Muſcle are Longitudinal, and Oblique; the former ſeem to take their Original at the Arytenoidal Cartilages, and paſſing ſomewhat Obliquely to the back Part of the *Oeſophagus*, deſcend to the Stomach: The latter ſeems to be a Continuation of the *Pterigopharyngæus*, and the *Oeſophagus*, deſcending obliquely in a Spiral manner, not unlike thoſe of the Inteſtines deſcribed by the learned Dr. *Cole*.

VAGINALIS *Tunica*: See *Elythroïdes*.

VAIRY, or VERRY, is when the Field of a Coat of Arms is checquered into 2 Colours by the Figures of little Bells; and if theſe Colours are Argent and Azure, 'tis *Vairy Proper*, and you need ſay no more but *Vairy*: But if the Colours are any other, they muſt be expreſly named in Blazoning the Coat: See the Form of it under *Verry*.



VAIRY *Coppy*, or *Potent Counter-Potent*, is a Bearing in Heraldry of this Figure, and in Blazon, the Colours muſt be expreſſed; as *Azure and Argent*, &c.

VALORE *Maritagii*, is a Writ: See *Value of Marriage*.

VALUE *of Marriages*, or *Valore Maritagii*, is a Writ that lies for the Lord, having proffered covenable *Marriage* to the Infant, without Diſparagement, if he refuſe to take the Lord's Offer, to recover the *Value of the Maritage*: See *Stat.* 12 *Car.* 2. *cap.* 24.

VALVULA *Major*, is the upper Part or Cover of the *Iſthmus*, which is betwixt the *Teſtes*, and the foremoſt Vermicular Proceſs of the *Cerebellum*, to which two it is tied at its two Ends, and to the Proceſſes that come from the *Cerebellum* to the *Teſtes*, at its Sides. 'Tis of a Medullary Subſtance; its Uſe is to keep the *Lympha* from falling out above the Nerves in the Baſis of the Skull.

VALVES, are little thin Membranes in Veſſels, or Fibres, like Folding-doors as it were; they have received different Names, according to the Diverſity of their Figuration, as *Sigmoides*, like the *Greek* Letter *Sigma*; *Semilunares*, like an Half-Moon, *&c.* They are found in Veins, Arteries, and in the Lymphatick and Lacteal Veſſels; nay, as ſome ſay, even in the Muſculous Fibres. There are

VALVES alſo found in the Inteſtines, in the ſmall and great Guts, eſpecially in the *Jejunum*, and about the Beginning of the *Ilium*, which are called Semi-circular from their Figure. Theſe Valves, or Folds, grow more and more Oblique, by little and little, the nearer you come to the *Ilium*, and at the Beginning of the *Ilium*, they are leſs Oblique than further on.

In like manner, near the End of the *Jejunum*, they are gradually more and more diſtant from one another, and ſo in the *Ilium* too.

At

At the Beginning, and in the Middle of the *Jejunum*, they are ſcarce diſtant half a Thumb's breadth; in the *Ilium* a whole Thumb's breadth, and more.

They yield a little if thruſt with your Finger, and move here and there: At the Beginning of the *Colon* there is a Fleſhy and Circular Valve, beſides ſeveral others in that Gut.

The Uſe of them is to ſtop the Meat a little, that it may be the better fermented, the Chyle diſtributed, adjacent Parts be cheriſhed with Heat; and laſtly, That it aſcends or returns not again.

VALVULÆ *Conniventes*: See *Conniventes*.

VANE. Thoſe *Sights* which are made to move and ſlide upon *Croſs-ſtaves*, *Foreſtaves*, *Davis's Quadrants*, &c. the Seamen call *Vanes*.

VAN-GUARD, a Military Term, ſignifying the firſt Line of an Army drawn up in Battalia. This is the ſame with the Front of an Army, and gives the firſt Charge upon the Enemy.

VAPORARIUM, is when the Patient ſits ſo as that he receives the Vapours through an Hole, under which there is placed a Pot full of oppoſite and boiling hot Ingredients, which cooling, freſh Matter is added.

VAPOROSUM *Balneum*: See *Balneum Vaporis*.

VAPOURS, in a Medical Senſe, is now a-days uſed for the Diſeaſe called otherwiſe *Hyſterick*, or *Hypocondriack Fits*, or *Melancholy*: But the moſt common Senſe of the Word, is for Watry Exhalations raiſed up either by the Heat of the Sun, the Subterraneal, or any other accidental Heat, Fire, &c.

Mr. *Halley*, in *Philoſophical Tranſactions*, N° 189. gives an Eſtimate of the Quantity of Vapours raiſed out of the Sea, by the Warmth of the Sun, by an Experiment as follows.

We took a Pan (ſaith he) about 4 Inches deep, and 7 or 9 Inches in Diameter, in which we placed a Thermometer, and by means of a Pan of Coals, we brought the Water to the ſame Degree of Heat which is obſerved to be that of our Air in the hotteſt Summers; the Thermometer nicely ſhewing it.

Then we affixed the Pan of Water with the Thermometer in it, to one end of the Beam of the Scales, and exactly counterpoiſed it with Weights in the other Scale: And by the Application or Removal of the Pan of Coals, we found it very eaſy to maintain the Water in the ſame preciſe Degree of Heat.

Doing thus, we found the Weight of the Water ſenſibly to decreaſe; and at the end of 2 Hours we obſerved, That there wanted half an Ounce of *Troy*, all but 7 Grains, or 233 Grains of Water, which in that Time had gone off in Vapour, tho' one could hardly perceive it to ſmoak, and the Water was not ſenſibly warm.

This Quantity in ſo ſhort a Time, ſeemed very conſiderable, being little leſs than 6 Ounces in 24 Hours, from ſo ſmall a Surface as a Circle of 8 Inches Diameter.

To reduce therefore this Experiment to an exact *Calculus*, and to determine the Thickneſs of that Skin of Water, which had ſo evaporated, I aſſume the Experiment alledged by Dr. *Edward Bernard*, to have been made in the *Oxford Society*, *viz.* That a Cube-Foot (*Engliſh*) of Water, weighs exactly 76 Pounds *Troy*. This divided by 1728 the Number of Inches in a Foot, will give $253\frac{4}{7}$ Grains, or half an Ounce, $13\frac{1}{3}$ Grains for the Weight of a Cube-Inch of Water; wherefore the Weight of 233 Grains is $\frac{233}{253\frac{4}{7}}$, or 35 Parts of 38 of a Cube-Inch of Water.

Now the Area of the Circle, whoſe Diameter is 72 Inches, is 49 Square Inches; by which dividing the Quantity of Water evaporated, *viz.* $\frac{35}{38}$ of an Inch, the Quote $\frac{35}{1862}$, or $\frac{1}{53}$, ſhews, that the Thickneſs of the Water evaporated, was the Fifty-third Part of an Inch; but we will ſuppoſe it only the Sixtieth Part, for the Facility of Calculation.

If therefore Water as warm as the Air in Summer, exhales the Thickneſs of a ſixtieth Part of an Inch in two Hours, from its whole Surface, in 12 Hours it will exhale the $\frac{1}{10}$ of an Inch; which Quantity will be found abundantly ſufficient to ſerve for all the Rains, Springs and Dews, and account for the *Caſpian* Seas being always at a ſtand, neither waſting nor overflowing; as likewiſe for the Current ſaid to ſet always in at the Streights of *Gibraltar*, though thoſe *Mediterranean* Seas receive ſo many, and ſo conſiderable Rivers.

To eſtimate the Quantity of Water ariſing in Vapour out of the Sea, I think I ought to conſider it only for the Time the Sun is up; for that the Dews return in the Night, as much if not more Vapours than are then emitted; and in Summer, the Days being longer than twelve Hours, this Exceſs is ballanced by the weaker Action of the Sun, eſpecially, when ariſing before the Water be warmed: So that if I allow $\frac{1}{10}$ of an Inch of the Surface of the Sea, to be raiſed *per Diem* in Vapours, it may not be an improbable Conjecture.

Upon this Suppoſition, every ten Square Inches of the Surface of the Water, yields in Vapour *per Diem*, a Cube-Inch of Water; and each Square Foot half a Wine-pint; every Space of four Foot Square, a Gallon; a Mile Square, 6914 Tons; a Square Degree, ſuppos'd of 69 *Engliſh* Miles, will evaporate 33 Millions of Tons: And if the *Mediterranean* be eſtimated at 40 Degrees long, and four broad, Allowances being made for the Places where it is broader, by thoſe where it is narrower, (and I am ſure, I gueſs at the leaſt) there will be 160 Square Degrees at Sea; and conſequently the whole *Mediterranean* muſt loſe in Vapour, in a Summer's Day at leaſt 5280 Millions of Tons, and this Quantity of Vapour, though very great, is as little as the Remains of another Cauſe, which cannot be reduced to Rule, I mean the Winds, whereby the Surface of the Water is lick'd up ſometimes faſter than it exhales by the Heat of the Sun; as is well known to thoſe that have conſidered thoſe Drying Winds which blow ſometimes.

To eſtimate the Quantity of Water the *Mediterranean* Sea receives from the Rivers that fall into it, is a very hard Task, unleſs one had the Opportunity to meaſure their Channels and Velocity; and therefore we can only do it by allowing more than enough: That is, by preſuming theſe Rivers greater than in all Probability they be, and then comparing the Quantity of Water voided by the *Thames*, with that of thoſe Rivers whoſe Waters we deſire to compute.

The *Mediterranean* receives theſe conſiderable Rivers; The *Iberus*, the *Rhone*, the *Tiber*, the *Po*, the *Danube*, the *Neiſter*, the *Boryſthenes*, the *Tanais* and the *Nile*; all the reſt being of no great Note, and their Quantity of Water inconſiderable.

Theſe nine Rivers, we will ſuppoſe each of them to bring down ten times as much Water as the River of *Thames*; not that any of them are ſo great in Reality, but to comprehend with them all the ſmall Rivulets that fall into the Sea, which otherwiſe I know not how to allow for.

To calculate the Water of the *Thames*, I aſſume that at *Kingſton-Bridge*, where the Flood never reaches, and the Water always runs down, the Breadth of the Channel is 100 Yards, and its Depth three, it being reduced to an Equality; (in in both which Suppoſitions I am ſure I take with the moſt.)

Hence the Profile of the Water in this Place, is 300 Square Yards: This multiplied by 48 Miles, (which I allow the Water to run in 24 Hours, at two Miles an Hour) or 84480 Yards, gives 25344000 Cubick-Yards of Water to be evacuated every Day: That is 20300000 Tons *per Diem*: And I doubt not but in the Exceſs of my Meaſures of the Channel of the River, I have made more than ſufficient Allowance for the Waters of the *Brent*, the *Wandel*, the *Lea*, and *Darwent*, which are all worth Notice, that fall into the *Thames* below *Kingſton*.

Now, if each of the aforeſaid nine Rivers yield ten Times as much Water as the *Thames* doth, 'twill follow, that each of them yield but 203 Millions of Tons *per Diem*, and the whole nine but 1827 Millions of Tons in a Day; which is but little more than one third of what is proved to be raiſed in Vapour out of the *Mediterranean* in Twelve Hours Time.

Now what becomes of this Vapour when rais'd, and how it comes to paſs that the Current always ſets in at the Mouth of the Streights of *Gibraltar*, is intended, with Leave, for a farther Entertainment of this Honourable Company.

In the mean Time, it is needful to advertiſe the Reader, That in making the Experiment herein mentioned, the Water uſed, had been ſalted to the ſame Degree, as is the common Sea-Water, by the Solution of about a fortieth Part of Salt.

The Quantity of Vapours drawn by any determinate Heat from any Quantity of Water in a determinate Time is always proportionable to the Surface of that Water: So that from a double Surface there will be raiſed a double Quantity of Vapour, from a triple Surface, a triple Quantity, *&c.*

For the Manner how, and the Reaſon why Vapours are raiſed by Heat, Mr. *Halley* gives the following Account.

He hath ſhewed, That if an Atom of Water be expanded into a Shell or Bubble, whoſe Diameter ſhall be Ten times as great as before, ſuch an Atom will be ſpecifically lighter than Air, and will riſe ſo long as that Flatus or warm Spirit which firſt ſeparated it from the Maſs of Water, ſhall continue to diſtend it to the ſame Degree: But then that Warmth declining, and the Air growing cooler, and with all ſpecifically lighter, theſe Vapours will ſtop at a certain Region of the Air, or elſe deſcend.

If therefore it ſhould be ſuppoſed, That the whole Earth were covered with Water, and that the Sun as now ſhould make his Diurnal Courſe round it, this Learned Perſon thinks, That the Air would be impregnated with a certain Quantity of Aqueous Vapours, which it would retain it in like Salts diſſolved in Water; and that the Sun in the Day time warming this Air, that part of the Atmoſphere would ſuſtain a greater Proportion of Vapours; (as warm Water will hold more Salt diſſolved in it than cold;) which on the Abſence of the Vapours at Night, would be diſcharged in Dews.

And in this Caſe he concludes, there could be no Diverſity of Weather, other than Periodically every Year alike, the Mixture of all Terreſtrious, Saline, and Heterogeneous Vapours being here excluded; which he judges to be when variouſly compounded and driven by Winds, the Cauſes of thoſe various Seaſons and Changes of Weather which we now find.

But if inſtead of an Earth covered all over with Water, you ſuppoſe the Sea interſperſed about wide and ſpacious Tracts of Land, and alſo divided by high Ridges of Mountains, ſuch as the *Pyrenean*, the *Alps*, and the *Appenine* in *Europe*: *Taurus*, *Caucaſus*, *Imaus*, &c. in *Aſia*; Mount *Atlas*, and the *Mountains of the Moon* in *Africa*: And the *Andes* and *Apalatean* Mountains in *America*; each of which far ſurpaſs the uſual Height to which the Aqueous Vapours of themſelves aſcend, and on the Tops of which, the Air is ſo cold, and rarified, as to retain but a ſmall Part of thoſe Vapours which are brought thither by the Winds.

The Vapours therefore thus rais'd from the Sea, and by the Winds carried over the Low-Lands to thoſe Ridges of Mountains, are there compelled by the Stream of the Air, to mount with it up to their Tops, where the Water preſently precipitates, gleeting down by the Crannies of the Stones; and part of the Vapour entring into the Caverns of the Hills, the Water thereof gathers as in an Alembick in the Baſons of Stone which it finds; and theſe being once full, the Overplus of the Water runs down at the loweſt Place of the Baſon, and breaking out by the Sides of the Hills, forms *Single Springs*:

Many of which running down by the Valleys, or Guts, between the Ridges of the Hills, and after uniting, form *little Rivulets*, or *Brooks*; and many of theſe meeting again in a common Channel from *large Rivers*.

And in this Theory, the Author ſaith, he was confirmed by Experience at *St. Helena*; where reſiding to make Celeſtial Obſervations, the Place being about 800 Yards above the Surface of the Sea, there was every Night ſuch a Condenſation, or rather Precipitation of the Vapours, as that, tho' the Sky was clear, they would cover every half Quarter of an Hour the Object-Glaſſes of his Teleſcopes, and wet his Paper ſo that it would hardly bear Ink to write his Obſervations. *Philoſophical Tranſactions*, N° 192.

The Learned Dr. *Woodward* ſuppoſes the great Abyſs of Water in the Bowels of the Earth to be the Promptuary from whence the Water of Springs and Rivers is chiefly deduced: See *Springs*.

Mr. *Homberg*,

Mr. *Homberg*, in ſome Experiments which he hath publiſhed in the *Memoires de Mathematique & de Phyſique*, for the Month of *May*, 1693. ſays, That the moſt probable Cauſe of the Elevation of Vapors in general, is that the Fiery or Æthereal Matter firſt puts the ſmall Particles of the Water into an Agitation, and then mingles it ſelf with it; which *Mixture* is what we call *Vapors*; this being ſpecifically lighter than Air, will riſe in it, 'till it come to ſuch an height, as that the Air is there of the ſame relative Gravity with it ſelf, and there it will ſwim about, 'till by the Motion of Winds, or other Cauſes, its Conſtitution is broken, and ſo the watry Parts uniting together in greater Drops, it deſcends in Dew, or Rain: Which Notion differs very little from Mr. *Halley*'s. Only *Homberg*, by an Experiment which he made of Evaporation *in Vacuo*, concludes, That Air is not neceſſary to the firſt riſing of Vapors, but only to the making of them mount up on high, after they once are brought or raiſed into it.

VARIATION is, according to *Tycho*, the third Inequality in the Motion of the Moon; and ariſes from her *Apogæum*, being changed as her Syſtem is carried round the Sun by the Earth. *Bullialdus* calls this the Moon's *Reflection*, expreſſing it, That her *Apogæon* reflects backwards contrary to the Order or Succeſſion of the Signs, by reaſon of which the Angle of her *Evection* is ſometimes more, and ſometimes leſs, than it would appear to be, by conſidering only the two other Inequalities. But *Tycho* aſſerts this *Variation* to be never leſs than 40 Minutes, 30 Seconds.

Sir *Iſaac Newton* thinks the *Variation* is cauſed partly by the Elliptick Form of the Moon's Orbit, and partly by the Inequality of the Moments of the Area which the Moon deſcribes by a Radius drawn to the Earth. This, *Prop.* 29. *Book* 3. of his *Principia*, he ſhews how to find; and ſets it at a middle Rate, to be 35 Minutes, 9 Seconds.

VARIATION *of the Needle, or Compaſs*, is the Deviation, or Turning of the *Magnetical Needle* in the *Mariners Compaſs*, from the true *North-point*; which happens more or leſs in moſt Places; and is commonly called by Sea-men the *North-Eaſting*, or *North-Weſting of the Needle.*

To find the Variation at Sea.

About three Hours before or after Noon, having the *Sun's Declination*, his *Altitude*, and the Latitude of the Place, find his true *Azimuth*, (as is directed under that Word) obſerve alſo the *Sun's Magnetical Azimuth*, and then the Differences of thoſe two Diſtances from the *Meridian*, is the *Variation of the Compaſs.*

The ſame is alſo found by having the *Sun's True* and *Magnetical Amplitude.*

For if the Amplitudes be of one kind; that is, both North, or both South, their Difference is the *Variation*: But if of different kinds; that is, one North, the other South, their Sum is the Variation.

In the Practice of obſerving the Variation, it is uſual to take it by the Amplitude of the Riſing and Setting of the Sun, *when his Centre appears in the Viſible Horizon*; whereas he ought to be obſerved when his under Limb is ſtill above the *Horizon* about two Thirds of his Diameter, or 20 Minutes, becauſe of the Refraction, and the Height of the Obſerver's Eye above the Surface of the Water; or elſe to work the *Amplitudes*, as the *Azimuths*, by reckoning the Sun's Diſtance from the *Zenith*, 90 Degrees 36 Minutes. This, tho' it be of little Conſequence near the Equinoctial, will make a great Error in high Latitudes, where the Sun Riſes and Sets Obliquely.

A Table of the Variation of the Compaſs, as it hath been obſerved in divers Places, and at divers Times.

Names of Places.	Longitude from *London*.		Latitude.		*Anno Dom.*	Variation obſerved.	
	Deg.	Min.	De.	Min.		Deg.	Min.
London,	00	00	51	32 N	1580	11	15 E
					1622	6	00 E
					1634	4	5 E
					1672	2	30 W
					1683	4	30 W
Paris,	2	25 E	48	51 N	1640	3	00 E
					1666	0	0
					1681	2	30 W
Uraniburg,	13	00 E	55	54 N	1672	2	35 W
Copenhagen,	12	53 E	55	41 N	1649	1	30 E
Dantzick,	19	0 E	54	23 N	1679	7	00 W
Mompelier,	4	0 E	43	37 N	1574	1	10 W
Breſt,	4	25 W	48	23 N	1680	1	45 W
Rome,	13	0 E	41	50 N	1681	5	0 W
Bayonne,	1	20 W	43	33 N	1680	1	20 W
Hudſon's-Bay,	79	40 W	51	00 N	1668	19	15 W
In *Hudſon's* Streights,	57	00 W	61	00 N	1668	29	30 W
In *Baffin's-Bay*, at Sir *Thomas Smith's* Sound,	80	0 W	78	00 N	1616	57	00 W
At Sea,	50	0 W	38	40 N	1682	7	30 W
At Sea,	31	30 W	43	50 N	1682	5	30 W
At Sea,	42	00 W	21	0 N	1678	0	40 E
Cape *St. Auguſtine*,	35	30 W	8	0 S	1670	5	10 E
At Sea off the Mouth of *R. Plata*,	58	0 W	39	30 S	1670	20	30 E
Cape *Frio*,	41	10 W	22	40 S	1670	12	10 E
At the Eaſt Entrance of *Magellan* Streights,	68	0 W	52	30 S	1670	17	00 E
At the Weſt Entrance of *Magellan* Streights,	75	0 W	53	0 S	1670	14	10 E
Baldivia,	73	0 W	40	0 S	1670	8	10 E
Cape *Agulhas*,	16	30 E	34	50 S	1622	2	0 W
					1675	8	0 W
At Sea,	1	00 E	34	30 S	1675	0	0
At Sea,	20	0 W	34	0 S	1675	10	30 E
At Sea,	32	0 W	24	0 S	1675	10	30 E
St. Helena,	6	30 W	16	0 S	1677	0	40 E
I. Aſcenſion,	14	10 W	7	50 S	1678	1	0 E
Johanna,	44	00 E	12	15 S	1675	19	30 W
Monbaſa,	40	00 E	4	0 S	1675	16	0 W
Zocatra,	56	0 E	12	30 N	1674	17	0 W
Aden, at the Mouth of the *Red-Sea*,	47	30 E	31	00 N	1674	15	0 W
Diego Roiz,	61	0 E	20	0 S	1676	20	30 W
At Sea,	64	30 E	0	0	1676	15	30 W
At Sea,	54	0 E	27	0 S	1676	24	0 W
Bombay,	72	30 E	19	0 N	1676	12	0 W
C. Comorin,	76	0 E	8	15 N	1680	8	48 W
Ballaſore,	87	0 E	21	30 N	1680	8	20 W
Fort *St. George*,	180	0 E	13	15 N	1680	8	10 W
Weſt Point of *Java*,	104	0 E	6	40 S	1976	3	10 W
At Sea,	58	0 E	39	0 S	1677	27	30 W
I. St. Paul,	72	0 E	38	0 S	1677	23	30 W
At *Van Diemens*,	142	0 E	42	25 S	1642	0	0
At *New Zealand*,	170	0 E	40	50 S	1642	9	0 E
At *Three King Iſle* in *New-Zealand*,	169	30 E	34	35 S	1642	8	40 E
I. Roterdam in the South Sea,	184	0 E	20	15 S	1642	6	20 E
On the Coaſt of *New Guinea*,	149	0 E	4	30 S	1643	8	45 E
At the Weſt Point of *New Guinea*,	126	0 E	0	26 S	1643	5	30 E

From the foregoing Table 'tis obſerv'd by the Learned Capt. Halley.

1. That in all *Europe*, the *Variation* at this Time is *Weſt*, and more in the Eaſtern Parts thereof than the Weſtern, increaſing that way.

2. That on the Coaſt of *America*, about *Virginia*, *New-England*, and *Newfoundland*, the *Variation* is *Weſterly*, increaſing all the way as you go Northerly along the Coaſt, ſo as to be above 20 Degrees at *Newfoundland*, nearly 30 Degrees in *Hudſon's Streights*, and not leſs than 57 Degrees in *Baffin's Bay*: And that as you ſail Eaſtward from this Coaſt, the Variation diminiſhes.

Whence it is, That ſomewhere between *Europe* and the North part of *America*, there muſt be an Eaſterly Variation, or at leaſt no Variation.

3. That on the Coaſt of *Brazil*, there is Eaſt Variation, increaſing as you go to the Southward, ſo as to be 12 Degrees at *Cape Frio*, and 20 Degr. and half over-againſt *R. Plata*; and thence ſailing South-weſterly, to the Streights of *Magellan*, it decreaſes 17 Degrees, and at the Weſt Entrance about 14 Degrees.

4. That the Eaſtward of *Brazil*, this Eaſterly Variation decreaſes, ſo as to be very little at *St. Helena* and *Aſcenſion*, and to be quite gone, and the Compaſs Point true about 18 Degrees of Longitude Weſt from the *Cape of Good Hope*.

5. That to the Eaſtward of the aforeſaid Places, a Weſtward Variation begins, and governs in all the *Indian Sea*, ariſing to 18 Degrees under the Equator, about the Meridian of the Northern part of *Madagaſcar*; and 27 Degrees and a half in 39 Degrees South Latitude, near the ſame Meridian: Eaſterly from thence, the Weſt Variation decreaſes, ſo as to be not much above 8 Degrees at *Cape Comorin*, and about 3 Degrees upon the Coaſt of *Java*; and about the *Molucca Iſlands* to be quite gone; as alſo a little to the Weſtward of *Van Diemen's Land*.

6. That to the Eaſtward of the *Molucca's* and *Van Diemen's Land*, in South Latitude, there ariſes another Eaſterly Variation, which ſeems not ſo great as the former, nor of ſo large Extent; for that at the Iſland *Rotterdam*, it is ſenſibly leſs than upon the Eaſt Coaſt of *New Guinea*; and at the rate it decreaſes, it may well be ſuppoſed, that about 20 Degrees further Eaſtward, or 225 Degrees Eaſt Longitude from *London*, in the Latitude of 20 Degrees South, a Weſterly Variation begins.

7. That the Variation taken at *Baldivia*, and at the Weſt Entrance of the *Streights of Megellan*, ſhews, That the Eaſt Variation noted in the third Obſervation, is decreaſing apace; and that it cannot well extend many Degrees into the *South Sea*, from the Coaſt of *Peru* and *Chili*, leaving room for a ſmall Weſterly Variation in that Tract of the unknown World that lies in the mid-way between *Chili* and *New Zealand*, and between *Hounds Iſland* and *Peru*.

8. That in ſailing North-weſt from *St. Helena*, by *Aſcenſion*, as far as the Equator, the Variation continues very ſmall Eaſt, and as it were, conſtantly the ſame; ſo that in this part of the World, the Courſe, wherein there is no Variation, is evidently no Meridian, but rather North-weſt.

9. That the Entrance of *Hudſon's Streights*, and the Mouth of *R. Plata*, being nearly under the ſame Meridian, at the one place the Needle varies 29 Degrees and a half Weſt; at the other 20 Degrees and a half Eaſt.

Whence 'tis concluded,

That the whole Globe of the Earth is one great Magnet, having four Magnetical Poles, or Points of Attraction, near each Pole of the Equator two; and that in thoſe Parts of the World which lie near adjacent to any one of thoſe Magnetical Poles, the Needle is govern'd thereby, the neareſt Pole being always predominant over the more remote.

And he conjectures, That the Pole, which is at preſent neareſt to us, lies in or near the Meridian of the *Lands-End* of *England*, and not above 7 Degrees from the *Arctick Pole*; by this Pole the Variation in all *Europe* and *Tartary*, and the *North Sea*, are principally govern'd; tho' with regard to the other *Northern Poles*, whoſe Situation is in the Meridian paſſing about the middle of *California*, and about 15 Degrees from the North Pole of the World; to this the Needle has chiefly reſpect in all the *North America*, and in the two Oceans on either ſide thereof, from the *Azores* Weſtwards to *Japan*, and farther.

The two Southern Poles are rather farther diſtant from the South Pole of the World: The one about 16 Degrees therefrom, in a Meridian ſome 20 Degr. to the Weſtward of *Magellan's Streights*, or 95 Degrees Weſt from *London*; this commands the Needle in all *South America*, in the *Pacifick Sea*, and the greateſt Part of the *Ethiopick Ocean*.

The fourth and laſt Pole ſeems to have the greateſt Power, and largeſt Dominions of all, as it is the moſt remote from the Pole of the World, being little leſs than 20 Degrees diſtant therefrom, in the Meridian which paſſes through *New Holland* and the Iſland *Celebes* about 120 Degrees Eaſt from *London*; this Pole is predominant in the South part of *Africa*, in *Arabia*, and the *Red Sea*, in *Perſia*, *India*, and its Iſlands; and all over the *Indian Sea*, from the *Cape of Good Hope* Eaſtwards, to the middle of the great South Sea that divides *Aſia* from *America*.

This ſeems to be the preſent Diſpoſition of the Magnetical Vertue throughout the whole Globe of the Earth: It remains to ſhew how this Hypotheſis makes out all the Variations that have been obſerv'd of late; and how it anſwers to the ſeveral Remarks drawn from the Table.

And firſt, it is plain, that (our *European North Pole* being in the Meridian of the *Lands-end* of *England*) all places more Eaſterly than that, will have it on the Weſt ſide of their Meridian; and conſequently the Needle reſpecting it with its Northern Point, will have a Wetterly Variation, which will ſtill be greater as you go to the Eaſtwards, till you come to ſome Meridian of *Ruſſia*, where 'twill be greateſt, and from thence decreaſe again. Thus at *Breſt* the Variation being but 1 Degree and

3 Quarters at *London* 4 Degrees and a half; but at *Dantzick* 7 Degrees Weſt. To the Weſtward of the Meridian of the *Lands-End* the Needle ought to have an Eaſterly Variation; were it not that (by approaching the *American Northern Pole*, which lies on the Weſt ſide of the Meridian, and ſeems to be of greater force than this other) the Needle is drawn thereby Weſtward, ſo as to counter-ballance the Direction given by the *European Pole*, and to make a ſmall Weſt Variation in the Meridian of the *Lands-End* it ſelf. Yet about the Meridian of the Iſle *Tercera*, 'tis ſuppoſed our neareſt Pole may ſo far prevail, as to give the Needle a little Turn to the Eaſt; tho' but for a very little ſpace; the Counter-ballance of thoſe two Poles permitting no conſiderable Variation in all the Eaſtern part of the *Atlantick Ocean*; nor upon the Weſt Coaſt of *England* and *Ireland*, *France*, *Spain* and *Barbary*: But to the Weſtward of the *Azores*, the Power of the *American* Pole, overcoming that of the *European*, the Needle has chiefly reſpect thereto; and turns ſtill more and more towards it, as you approach it. Whence it comes to paſs, that on the Coaſt of *Virginia*, *New-England*, *Newfoundland*, and in *Hudſon's-Streights*, the Variation is Weſtward; that it increaſes as you go from thence towards *Europe*, and that it is leſs in *Virginia* and *New-England*, than in *Newfoundland* and *Hudſon's-Streights*.

This Weſterly Variation again decreaſes, as you paſs over the *North America*, and about the Meridian of the middle of *California*, the Needle again points due North; and from thence Weſtwards to *Yedzo* and *Japan*, 'tis ſuppoſed the Variation is Eaſterly; and half Sea over, not leſs than 15 Degrees: And that this Eaſt Variation extends over *Japan Yedzo*, *Eaſt-Tartary*, and part of *China*, till it meet with the Weſterly, which is govern'd by the *European* North Pole, and which is the greateſt ſomewhere in *Ruſſia*.

Towards the South Pole the Effect is much the ſame, only that here the South Point of the Needle is attracted.

Hence it will follow, That the Variation on the Coaſt of *Brazil*, at the River of *Plate*, and ſo on to the *Streights* of *Magellan*, ſhould be Eaſterly, if we ſuppoſe a Magnetical Pole ſituated about 20 Degrees more Weſterly than the *Streights* of *Magellan*. And this Eaſterly Variation doth extend Eaſtward over the greateſt part of the *Ethiopick* Sea, till it be counterpoiz'd by the Vertue of the other Southern Pole; as it is about mid-way between the *Cape of Good Hope*, and the Iſles of *Triſtan d' Acuntia*.

From thence Eaſtwards the *Aſian* South Pole becoming prevalent, and the South Point of the Needle being attracted thereby, there ariſes a Weſt Variation very great in Quantity and Extent, becauſe of the great Diſtance of this Magnetical Pole of the World.

Hence it is, That all the *Indian Sea*, as far as *Hollandia Nova*, and farther, there is conſtantly Weſt Variation; and that under the Equator it ſelf, it ariſes to no leſs than 18 Degrees, where 'tis moſt.

About the Meridian of the Iſland of *Celebes*, being likewiſe that of this Pole, this Weſterly Variation ceaſes, and an Eaſterly begins, which reaches to the middle of the South Sea, between the middle of *Zelandia Nova* and *Chili*, leaving room for a ſmall Weſt Variation govern'd by the *American* South Pole.

From all this it appears, That the Direction of the Needle in the Temperate and Frigid Zone, depends chiefly upon the Counterpoiſe of the Forces of two Magnetical Poles of the ſame Nature: As alſo how it is, that under the ſame Meridian, the Variation ſhould be in one place 29 Degrees and a half Weſt, and in another 20 Degrees and a half Eaſt.

In the *Torrid Zone*, and particularly under the Equinoctial, reſpect muſt be had to all four Poles, and their Poſitions well conſider'd; otherwiſe it will not be eaſie to determine what Variations ſhall be; the neareſt Pole being always ſtrongeſt; yet not ſo, as not to be counter-ballanc'd ſometimes by the united Forces of two more remote; as is noted in the Eighth Obſervation, that in ſailing from *St. Helena*, by the Iſle of *Aſcenſion*, to the Equator, on the North-weſt Courſe, the Variation is very little Eaſterly, and in that whole Tract unalterable, becauſe that the *South American* Pole (which is conſiderably the neareſt in the aforeſaid Places) requiring a great Eaſterly Variation, is counterpoiz'd by the contrary Attraction of the *North American*, and the *Aſian South* Pole; each whereof ſingly are, in theſe Parts, weaker than the *American South* Pole; and upon the North-weſt Courſe, the Diſtance from this latter is very little varied; and as you recede from the *Aſian South* Pole, the Ballance is ſtill preſerv'd by acceſs towards the *North American* Pole. In this Caſe no notice is taken of the *European North* Pole; its Meridian being little remov'd from thoſe of theſe Places, and of it ſelf requiring the ſame Variations we here find.

After the ſame manner you may proceed to determine the Variations in other places, under and near the Equator.

All this ſeems very much to confirm the aforeſaid *Hypotheſis*, *That there are in the Earth four ſuch Magnetical Points, or Poles, which occaſion the great Variety, and ſeeming Irregularity, which is obſerved in the Variation of the Compaſs.*

But to calculate exactly what it is, in any Place aſſign'd, is not as yet done, nor is it determin'd in what Proportion the attractive Power decreaſes, as you remove from the Pole of the Magnet; as alſo the Change of the Variation, and at what rate, is not yet perfectly diſcovered.

From the foregoing Table, it ſhould ſeem, that all the Magnetical Poles had a Motion Weſtward; but if it be ſo, 'tis evident, That it is not a Rotation about the Axis of the Earth; for then the Variations would continue the ſame, in the ſame Parallel of Latitude (the Longitude only changed) as much as the Motion of the Magnetical Poles: But the contrary is found by Experience; for there is no where in the Latitude of 51 and an half North, between *England* and *America*, a Variation of 11 Degrees Eaſt, at this time; as it was once here at *London*. Wherefore it ſeems that our *European* Pole is grown nearer the Pole *Arctick* than it was heretofore; or elſe that it has loſt part of its Virtue.

But whether theſe Magnetick Poles move altogether with one Motion, or with ſeveral, whether equally, or unequally; whether circular, or libratory: If circular, about what Centre; if libratory, after what manner, things yet unknown.

In

In *Philoſ. Tranſ.* N. 195. Capt. *Halley* brings the following *Hypotheſis*, accounting for this *Variation*, and ſolving all its *Phænomina's*; which is thus:

He reckons the external Parts of the Globe as the Shell, and the internal as a *Nucleus*, or inner Globe, included within ours, with a fluid Medium between, which having the ſame common Centre and Axis of Diurnal Rotation, may turn about with our Earth each 24 Hours; only this outer Sphere having its turbinating Motion, ſome ſmall matter either ſwifter or ſlower than the internal Ball. And a very minute Difference in Length of Time, by many Repetitions, becomes ſenſible; the internal Parts will by degrees recede from the external; and not keeping pace with one another, will appear gradually to move, either Eaſtward or Weſtward, by the Difference of their Motions.

Now ſuppoſing ſuch an internal Sphere having ſuch a Motion, the two great Difficulties in the former Hypotheſis is eaſily ſolv'd: For if this exterior Shell of Earth be a Magnet, having its Poles at a diſtance from the Poles of Diurnal Rotation; and if the internal *Nucleus* be likewiſe a Magnet, having its Poles in two other places diſtant alſo from the Axis; and theſe latter, by a gradual and ſlow Motion, change their Place in reſpect of the External: We may then give a reaſonable Account of the four Magnetical Poles aforemention'd, as likewiſe of the Changes of the Needle's Variations.

The Period of this Motion being wonderful great, and there being hardly an hundred Years ſince theſe Variations have been duly obſerv'd, it will be very hard to bring this *Hypotheſis* to a *Calculus*, eſpecially ſince tho' the Variations do increaſe and decreaſe regularly in the ſame place, yet in differing places, at no great diſtance, there are found ſuch caſual Changes thereof, as can no ways be accounted for by a regular Hypotheſis, as depending upon the unequal and irregular Diſtribution of the Magnetical Matter within the Subſtance of the external Shell or Coat of the Earth, which deflect the Needle from the Poſition it would acquire from the Effect of the general Magnetiſm of the whole.

Of this, the *Variations* at *London* and *Paris* give a notable Inſtance; for the Needle has been conſtantly about $1\frac{1}{2}$ more Eaſterly at *Paris* than at *London*: Tho' it be certain, that according to the general Effect, the Difference ought to be contrary way; notwithſtanding which, the Variations in both places do change alike.

Hence, and from ſome other things of like nature, it ſeems plain, that the two Poles of the external Globe are fix'd in the Earth, and that if the Needle were wholly govern'd by them, the *Variations* thereof would be always the ſame, with ſome Irregularities upon the Account but juſt now mention'd. But the internal Sphere having ſuch a gradual Tranſlation of its Poles, does influence the Needle, and direct it variouſly, according to the Reſult of the attractive or directive Power of each Pole; and conſequently, there muſt be a Period of the Revolution of this internal Ball; after which, the Variations will return again, as before. But if it ſhall in future Ages be obſerved otherwiſe, we muſt then conclude, that there are more of theſe internal Spheres, and more Magnetical Poles than Four, which, at preſent, we have not a ſufficient number of Obſervations to determine, and particularly in that vaſt *Mer del Zur*, which occupies ſo great a part of the whole Surface of the Earth.

If then, two of the Poles be fix'd, and two moveable, it remains to aſcertain, which they are that keep their Place. And it were to be wiſh'd we had the Experience of another Century of Years to found our Concluſions upon: Yet he thinks it may be ſafely determined, that our *European North Pole* (which is ſuppoſed to be near the Meridian of the *Lands-End* of *England*, and about 7 Deg. therefrom) is that that is moveable of the two Northern Poles, and that that has chiefly influenced the Variations in theſe Parts of the World: For in *Hudſon's-Bay*, which is under the Direction of the *American Pole*, the Change is not obſerv'd to be near ſo faſt, as in theſe Parts of *Europe*, tho' that Pole be much farther removed from the Axis.

As to the *South Poles*, he takes the *Aſian Pole* which he places about the Meridian of the Iſland *Celebes* to be fixed, and conſequently the *American Pole* to move, from the like Obſervation of the ſlow decreaſe of the Variation on the Coaſt of *Java*, and near the Meridian of the *Aſian Pole*; tho' he owns to have no Account of the Effects of the other beyond *Magellan Straights*.

This being granted, 'tis plain, That the fixed Poles, are the Poles of this external Shell or *Cortex* of the Earth; and the other two, the Poles of the Magnetical *Nucleus*, included and moveable within the other. It likewiſe follows, that this Motion is Weſtwards; and, by conſequence, that the aforeſaid *Nucleus* has not preciſely attain'd the ſame Degree of Velocity with the exterior Parts in their diurnal Revolutions; but ſo very nearly equals it, that in 365 Revolves, the Difference is ſcarce ſenſible.

This is ſuppoſed to ariſe from the Impulſe whereby this diurnal Motion was impreſs'd on the Earth, being given to the external Parts, and from thence, in time, communicated to the internal; but not ſo, as perfectly to equal the Velocity of the firſt Motion impreſs'd on, and ſtill conſerv'd by the ſuperficial Parts of the Globe.

As to the Quantity of this Motion, it is impoſſible to define it, both from the Nature of this kind of Obſervation, which cannot be very accurately perform'd; as alſo, from the ſmall Time theſe Variations have been obſerv'd, and their Change diſcover'd. It appears by all Circumſtances, that its Period is of many Centuries of Years, and as far as may be, collected from the Change of the Place, where there was no Variation by reaſon of the *Equilibrium* of the two Southern Magnetical Poles, *viz.* from *Cape d' Agulhas*, to the Meridian of *St. Helena* (which is about 23 Deg. in about 90 Years) and of the Place where the Weſterly Variation is in its greateſt Deflection, being about half ſo much, *viz.* from the Iſle of *Diego Roiz*, to the South-weſt Parts of *Madagaſcar*; we may with ſome reaſon conjecture, that the *American* Pole has moved Weſtward 46 Degr. in that Time, and that the whole Period thereof is perform'd in 700 Years, or thereabouts: So that, the nice Determination of this, and of ſeveral other Particulars in the Magnetick Syſtem, is reſerv'd for Poſterity; all that we can hope to do, is to leave behind us Obſervations that may be confided in, and to propoſe Hy-

potheſes which after Ages may examine, amend, and refute.

Thus, in order to explain the Change of the *Variations*, we have adventured to make the Earth hollow, and to place another Globe within it; not but that there may be ſeveral Objections againſt it; as,

That there is no Inſtance in Nature of the like thing.

That, if there was ſuch a middle Globe, it would not keep its Place in the Centre, but be apt to deviate therefrom, and might poſſibly chock againſt the concave Shell, to the Ruin, or at leaſt Endamaging thereof.

That the Water of the Sea would perpetually leak through, unleſs we ſuppoſe the Cavity to be full of Water.

That were it poſſible, yet it does not appear what Uſe ſuch an inward Sphere can be of, being ſhut up in eternal Darkneſs, and therefore unfit for the Production of Animals, or Plants; with many more Objections, according to the Fate of all ſuch new Propoſitions.

To theſe it may be briefly anſwer'd, That the Ring environing of the Globe of *Saturn*, is a notable Inſtance of this kind, as having the ſame common Centre, and moving along with the Planet, without ſenſibly approaching him on one ſide more than on the other. And if this Ring were turned on one of its Diameters, it would then deſcribe ſuch a concave Sphere as this external one is ſuppoſed to be. And ſince the Ring in any Poſition given, would in the ſame manner keep the Centre of *Saturn* in its own, it follows, That ſuch a concave Sphere may move with another included in it, having the ſame common Centre: Nor can it well be ſuppoſed otherwiſe, conſidering the Nature of Gravity; for ſhould theſe Globes be adjuſted once to the ſame common Centre, the Gravity of the Parts of the Concave, would preſs equally towards the Centre of the inner Ball; which Equality muſt neceſſarily continue till ſome external Force diſturb it, which is not eaſie to imagine in this Caſe. And, perhaps, this might be more intelligibly expreſs'd, by ſaying, That the inner Globe being poſited in the Centre of the Exterior, muſt neceſſarily aſcend which way ſoever it moves; that is, it muſt overcome the Force of Gravity preſſing towards the common Centre, by an Impulſe it muſt receive from ſome outward Agent. But all outward Efforts being ſufficiently fenced againſt, by the Shell that ſurrounds it, it follows, That this *Nucleus* being once fix'd in the common Centre, muſt always there remain.

As to the Leaking of the Water through this Shell, when once a Paſſage ſhall be found for it to run through, is confeſs'd to be an Objection ſeemingly of weight; but by conſidering how rightly great Beds of Chalk or Clay, and much more Stone, do hold Water, and even Caves arch'd with Sand, no Man can doubt but the Wiſdom of the Creator has provided for the Microcoſm, by many more Ways than can be either imagin'd or expreſs'd; eſpecially ſince we ſee the admirable and innumerable Contrivances wherewith each worthleſs Individual is furniſh'd, both to defend it ſelf, and propagate its Species. What Curioſity in the Structure; what Accuracy in the Mixture and Compoſition of the Parts ought not we to expect in the Fabrick of this Globe, made to be the laſting Habitation of ſo many various Species of Animals, in each of which, there want not many Inſtances that manifeſt the boundleſs Power and Goodneſs of their Divine Author; and can we then think it a hard Suppoſition, that the internal Parts of this Bubble of Earth ſhould be replete with ſuch *Saline* and *Vitriolick* Particles, as may contribute to Petrefaction, and diſpoſe the tranſuding Water to ſhoot and coagulate into Stone, ſo as continually to fortify, and, if need were, to conſolidate any Breach or Flaw in the concave Surface of the Shell.

And perhaps this may not without reaſon be ſuppoſed to be the final Cauſe of the Admixture of the magnetical Matter in the Maſs of the terreſtrial Parts of our Globe, *viz.* To make good and maintain the concave Arch of this Shell: For, by what the Excellent Sir *Iſ. Newton* has ſhewn in his *Principia Philoſophiæ*, it will follow, that according to the general Principle of Gravity, viſible throughout the whole Univerſe, of thoſe Particles that by Length of Time, or otherwiſe, ſhall moulder away, or become looſe on the concave Surface of the external Sphere, would fall in, and with great Force deſcend on the internal, unleſs thoſe Particles were of another ſort of Matter, capable by their ſtronger Tendency to each other, to ſuſpend the Force of Gravity; but no other Subſtance is known capable of ſupporting each other by their mutual Attraction, but the Magnetical; and theſe we ſee miraculouſly to perform that Office, even where the Power of Gravity has its full Effect; much more within the Globe, where it is weaker. Why then may we not ſuppoſe theſe ſaid Arches to be lined throughout with a magnetical Matter, or rather, to be one great concave Magnet, whoſe two Poles are the Poles we have before obſerv'd to be fix'd in the Surface of our Globe.

Another Argument favouring this Hypotheſis, is drawn from a Propoſition of the ſame Sir *Iſaac Newton*, where he determines the Force wherewith the *Moon* moves the *Sea* in producing the *Tides*; his Words are, *Denſitas Lunæ eſt ad denſitatem Terræ ut* 680 *ad* 387, *ſeu* 9 *ad* 5 *quem proxime. Eſt igitur corpus Lunæ denſius ac magis terreſtre quam Terra noſtra*, p. 466.

Now if the *Moon* be more ſolid than the Earth, as 9 to 5, why may we not reaſonably ſuppoſe the *Moon*, being a ſmall Body, and a ſecondary Planet, to be ſolid Earth, Water and Stone, and this Globe to conſiſt of the ſame Materials, only $\frac{4}{5}$ thereof to be Cavity, within and between the internal Spheres; which might be rendred not improbable.

And one of the Uſes of the Cavity of the Earth ſeems to be, To diminiſh the Specifick Gravity thereof, in reſpect of the *Moon*; for it may be demonſtrated, that the Oppoſition of the *Æther* to the Motions of the Planets, in a long time, becomes ſenſible; and conſequently, the greater Bodies muſt receive a leſs Oppoſition than the ſmaller, unleſs the Specifick Gravity of the ſmaller do proportionably exceed that of the greater, in which Caſe only they can move together; ſo that the Cavity aſſign'd in the Earth, may ſerve well to adjuſt its Weight to that of the *Moon*: For otherwiſe, the Earth would leave the *Moon* behind it, and ſhe become another primary Planet.

VARI-

VARICOSUM *Corpus*, is that Contexture of Spermatick Veſſels, which enters the Teſticles.

VARIOLÆ, the Small-Pox, conſiſts in a contagious Diſorder of the Blood, contracted from the Air or otherwiſe; accompanied with a continued wandring Fever, which ſometimes increaſes, ſometimes decreaſes, with a Pain in the Head and Loins, Anxiety and Inquietude, and with a breaking forth of Pimples and Wheals, which ſwell and ſuppurate. The Famous *Willis* attributes the Cauſe of this Diſtemper to ſome filthy and fermentative Matter, which is communicated to the *Fœtus*, together with the Nouriſhment from the Womb; but how this can hold in adult Perſons, whoſe Blood has undergone ſo many Alterations, I could never yet underſtand from his Writings. It ſeems rather to conſiſt in a depraved Temperature of Air, with a peculiar Diſpoſition of the Blood and the nervous Juice towards this Diſtemper. This poiſonous Quality of the Air, firſt infects the nervous Juice, (whence proceeds the Pain of the Head and Loins) wherewith the Blood boils and ferments, and parts into little Pieces or Clots, which in the Courſe of Circulation, ſtick to the outward Parts, and to the inner *Viſcera* too; after a while they grow ripe, and ſuppurate. *Blanchard.*

VARIX: See *Cirſus.*

VAS *breve*: See *Breve vas.*

VASA, the Veſſels in an Animal, are Cavities through which the Liquors of the Body paſs, as a Vein, an Artery, Lymphatick Veſſels, the *Ductus* that conveys the Chyle, and thoſe of the Spittle.

VASA *deferentia*, are thoſe Veſſels wherein the Seed is convey'd from the Teſticles to the *Veſiculæ Seminales.*

VASA *Lactea*, the Milky Veſſels in the Meſentery: They which reach from the Guts to the Glandules in the Meſentery, are ſaid to be of the firſt ſort; and they which reach from thoſe Glandules to the Bag that carries the Chyle, are of the ſecond ſort.

Their Uſe is to convey the Chyle from the Guts to the little Bag which holds the Chyle, and thence to the *Ductus*, which conveys it to the *Thorax*. *Aſellius* was the firſt who diſcovered them, and the dexterous *F. Ruiſchius* afterwards diſcover'd Valves in them. *Blanchard.*

VASA *Lymphaticæ*: See *Vena Lymphatica.*

VASCULIFEROUS *Planets*, are, according to the Botaniſts, ſuch as have beſides the common Calyx or Flower-Cup, a peculiar Veſſel or Caſe to contain their Seed, one belonging to each Flower, but ſometimes divided into diſtinct Cells. Theſe have always a monopetalous Flower, either *uniform* or *difform*.

The former of theſe have their Seeds all divided.

1. Into two Partitions; as the *Hyoſcyamus*, *Nicotiana*, *Priapeia*, and the *Gentiana.*

2. Into three Partitions; as the *Convolulus*, *Speculum Veneris*, *Trachelium*, *Repunculus*, *Campanula*, *Repunculus Corniculatus*, &c.

3. Into four Partitions; as the *Stramonium.*

Thoſe of the latter Kind, or which have a *difform monopetalous* Flower, as the *Linaria*, *Pinguicula*, *Antirrhinum*, *Ariſtolchia*, *Scrophularia*, *Digitalis*, *Pedicularis*, *Melampyrum* and *Euphraſia*, &c.

VASTI *Muſculi*, are certain Muſcles that contribute to the extending of the Leg, and are of two ſorts, *viz*. *External* and *Internal.*

VASTO, is a Writ that lies for the Heir againſt the Tenant for Term of Life, or of Years, for making Waſte, or for him in the Reverſion or Remainder.

VASTUM, is a Waſte or Common, lying open to the Cattle of all Tenants, who have a Right of Commoning.

VASTUS *Externus*, is a Muſcle of the Leg, ſo called, from its Magnitude and Situation. It ariſes outwardly tendinous, inwardly fleſhy from the external Part of the great *Trochanter*, and *Linea Aſpera* of the Thigh-bone, from whence its Fibres deſcend obliquely forwards; and on the contrary, become outwardly fleſhy, and tendinous internally; and ſo ſoon as they meet with the Tendon of the *Rectus Femoris*, grow perfectly tendinous. It helps to extend the *Tibia.*

VASTUS *Internus*, is a Muſcle of the Leg, which hath its Denomination from its Situation and Magnitude. Its Beginning is large, partly tendinous, and partly fleſhy; its being continued from the *Linea Aſpera*, on the Back part of the Thigh-bone, from immediately below the leſſer *Trochanter*, till within three Fingers breadth above the inferior *Appendix* of the ſaid Bone internally and laterally; from hence its fleſhy Fibres deſcend obliquely outwards, and an almoſt ſemicircular manner, and on a ſudden ceaſing to be fleſhy, its Tendon is united with that of the *Rectus*, together with the *Vaſtus Internus* and *Crureus*, and is inſerted with them. It helps to extend the *Tibia.*

VECTIS, or the *Lever*, is the firſt of the Mechanick Powers, as they are uſually call'd. This Dr. *Wallis*, in his Mechanicks, rightly conſiders as a *Right Line* perfectly inflexible, of no weight it ſelf, or at leaſt, of an equable one throughout, accommodated to the raiſing or ſuſtaining of heavy Bodies. This *Vectis* is always ſupported by a *Fulcrum*, on which it moves as on an immoveable Centre.

VECTOR, a Line ſuppoſed to be drawn from any Planet moving round a Centre, as the Focus of an Ellipſis, to that Centre or Focus, is by ſome Writers of the New Aſtronomy, call'd the *Vector*; becauſe 'tis that Line by which the Planet ſeems to be carried round its Centre, and with which it deſcribes proportional Area's in proportional Time.

VEDETTE, a Military Term, ſignifying a Centinel on Horſe-back detach'd from the Main Body of the Army, to diſcover and give notice of the Enemies Deſigns.

VEER: The Seamen call *Veering* out a Rope, letting it go by Hand, or letting it run out of it ſelf. Thus they ſay, *Veer more Cable*; that is, let more Cable run out. But they don't uſe this Word for the letting out of any running Rope, except the *Sheat*, but of that, they ſay, *Veer more Sheat*; that is, let more of it run out.

The Word *Veer* is alſo uſed in reference to the Wind; for when it changeth often and ſuddenly, they ſay, the Wind *veereth*; alſo when a Ship being under Sail, hath her *Sheat veered out*, they ſay, ſhe goes *Veering*; that is, at large; neither *by* a Wind, nor directly *before* it, but between both, which they call alſo Quartering.

VEGETABLES, are ſuch Natural Bodies as grow and increaſe from Parts organically form'd, but have no proper Life nor Senſation.

VEGE-

VEGETATION, is the Way of Growth or Increaſe of Bulk, Parts and Dimenſions, proper to all Trees, Shrubs, Plants, and Herbs.

It hath been a general Opinion amongſt almoſt all the Modern Naturaliſts; That the Vegetation of Plants and even Minerals too, was chiefly owing to Water; and that not only as a Vehicle, to convey to them the fine rich Earth, *&c.* proper for their Nouriſhment; but that the Water was tranſmuted into the very Body of the Plant, and afforded the greateſt part of it, if not all the Matter with which they are nouriſh'd, and by which they grow and increaſe in Bigneſs. This Opinion countenanced by very great Names, that Learned and Ingenious Naturaliſt Dr. *John Woodward*, Author of the *Natural Hiſtory of the Earth*, thought very well worth taking into ſerious Examination.

And in the firſt place, he carefully examined all ſorts of Water, and found, that the cleareſt, fineſt Spring-water, which he could any where meet with, exhibited even to the naked Eye, great Numbers of exceeding ſmall terreſtrial Particles, and that all other Craſſer Waters had theſe in yet much greater Quantity; and alſo, that they were of a much larger Bulk.

He found this Terreſtrial Matter, contain'd in all Water, to be of two kinds: The one properly a *Vegetable Matter*, but conſiſting of very different Particles; ſome of which are proper for the Nouriſhment of ſome kinds of Plants; others for different ſorts, *&c.* The other kind of Earthy Matter, he found to be purely of a Mineral Nature; and this alſo was of very various and different kinds.

The former ſort of Vegetable Earthy Matter, abounds plentifully in all Waters; but for the *Mineral*, 'tis found moſtly in Spring-water, next to that, in River-water, and leaſt of all in Rain-water; tho' even there it is alſo to be found plentifully.

This Fact (he ſaith) any one may diſcover, by only keeping Water for a competent Time without ſtirring it, in a clear Glaſs Viol, cloſe ſtopt, to keep out Duſt, *&c.* For then he will obſerve, that theſe very ſmall Terreſtrial Particles, which before were ſcarcely viſible ſingly, will now combine together into larger and more conſpicuous Maſſes, which, by Degrees, will join together, and form Clouds as it were in the Water, which will grow daily more and more opacous and thick, by the continual Acceſſion of new Matter. And if the Earthy Matter in the Water be chiefly of the *Vegetable* kind, it will turn the Water green, the uſual Colour of Vegetables; and this will grow deeper and deeper colour'd, but will not precipitate to the Bottom of the Glaſs, as the *Mineral* Matter will, if there be any conſiderable Quantity, by reaſon of its much greater Specifick Gravity. On the whole therefore he concludes, very juſtly, That there is in all Water a conſiderable Quantity of Earthy Matter: And in order to determine whether the Vegetation of Plants was chiefly owing to bare Water, or not rather to the *Terreſtrial Matter* therein contain'd, he made, with very great Accuracy and Care, the following Experiments, as you will find in a Diſcourſe of his, read before the Royal Society, and publiſh'd in their *Tranſactions*, N. 253.

Which *Experiments*, becauſe they are done with an uncommon Care and Exactneſs, are a ſufficient number of them, and are follow'd by very ingenious *Reflections*, ſerving to explicate many Difficulties in Philoſophy, and to ſet the whole Affair of Vegetation in a very good Light; I ſhall give the Reader as followeth.

A. D. 1691, I choſe (ſaith he) ſeveral *Glaſs Viols*, that were all, as near as poſſible, of the ſame ſhape and bigneſs. After I had put what Water I thought fit into every one of them, and taken an Account of the *Weight* of it, I ſtrain'd and ty'd over the Orifice of each Viol, a piece of Parchment, having an Hole in the Middle of it, large enough to admit the *Stem* of the *Plant* I deſign'd to ſet in the Viol, without confining or ſtraitning it, ſo as to impede its *Growth*. My Intention in this, was to prevent the encloſed Water from evaporating or aſcending any other way, than only through the Plant to be ſet therein.

Then I made choice of ſeveral Sprigs of *Mint*, and other *Plants* that were, as near as I could poſſibly judge, alike freſh, ſound and lively. Having taken the Weight of each, I plac'd it in a Viol order'd as above; and as the Plant imbibed and drew off the Water, I took care to add more of the ſame from time to time, keeping an Account of the Weight of all I added. Each of the Glaſſes were for better Diſtinction, and the more eaſy keeping a Regiſter of all the Circumſtances, noted with a different Mark or Letter, A, B, C, *&c.* and all ſet in a row in the ſame Window, in ſuch manner, that all might partake alike of *Air*, *Light*, and *Sun*. Thus they continued from *July* the 20th to *October* the 5th, which was juſt 77 Days. Then I took them out, weigh'd the Water in each Viol, and the Plant likewiſe, adding to its Weight that of all the Leaves that had fallen off during the Time it ſtood thus. And laſtly, I computed how much each Plant had gain'd, and how much Water was ſpent upon it. The Particulars are as follows.

A. *Common Spear-Mint*, ſet in *Spring-water*.

The Plant weigh'd, when put in *July* 20, juſt 27 Grains; when taken out *October* 5. 42 Gr. So that in this Space of 77 Days, it had gain'd in Weight 15 Grains.

The whole Quantity of Water expended during the 77 Days, amounts to 2558 Gr. Conſequently, the Weight of the Water taken up, was $170\frac{3}{17}$ times as much as the Plant had got in Weight.

Weight of the Plant when firſt put in Water.	Weight of the Plant when taken out of the Water.	Weight gained by the Plant dur- the 77 Days.	Weight of the Water expended upon the Plant.	Proportion of the Increaſe of the Plant to the Expence of the Water.
A. *Common Spear-Mint : Spring-Water.*				
27 Grains.	42 Grains.	15 Grains.	2558 Grains.	As 1 to 170 $\frac{8}{13}$.
B. *Common Spear-Mint : Rain-Water.*				
28 $\frac{1}{4}$ Gr.	45 $\frac{3}{5}$ Gr.	17 $\frac{1}{2}$ Gr.	3004 Gr.	As 1 to 171 $\frac{23}{25}$
C. *Common Spear-Mint : Thames-Water.*				
28 Gr.	54 Gr.	26 Gr.	2493 Gr.	As 1 to 95 $\frac{23}{26}$.
D. *Common Solanum, or Night-Shade: Spring-Water.*				
49 Gr.	106 Gr.	57 Gr.	3708 Gr.	As 1 to 65 $\frac{2}{57}$.
E. *Lathyres* ſeu *Cataputia Gerh. Spring-Water.*				
98 Gr.	101 $\frac{1}{2}$ Gr.	3 $\frac{1}{2}$ Gr.	2501 Gr.	As 1 to 714 $\frac{4}{7}$.

The Specimen *D* had ſeveral *Buds* upon it when firſt ſet in Water; theſe in ſome Days became fair *Flowers*, which were at length ſucceeded by *Berries*. Several other Plants were try'd, that did not thrive in Water, or ſucceed any better than the *Cataputia* foregoing.

The Viols *F* and *G* were filled, the former with *Rain*, and the other with *Spring-Water*, at the ſame time as thoſe above-mention'd were, and ſtood as long as they did; but they had neither of them any Plant; my Deſign in theſe being only to inform my ſelf, whether any Water exhaled out of the Glaſſes, otherwiſe than through the Bodies of the Plants. The Orifices of theſe two Glaſſes were cover'd with *Parchment*; each piece of it being perforated with an Hole of the ſame bigneſs with thoſe of the Viols above: In this I ſuſpended a bit of Stick about the thickneſs of the Stem of one of the aforeſaid Plants, but not reaching down to the Surface of the included Water; I put them in thus, that the Water in theſe might not have more ſcope to evaporate than that in the other Viols.

Thus they ſtood the whole 77 Days in the ſame Window with the reſt; when, upon Examination, I found none of the Water in theſe waſted or gone off: Though I obſerved, both in theſe, and the reſt, eſpecially after hot Weather, ſmall Drops of Water, not unlike Dew, adhering to the inſides of the Glaſſes; that part of them I mean, that was above the Surface of the encloſed Waters.

The Water in theſe two Glaſſes that had no Plants in them, at the End of the Experiment, exhibited a larger Quantity of Terreſtrial Matter than that in any of thoſe that had the Plants in them did. The Sediment in the Bottom of the Viols was greater, and the *Nubeculæ* diffuſed thro' the Body of the Water thicker. And of that which was in the others, ſome of it proceeded from certain ſmall Leaves that had fallen from that part of the Stems of the Plants that was within the Water, wherein they rotted and diſſolved. The Terreſtrial Matter in the *Rain-Water*, was finer than that in the *Spring-Water*.

Experiments, *Anno* 1692.

The Glaſſes made uſe of in this, were of the ſame ſort with thoſe of the former Experiment; and cover'd over with Parchment in like manner.

The Plants here were all *Spear-Mint*; the moſt kindly, freſh, ſprightly Shoots I could chuſe. The Water and the Plants were weigh'd as above, and the Viols ſet in a Line, in a *South Window*, where they ſtood from *June* the 2d, to *July* the 28th, which was juſt 56 Days.

H. *Hyde-Park Conduit Water, alone.*

The Weight of the Plant when firſt ſet in Water.	Weight of the Plant when taken out of the Water.	What gain'd by the Plant during the 56 Days.	What of the Water is expended upon the Plant.	Proportion of the Increaſe of the Plant to the Expence of the Water.
127 Grains.	255 Grains.	128 Grains.	14190 Grains.	As 1 to 110$\frac{11}{12}$.

I. *The ſame Water, alone.*

110 Gr.	249 Gr.	139 Gr.	13140 Gr.	As 1 to 94$\frac{74}{133}$.

K. *The ſame Water, with an Ounce and an half of common Garden Earth diſſolved in it.*

76 Gr.	244 Gr.	168 Gr.	10731 Gr.	As 1 to 63$\frac{147}{168}$.

L. *Hyde-Park Water, with the ſame Quantity of Garden Mould as the former.*

92 Gr.	376 Gr.	284 Gr.	14950 Gr.	As 1 to 52$\frac{182}{384}$

M. *Hyde-Park Water, diſtilled with a gentle Still.*

114 Gr.	155 Gr.	41 Gr.	8803 Gr.	As 1 to 214$\frac{29}{41}$.

N. *The Reſidue of the Water which remain'd in the Still after that in* M *was diſtill'd off.*

81 Gr.	176 Gr.	94 Gr.	4344 Gr.	As 1 to 46$\frac{20}{94}$.

H, was all along a very *kindly Plant*, and had run up above two Foot in height. It had ſhot but one conſiderable collateral Branch; but had ſent forth many and long Roots, from which ſprung very numerous, tho' ſmall and ſhort leſſer *Fibres*. Theſe leſſer Roots came out of the larger on two oppoſite ſides, for the moſt part; ſo that each Root, with its *Fibrilla*, appeareth not unlike a ſmall Feather. To theſe *Fibrillæ* adhered pretty much *Terreſtrial Matter*. In the Water which was at the laſt thick and turbid, was a green Subſtance, reſembling a fine thin *Conferva*.

The *Plant* I, was as kindly as the former, but had ſhot no collateral Branches: Its *Roots*, the *Waters*, and the green Subſtance, all much as in the former.

The *Plant* K, tho' it had the Misfortune to be annoy'd with very ſmall Inſects that happen'd to fix upon it, yet had ſhot very conſiderable collateral Branches; and at leaſt as many Roots, as either in H or I, which had a much greater Quantity of *Terreſtrial Matter* adhering to the Extremities of them. The ſame green Subſtance here that was in the two preceding.

The *Plant* L, was far more flouriſhing than any of the precedent; had ſeveral conſiderable collateral Branches, and very numerous Roots, to which *Terreſtrial Matter* adhered very copiouſly.

The Earth in both theſe Glaſſes was very ſenſibly and conſiderably waſted, and leſs than when firſt put in. The ſame ſort of green Subſtance here, as in thoſe above.

The *Plant* M, was pretty kindly; had two ſmall collateral Branches, and ſeveral Roots, tho' not ſo many as that in H or I; but as much *Terreſtrial Matter* adhering to them, as thoſe had. The Water was pretty thick; having very numerous ſmall Terreſtrial Particles ſwimming in it, and ſome Sediment at the bottom of the Glaſs. This Glaſs had none of the green Matter abovementioned in it.

The *Plant* N, was very lively, and had ſent out ſix collateral Branches, and ſeveral Roots.

The Glaſs O, had alſo *Hyde Park Conduit Water*, in which was diſſolv'd a Dram of *Nitre*. The *Mint* ſet in this, ſuddenly began to wither and decay, and *died* in a few days, as likewiſe did two more Sprigs that were ſet in it ſucceſſively. In another Glaſs I diſſolv'd an Ounce of good Garden Mould, and a Dram of *Nitre*; and in a third, half an Ounce of Wood-aſhes, and a Dram of *Nitre*; but the Plants in theſe ſucceeded no better than in the former. In other Glaſſes I diſſolved ſeveral other ſorts of Earth, Clay, Marls, and variety of Manures, &c. I ſet *Mint* in diſtilled *Mint-Water*; and other Experiments I made of

ſeveral

ſeveral Kinds, in order to get Light and Information what haſtned or retarded, promoted or impeded *Vegetation*.

The *Glaſs* P, *Hyde-Park Conduit Water*: In this I fixed a *Glaſs-Tube* of ten Inches long, the Bore about one ſixth of an Inch in Diameter, filled with very fine and white Sand, which I kept from falling down out of the Tube into the Viol, by tying a thin Piece of Silk over that end of the Tube that was downwards. Upon Immerſion of the lower End of it into the Water; this by little and little aſcended quite to the upper Orifice of the Tube; and yet in all the 56 Days which it ſtood thus, a very inconſiderable Quantity of Water had gone off, *viz.* ſcarcely 20 Grains, tho' the Sand continued moiſt up to the top, 'till the very laſt. The Water had imparted a green Tincture to the Sand, quite to the very top of the Tube: And in the Viol, it hath precipitated a greeniſh Sediment, mix'd with Black. To the Bottom and Sides of the Tube, as far as 'twas immerſed in the Water, adhered pretty much of the green Subſtance deſcribed above. Other-like Tubes I filled with *Cotton*, *Lint*, *Pith of Elder*, and ſeveral other porous *Vegetable Subſtances*; ſetting ſome of them in clear Water, others in Water tinged with *Saffron*, *Cochinele*, *&c.* And ſeveral other Trials were made, in order to give a Mechanical Repreſentation of the Motion and Diſtribution of the Juices in Plants; and of ſome other *Phænomena* obſervable in *Vegetation*.

Several *Plants* being alſo ſet in the Viols Q, R, S, *&c.* ordered in like manner as thoſe above, in *October*, and the following colder Months; theſe throve not near ſo much, nor did the Water aſcend in nigh the Quantity it did in the hotter Seaſons, in which the before cited Trials were made.

Some Reflections upon the foregoing Experiments.

1. *In the Plants of the ſame kind, the leſs they are in Bulk, the ſmaller Quantity of the Fluid Maſs in which they are ſet, is drawn off; the Diſpendium of it where the Maſs is of equal Thickneſs, being pretty nearly proportion'd to the Bulk of the Plant.*

Thus, that in the Glaſs mark'd A, which weigh'd only 27 *Gr.* drew off but 2558 *Gr.* of the Fluid: And that in B, which weigh'd only 28 $\frac{1}{4}$ took up but 3004 *Gr.* Whereas that in H, which weigh'd 127 *Gr.* ſpent 14190 *Gr.* of the *Liquid Maſs*.

The Water ſeems to aſcend up the Veſſels of Plants, in much the ſame manner as up a *Filtre*; and 'tis no great Wonder, that the larger Filtre ſhould draw off more Water, than the leſſer; or that a Plant that has more and larger Veſſels, ſhould take up a greater ſhare of the Fluid in which it is ſet, than one that has fewer and ſmaller ones can. Nor do I note this as a Thing very conſiderable in it ſelf, but chiefly in regard to what I am about next to offer: And that it may be ſeen, that in my other Collations of Things, I made due Allowance for this Difference.

2. *The much greater part of the Fluid Maſs that is thus drawn off, and convey'd into the Plant, does not ſettle or abide there; but paſſes through the Pores of them, and exhales up into the Atmoſphere.*

That the Water in theſe Experiments aſcended only through the Veſſels of theſe Plants, is certain.

The *Glaſſes* F and G, that had no Plants in them, tho' diſpoſed in like manner as the reſt, remain'd at the end of the Experiment, as at firſt, and none of the Water was gone off: And that the greateſt part of it flies off from the Plant into the Atmoſphere, is as certain.

The leaſt Proportion of the Water expended, was to the Augment of the Plant, as 46 or 50 to 1. And in ſome, the Weight of the Water drawn off was 100, 200, nay, in one above 700 times as much as the Plant had received of Addition.

This ſo continual an Emiſſion and Detachment of Water, in ſo great Plenty, from the Parts of the Plants, affords us a manifeſt Reaſon, why Countries that abound with Trees, and the larger Vegetables eſpecially, ſhould be very obnoxious to *Damps*, great Humidity in the Air, and more frequent Rains, than others that are more open and free. The great Moiſture in the Air, was a mighty Inconvenience and Annoyance to thoſe who firſt ſettled in *America*, which at that Time was much overgrown with Woods and Groves. But as theſe were burnt and deſtroy'd, to make way for Habitations and Culture of the Earth, the Air mended and cleared up apace, changing into a Temper much more ſerene and dry than before. Nor does this Humidity go off pure and alone, but uſually bears forth with it many Parts of the ſame Nature with thoſe whereof the *Plant*, through which it paſſes, conſiſts. The *Craſſer* indeed are not ſo eaſily born up into the Atmoſphere; but are uſually depoſited on the Surface of *Leaves*, *Flowers*, and other Parts of the *Plants*. Hence come our *Manna*'s, our *Honies*, and other *Gummous* Exſudations of *Vegetables*.

But the finer and lighter Parts are with greater eaſe ſent up into the *Atmoſphere*.

Thence they are convey'd to our Organs of *Smell*, by the *Air* we draw in *Reſpiration*, and are pleaſant or offenſive, beneficent or injurious to us, acording to the Nature of the Plants from whence they ariſe.

And ſince theſe owe their Riſe to the Water that aſcends out of the Earth through the Bodies of Plants, we cannot be far to ſeek for the Cauſe why they are more numerous in the Air, and we find a greater Quantity of Odours exhaling from Vegetables, in warm, humid Seaſons, than in any others whatſoever.

3. *A great part of the Terreſtrial Matter that is mix'd with Water, aſcends up into the Plant, as well as the Water.*

There was much more Terreſtrial Matter at the end of the Experiment in the Water of the *Glaſſes* F and G, that had no *Plants* in them, than in thoſe that had *Plants*.

The *Garden Mould* diſſolved in the Glaſſes K and L, was conſiderably diminiſhed, and carried off; nay, the *Terreſtrial* and *Vegetable Matter*

w[illegible]born up in the *Tubes* fill'd with *Sand*, *Cotton*, &c. in that Quantity, as to be evident even to Senſe. And the Bodies in the Cavities of the other Tubes, that had their lower Ends immers'd in Water, wherein *Saffron*, *Cochineel*, &c. had been infuſed, were *tinged* with *Yellow*, *Purple*, &c.

If I may be permitted to look abroad a while, towards our *Shores* and *Parts* within the *Verge* of the *Sea*, theſe will preſent us with a large Scene of *Plants*, that along with the Vegetable, take up into them meer *Mineral Matter* alſo in great abundance: Such are our *Sea Purſlain*, the ſeveral ſorts of *Alga's*, of *Samphires*, and other *Marine Plants*. Thoſe contain *common Sea Salts*, which is all one with the *Foſſil*, in ſuch Plenty, as not only to be plainly diſtinguiſh'd on the *Palate*, but may be drawn forth of them in conſiderable Quantity; nay, there want not thoſe, who affirm, There are *Plants* found that will yield *Nitre*, and other *Mineral Salts*; of which, indeed, I am not ſo far ſatisfied, that I can depend on the thing, and therefore give this only as an *Hint* for Enquiry.

To go on with the *Vegetable* Matter, how apt and how much diſpos'd this, being ſo very *fine* and *light*, is to attend Water in all its *Motions*, and follow it into each of its *Receſſes*, its manifeſt, not only from the Inſtances above alledged, but many others. *Percolate* it with all the Care imaginable, *Filter* it with never ſo many *Filtrations*, yet ſome Terreſtrial Matter will remain. 'Tis true, the Fluid will be thinner every time than other, and more diſengaged of the ſaid Matter; but never wholly free and clear. I have filtred Water thro' ſeveral Sheets of thick Paper, and after that thro' very cloſe fine Cloth twelve times doubled; nay, have done this over and over, and yet a conſiderable Quantity of this Matter diſcovered it ſelf in the Water after all. Now, if it thus paſſes *Interſtices* that are ſo very ſmall and fine along with the Water, 'tis the leſs ſtrange it ſhould attend it in its Paſſage through the Ducts and Veſſels of Plants. 'Tis true, filtring and diſtilling of Water, intercepts and makes it quit ſome of the Earthy Matter it was before impregnated withal; but then, that which continues with the Water after this, is fine and light, and ſuch conſequently as is in a peculiar manner fit for the Growth and Nouriſhment of Vegetables. And this is the caſe of Rain-water. The Quantity of Terreſtrial Matter it bears up into the *Atmoſphere* is not great: But that which it does bear up, is mainly of that light kind or Vegetable Matter, and that too perfectly diſſolved, and reduced to ſingle Corpuſcles, all fit to enter the *Tubules* and Veſſels of *Plants*. On which account 'tis, that this Water is ſo very *Fertile* and *Prolifick*.

The Reaſon why in this *Propoſition* I ſay only a great Part of the Terreſtrial Matter that is mix'd with the Water, aſcends up with it into the Plant is, becauſe all of it cannot. The Mineral Matter is a great deal of it, not only groſs and ponderous, but ſcabrous and inflexible; and ſo not diſpoſed to enter the Pores of the Roots. And a great many of the ſimple Vegetable Particles by Degrees unite, and form ſome of them ſmall *Clods* or *Moleculæ*; ſuch as thoſe mention'd in H, K, and L, ſticking to the Extremities of the Roots of thoſe Plants. Others of 'em intangled in a looſer manner, and form the *Nubeculæ*, and green Bodies ſo commonly obſerved in ſtagnant Water. Theſe, when thus conjoin'd, are too big to enter the *Pores*, or aſcend up the Veſſels of Plants, which ſingly they might have done.

They who are converſant in *Agriculture*, will eaſily ſubſcribe to this. They are well aware, that be their *Earth* never ſo rich, ſo good, and ſo fit for the Production of *Corn* or other *Vegetables*, little will come of it, unleſs the Parts of it be ſeparated and looſe. 'Tis on this account they beſtow the Pains they do in *Culture* of it; in *Diging*, *Plowing*, *Harrowing*, and breaking of the *clodded Lumps* of Earth. 'Tis the ſame way that *Sea Salt*, *Nitre*, and other *Salts* promote *Vegetation*.

I am ſorry I cannot ſubſcribe to the Opinion of thoſe Learned *Gentlemen*, who imagine *Nitre* too eſſential to Plants; and that nothing in the *Vegetable* Kingdom is tranſacted without it. By all the Trials I have been able to make, the thing is quite otherwiſe; and when contiguous to the Plant, it rather deſtroys, than nouriſhes it. But this *Nitre* and other *Salts* certainly do; they looſen the Earth and ſeparate the concreted Parts of it, by that means fitting and diſpoſing them to be aſſumed by the Water, and carried up into *Seed* or *Plant*, for its *Formatation* and *Augment*.

There is no Man but muſt obſerve, how apt all ſorts of *Salts* are to be wrought upon by *Moiſture*; how eaſily they liquate and run with it; and when theſe are drawn off, and have deſerted the Lumps wherewith they were incorporated, thoſe muſt moulder immediately, and fall aſunder of courſe. The hardeſt Stone we meet with, if it happen, as frequently it does, to have any ſort of *Salt* intermix'd with the Sand, of which it conſiſts, upon being expos'd to an *humid Air*, in a ſhort time diſſolves and crumbles all to Pieces, and much more will clodded Earth or Clay, which is not of near ſo *compact* and ſo *ſolid* a Conſtitution as Stone is. The ſame way likewiſe is Lime ſerviceable in this Affair. The Husbandman ſays of it, That it does not *fatten*, but only *mellows* Ground. By which they mean, That it does not contain any thing in it ſelf that is of the ſame Nature with the *Vegetable Mould*, or afford any Matter fit for the Formation of *Plants*, but meerly ſoftens and relaxes the Earth, by that means rendring it more capable of entring the *Seeds* and *Vegetables* ſet in it, in order to their Nouriſhment, than otherwiſe it would have been. The Properties of Lime are well known, and how apt 'tis to be put into *Ferment* and *Commotion* by *Water*: Nor can ſuch *Commotion* ever happen when *Lime* is mixed with *Earth*, however hard or clodded that may be, without opening and looſening of it.

4. *The Plant is more or leſs nouriſhed and augmented in Proportion, as the Water in which it ſtands contains a greater or ſmaller Quantity of proper Terreſtrial Matter in it.*

The Truth of this *Propoſition* is ſo evidently diſcernable through the whole Proceſs of theſe Trials, that I think no doubt can be made of it.

The Mint in the Glaſs C, was of much the ſame Bulk and Weight with thoſe in A and B: But the Water in which that was, being *River Water*, which was apparently ſtored more copiouſly with Terreſtrial Matter, than the Spring or Rain Water wherein they ſtood, were; it had thriven at almoſt

almoſt double the Bulk that either of them had, and with a leſs Expence of Water too. So likewiſe, the *Mint* in L, in whoſe Water was diſſolved a ſmall Quantity of good Garden Mould, tho' it had the Diſadvantage to be leſs when firſt ſet, than either of the *Mints* in H or I, whoſe Water was the very ſame with that in L, but had none of that Earth mixed with it, yet in a ſhort time, the Plant not only overtook, but much outſtrip'd thoſe; and at the end of the Experiment, was very conſiderably bigger and heavier than either of them.

In like manner, the *Mint* in N, tho' leſs in the beginning than that in M, being ſet in that *thick, turbid, ferculent Water* that remained behind, after that wherein M was placed was ſtilled off, had in fine more than double its original Weight and Bulk; and received above twice the additional Encreaſe that *that* in M, which ſtood in thinner *diſtilled Water*, had done: And which is not leſs conſiderable, had not drawn off half the Quantity of Water that *that* had.

Why, in the beginning of this Article, I limit the Proportion of the Augment of the *Plant*, to the Quantity of the proper Terreſtrial Matter in the Water, is, Becauſe all, even the *Vegetable Matter*, to ſay nothing of the *Mineral*, is not proper for the Nouriſhment of every *Plant*.

There may be, and doubtleſs are, ſome Parts in different Species of *Plants*, that may be much alike, and ſo owe their Supply to the ſame common Matter: But 'tis plain, all cannot. And there are other *Parts* ſo differing, that 'tis no ways credible they ſhould be formed all out of the ſame ſort of *Corpuſcles*: So far from it, that there want not good Indications, as we ſhall ſee by and by, That every kind of *Vegetable* requires a peculiar and ſpecifick Matter for its *Formation* and Nouriſhment; yea, each part of the ſame *Vegetable* does ſo; and there are very many and different Ingredients go to the Compoſition of the ſame individual Plant.

If therefore the Soil, wherein any Vegetable or Seed is planted, contains all or moſt of theſe Ingredients, and thoſe in due Quantity, 'twill grow and thrive there; otherwiſe 'twill not. If there be not as many ſort of *Corpuſcles*, as are requiſite for the Conſtitution of the main and more eſſential Parts of the Plant, 'twill not proſper at all. If there be theſe, and not in ſufficient Plenty, 'twill ſtarve, and never arrive to its natural Stature. Or if there be any the leſs *neceſſary* and *eſſential* Corpuſcles wanting, there will be ſome Failure in the *Plant*; 'twill be defective in *Taſte*, in *Smell*, in *Colour*, or ſome other way.

But tho' the Tract of Land may happen not to contain proper Nouriſhment for the Conſtitution of ſome one peculiar kind of *Plant*; yet it may for ſeveral *others*, and thoſe much differing amongſt themſelves.

The *Vegetable Particles* are commixt and blended in the Earth, with all the Diverſity and Variety, as well as all the Uncertainty conceivable. (I have given ſome Intimations of this in *Nat. Hiſt. of the Earth*, Page 228, &c. and ſhall not repeat them here.)

It is not impoſſible to imagine, how, *one, uniform, homogeneous Matter*, having its Principles or *original Parts* all of the ſame *Subſtance*, *Conſtitution*, *Magnitude*, *Figure*, and *Gravity*, ſhould ever conſtitute *Bodies* ſo egregiouſly unlike, in all thoſe reſpects, as *Vegetables* of different kinds are; nay, even as the different Parts of the ſame *Vegetable*: That one ſhould carry a *Roſinous*, another a *Milky*, a third a *Yellow*, a fourth a *Red Juice* in its Veins; one afford a *fragrant*, another an *offenſive Smell*; one be *ſweet* to the Taſte, another *bitter*, *acid*, *acerb*, *auſtere*, &c. That one ſhould be *nouriſhing*, another *poiſonous*, one *purging*, another *aſtringent*, That there ſhould be that vaſt difference in them; in their ſeveral *Conſtitutions*, *Makes*, *Properties*, and *Effects*, and yet all ariſe from the very ſame *ſort* of *Matter*, would be very ſtrange. And, to Note that by the Bye, this Argument makes equally ſtrong againſt thoſe who ſuppoſe mere *Water* the *Matter* out of which all *Bodies* are formed.

The *Cataputia*, in the Glaſs E, received but very little Encreaſe, only three Grains and an half all the while it ſtood, tho' 2501 Gr. of *Water* were ſpent upon it. I will not ſay the reaſon was, Becauſe the *Water* did not contain in it *Matter* fit and proper for the Nouriſhment of that peculiar and remarkable *Plant*. No, it may be, the Water was not a proper *Medium* for it to grow in: And we know, there are very many Plants that will not thrive in it.

Too much of that Liquor, in ſome *Plants*, may probably hurry the Terreſtrial Matter thro' their Veſſels too faſt for them to arreſt and lay hold of it. Be that as it will, 'tis moſt certain, There are peculiar Soils that ſuit particular Plants.

In *England*, *Cherries* are obſerv'd to ſucceed beſt in *Kent*; *Apples* in *Herefordſhire*; *Saffron* in *Cambridgeſhire*; *Woad* in two or three of our *Midland Counties*; and *Teazles* in *Somerſetſhire*. This is an Obſervation that hath held in all *Parts*, and indeed in all *Ages* of the *World*. The moſt ancient Writers of Husbandry took Notice of it; and are not wanting in their *Rules*, for making choice of *Soils* ſuited to the *Nature* of each kind of *Vegetable* they thought valuable or worth Propagating.

But, which is a further Proof of what I am here endeavouring to advance, That Soil that is once proper and fit for Production of ſome one ſort of *Vegetable*, does not ever continue to be ſo. No, in Tract of Time, it loſes that Property; but *ſooner* in ſome *Lands*, and *later* in *Others*. This is what all, who are converſant in theſe Things, know very well.

If *Wheat*, for Example, be ſown upon a Tract of Land that is proper for that *Grain*, the *firſt* Crop will ſucceed very well, and perhaps the *ſecond*, and the *third*, as long as the Ground is in *Heart*, as the *Farmers* ſpeak: But in a *few Years* 'twill produce *no more*, if ſowed with that *Corn*. Some other *Grain* indeed it may, as Barley. And after this has been ſown ſo often, that the *Land* can bring forth no more of the ſame, it may afterwards yield ſome good *Oats*, and perhaps *Peaſe* after them: At length it will become barren; the *Vegetative* Matter that at firſt it abounded withal, being reduced forth of it by thoſe ſucceſſive *Crops*, and moſt of it born off. Each ſort of *Grain* takes forth that peculiar *Matter* that is proper for its own Nouriſhment. Firſt the *Wheat* draws off thoſe Particles that ſuit the Body of that *Plant*, the reſt lying all *quiet* and *undiſturb'd* the while. And when the Earth has yielded up all them, thoſe that are proper for *Barley*, a different *Grain*, remain ſtill behind, 'till the ſucceſſive Crops of that *Corn* fetch them forth too: And ſo the *Oats* and *Peaſe* in their *Turn*, 'till in fine all is carried off, and the

Earth in a great Meaſure drained of that ſort of Matter.

After all which, that very Tract of Land may be brought to produce another *Series* of the ſame *Vegetables*, but never till 'tis ſupplied with a new *Fund* of *Matter* of the like ſort with that it at firſt contained. This Supply is made ſeveral ways: By the Ground's lying Fallow for ſome time, till the *Rain* has poured down a freſh Stock upon it: Or by the *Tiller*'s Care, in Manuring of it. And for further Evidence that this Supply is in reality of like ſort, we need only reflect a while upon thoſe *Manures* that are found by conſtant Experience beſt to promote *Vegetation*, and the *Fruitfulneſs* of the *Earth*. Theſe are chiefly either *Parts of Vegetables*, or of *Animals*, which indeed either derive their own Nouriſhment immediately from *Vegetable* Bodies, or from other Animals that do ſo. In particular, the *Blood*, *Urine*, and *Excrements* of *Animals*; *Shaving of Horns*, and of *Hoofs*; *Hair*, *Wooll*, *Feathers*, *calcined Shells*, *Lees of Wine*, and of *Beer*, *Aſhes* of all ſorts of *Vegetable Bodies*, *Leaves*, *Straw*, *Roots*, and *Stubble* turned into *Earth*, by plowing or otherwiſe, to *rot* and *diſſolve* there. Theſe, I ſay, are our beſt *Manures*; and being *Vegetable* Subſtances when refunded back again into the Earth, ſerve for the Formation of other like Bodies.

Not wholly to confine our Thoughts to the *Fields*, let us look a while into our Gardens, where we ſhall meet with ſtill further Confirmations of the ſame thing. The *Trees*, *Shrubs*, and *Herbs*, Cultivated in *theſe*, after they are continued in one *Station*, till they have derived thence the greater Part of the Matter fit for their *Augment*, will *decay* and *degenerate*, unleſs either freſh Earth, or ſome fit *Manure*, be applied unto them. 'Tis true, they may maintain themſelves there for ſome time, by ſending forth Roots further and further, to a great Extent all round, to fetch in more remote Proviſion: But at laſt, all will fail; and they muſt either have a freſh Supply brought to them, or they themſelves be removed and tranſplanted to ſome Place better furniſhed with Matter for their *Subſiſtance*. And accordingly, Gardiners obſerve, That Plants that have ſtood a great while in a Place, have longer Roots than uſual; part of which they cut off when they tranſplant to a freſh Soil, as now not of any further uſe to them.

All theſe Inſtances, to paſs over a great many others that might be alledged, point forth a *particular Terreſtrial Matter*, and not Water, for the Subject, to which Plants owe their Increaſe: Were it Water only, there would be no need of *Manures*, or of Tranſplanting them from place to place. The Rain falls in all places alike, in this *Field* and in that indifferently, in one ſide of an Orchard or Garden as well as another. Nor could there be any reaſon, why a Tract of Land ſhould yield *Wheat* one Year, and not the next, ſince the Rain ſhowers down alike in each. But I am ſenſible I have carried this Article to too great a *length*, which yet on ſo ample and extenſive a Subject, 'twas not eaſie to avoid.

5. *Vegetables are not formed of Water, but of a certain peculiar Terreſtrial Matter.*

It hath been ſhewn, That there is a conſiderable Quantity of this Matter contained both in *Rain*, *Spring*, and *River-water*; that the much greateſt part of the Fluid Maſs that aſcends up into Plants, does not ſettle or abide there, but paſſes through the Pores of them, and Exhales up into the Atmoſphere; that a great part of the Terreſtrial Matter mixed with the Water, paſſes up into the Plant along with it, and that the Plant is *more* or *leſs* augmented in proportion, as the Water contains a *greater* or *ſmaller* Quantity of that Matter. From all which we may very reaſonably infer, That *Earth*, and not *Water*, is the Matter that conſtitutes Vegetables.

The Plant in E drew up into it 2501 Grains of the *Fluid Maſs*, and yet had received but $3\frac{1}{2}$ Gr. of Encreaſe from all that.

The *Mint* in L, tho' it had at firſt the Diſadvantage to be much leſs than that in I, yet being ſet in *Water*, wherewith Earth was plentifully mixed, and that in I only in Water, without any ſuch additional Earth, it had vaſtly outgrown the other, weighing at laſt 145 Gr. more than that did, and ſo having gain'd above twice as much as the other had.

In like manner, that in K, tho' 'twas a great deal *leſs* when put in than that in I, and was alſo impair'd and offended by Inſects, yet being planted in Water wherein Earth was diſſolved, whereas the Water in which (I) ſtood, had none, it not only overtook, but conſiderably ſurpaſſed the other, weighing at laſt 29 Gr. more than that in I, and yet had not expended ſo much Water as that by above 2400 Gr.

The *Plant* in N, tho' at firſt a great deal leſs than that in M, yet being ſet in the *foul craſs Water* that was left in the Still, after that in which M was ſet, was drawn off, in concluſion, had gain'd in Weight above double what that in the finer and thinner Water had.

The Proportion of the Augment of that *Plant* that throve moſt, was to the Fluid Maſs ſpent upon it, but as 1 to 46; in others, 'twas as 1 to 60, 100 to 200; nay, in the *Cataputia*, 'twas but as 1 to 714.

The *Mint* in B took up 39 Gr. of Water a day, one day with another; which was much more than the whole Weight of the Plant originally; and yet withal this, it gained not $\frac{1}{4}$ of a Grain a day, in *Weight*.

Nay, that in H, took up 253 Gr. a day of the Fluid, which was near *twice* as much as its original *Weight*, it weighing, when firſt ſet in the Water, but 127 Gr. And after all, the daily Encreaſe of the Plant was no more than $2\frac{15}{36}$ Gr.

6. *Spring and Rain-water contain pretty near an equal Charge of Vegetable Matter; River-water more than either of them.*

The *Plants* in the Glaſſes A, B, and C, were at firſt of much the ſame Size and Weight. At the end of the Experiment, the Mint in A had gain'd 15 Gr. out of 2558 Gr. of *Spring-water*: That in B, $17\frac{1}{2}$ Gr. out of 3004 Gr. of *Rain-water*; but that in C had got 26 Gr. out of only 2493 Gr. of *River-water*.

I do not found this *Propoſition* ſolely upon thoſe Trials, having made ſome more, which I do not relate here, that agree well enough with theſe: So that the *Proportions* here delivered, will hold for the *main*; but a ſtrict and juſt Compariſon is hardly to be expected; ſo far from it, that I make no doubt, but the Water that falls in *Rain*, at ſometimes,

times, contains a greater Share of *Terreſtrial Matter*, than that which falls at others. A more powerful and intenſe Heat muſt needs hurry up a larger Quantity of that Matter along with the humid *Vapours*, that form *Rain*, than one more *feeble* and *remiſs* ever poſſibly can. The Water of one Spring may flow forth with an higher Charge of this Matter, than that of another; this depending partly upon the quickneſs of the *Ebullition* of the Water; and partly, upon the quantity of that *Matter* latent in the *Strata* through which the Fluid paſſes, and the *greater* or *leſs* Laxity of thoſe *Strata*. For the ſame Reaſon, the Water of one River may abound with it more than that of another; nay, the ſame River, when much agitated and in *Commotion*, muſt bear up more of it, than when it moves with leſs *Rapidity* and *Violence*.

That there is a great quantity of this Matter in Rivers; and that it contributes vaſtly to the ordinary Fertility of the Earth, we have an illuſtrious Inſtance in the *Nile*, the *Ganges*, and other *Rivers*, that yearly overflow the neighbouring *Plains*. Their *Banks* ſhew the faireſt and largeſt *Crops* of any in the whole World: They are even loaded with the multitude of their Productions; and thoſe who have not ſeen them, will hardly be induced to believe the mighty Returns thoſe *Tracts* make, in compariſon of others, that have not the Benefit of like *Inundations*.

7. *Water ſerves only for a Vehicle to the Terreſtrial Matter which forms Vegetables, and does not it ſelf make any Addition unto them.*

Where the proper *Terreſtrial Matter* is wanting, the *Plant* is not augmented, tho' never ſo much Water aſcend into it.

The *Cataputia* in E, took up more Water than the *Mint* in C, and yet had grown but very little, having received only 3½ Gr. of additional Weight, whereas the other had received no leſs than 26 Grains.

The *Mint* in I, was planted in the ſame ſort of Water as that in K was; only the latter had Earth diſſolved in Water, and yet that drew off 13140 Gr. of *Water*, gaining it ſelf no more than 139 Gr. in Weight; whereas the other took up but 10731 Gr. of *Water*, and was augmented 168 Gr. in Weight; conſequently, that ſpent 2409 Gr. more of the Water than *this* in K did, and yet was not ſo much encreaſed in Weight as this, by 29 Grains.

The *Mint* in M ſtood in the very ſame kind of Water, as that in N did. But the Water in M having much leſs Terreſtrial *Matter* in it than that in N had, the Plant bore up 8803 Gr. of it, gaining it ſelf only 41 Gr. the while; whereas that in N drew off no more than 4344 Gr. and yet was augmented 94 Gr. So that it ſpent 4459 Gr. of Water more than that did; and yet was not it ſelf ſo much encreaſed in Weight as that was by 53 Gr.

This is both a very fair and a very concluſive Inſtance; on which account 'tis that I make often uſe of it. Indeed they are all ſo; and to add any thing further on this Head, will not be needful.

'Tis evident therefore, Water is not the Matter that compoſes Vegetable Bodies; 'tis only the Agent that conveys that Matter to them, that introduces and diſtributes it to their ſeveral Parts for their Nouriſhment. That *Matter* is ſluggiſh and inactive, and would lie eternally confined to its Beds of Earth, without ever advancing up into *Plants*, did not Water, or ſome like Inſtrument, fetch it forth, and carry it unto them.

That therefore there is that plentiful Proviſion and vaſt Abundance of it ſupplied to all Parts of the Earth, is a Mark of a *Natural Providence* Super-intending over the Globe we Inhabit, and Ordaining a due Diſpenſation of that Fluid, without the Miniſtry of which the noble Succeſſion of Bodies we behold in *Animals*, *Vegetables*, and *Minerals*, ſhould be all at a ſtand. But to keep to Plants, 'tis manifeſt, Water, as well upon this, as upon the other Hypotheſis, is abſolutely neceſſary in the Affair of *Vegetation*; and it will not ſucceed without it: Which indeed, gave occaſion to the Opinion, That *Water* it ſelf nouriſhed, and was changed into Vegetable Bodies. They ſaw, That tho' theſe were planted in a Soil never ſo Rich, ſo Happy, ſo Advantageous, nothing came of it, unleſs there was *Water* too in conſiderable Quantity.

And it muſt be allow'd, *Vegetables* will not come on or proſper, where that is wanting. But yet what theſe Gentlemen inferred thence, was not, we ſee, well grounded.

This *Fluid*, is capacitated for the Office here aſſigned it, ſeveral ways. By the Figure of its Parts, which, as appears from many Experiments, is Exactly and Mathematically Spherical; their Surfaces being perfectly Polite, and without any the leaſt Inequalities. 'Tis evident, Corpuſcles of ſuch a Figure are eaſily ſuſceptible of Motion, yea, far above any others whatſoever; and conſequently, the moſt capable of moving and conveying other Matter that is not ſo active and voluble. Then the Intervals of Bodies of that Figure are, with reſpect to their Bulk, of all others, the largeſt, and ſo the moſt fitting to receive and entertain foreign Matter in them. Beſides, as far as the Trials hitherto made inform us, the conſtituent Corpuſcles of Water, are each ſingly conſidered abſolutely ſolid, and do not yield to the greateſt external Force. This ſecures their Figure againſt any Alteration; and the Intervals of the Corpuſcles muſt be always alike.

By the latter, 'twill be ever diſpoſed to receive Matter into it: And by the former, when once received, to bear it along with it.

Water is further capacitated to be a Vehicle to this Matter, by the Tenuity and Fineneſs of the Corpuſcles of which it conſiſts. We hardly know any Fluid in all Nature, except Fire, whoſe Conſtituent Parts are ſo exceeding ſubtil and ſmall, as thoſe of Water are. They'll paſs Pores and Interſtices, that neither Air nor any other Fluid will. This enables them to enter the fineſt Tubes and Veſſels of Plants, and to introduce the Terreſtrial Matter, conveying it to all Parts of them; whilſt each, by means of Organs 'tis endow'd with for the Purpoſe, intercepts and aſſumes into it ſelf ſuch Particles as are ſuitable to its own Nature, letting the reſt paſs on through the common Ducts: Nay, we have almoſt every where Mechanical Inſtances of much the ſame Tenor.

'Tis obvious to every one, how eaſily and ſuddenly Humidity, or the Corpuſcles of Water ſuſtained in the Air, pervade and inſinuate themſelves into Cords, however tightly twiſted into Leather, Parchment, Vegetable Bodies, Wood, and the like.

This

This it is that fits them for Hygrometers, and to measure and determine the different Quantities of Moisture in the Air, in different Places and Seasons.

How freely Water passes and carries with it Terrestrial Matter through Filtres, Colatures, Distillations, &c. hath been intimated already.

8. *Water is not capable of performing this Office to Plants, unless assisted by a due Quantity of Heat; and this must concurr, or Vegetation will not succeed.*

The Plants that were set in the Glasses Q, R, S, &c. in *October*, and in the following colder Months, had not near the Quantity of Water sent up into them, or so great an additional Encrease by much as those that were set in *June*, *July*, and the hotter Months. 'Tis plain, Water has no power of moving it self, or rising to the vast Height it does in the more tall and lofty Plants; so far from this, that it does not appear from any Discovery yet made, that even its own Fluidity consists in the intestine Motion of its Parts; whatever some otherwise very learned and knowing Persons may have thought. There is no need of any thing more for solving all the Phænomena of *Fluidity*, than such a Figure and Disposition of Parts, as Water has. Corpuscles of that make, and that are all absolutely *Spherical*, must stand so very tickliſh and nicely upon each other, as to be susceptible of every Impression, and tho' not perpetually in Motion, yet must be always ready and liable to be put into it, by any the slightest Force imaginable. It is true, the Parts of Fire or Heat are not capable of moving themselves any more than those of Water; but they are more subtil, light, and active than those are, and so more easily put into Motion.

In fine, 'tis confident, and Matter of Fact, That Heat does operate upon, and move the Water, in order to its carrying on the Work of *Vegetation*; but how 'tis agitated it self, and when the Motion first begins, this is no fit Place to enquire.

That the Concourse of Heat in this Work, is really necessary, appears not only from the Experiments before us, but from all Nature: From our Fields and Forests, our Gardens and our Orchards, we see in *Autumn*, as the Sun's Power grows gradually less and less, so its effects on Plants is remitted, and their *Vegetation* slackens by little and little.

Its Failure is first discernible in Trees; these are raised highest above the Earth, and require a more intense Heat to elevate the Water charged with its Nourishment, to the Tops and Extremities of them; so that for want of fresh Support and Nutriment, they shed their Leaves, unless secured by a very firm and hardy Constitution indeed, as our *Evergreens* are; next the Shrubs part with theirs, and then the Herbs and lower Tribes; the Heat being at length not sufficient to supply even these, tho' so near the Earth, the Fund of their Nourishment. As the Heat returns the succeeding Spring, they all recruit again, and are furnished with fresh Supplies and Verdure; But first those which are lowest and neareſt the Earth, Herbs, and they that require a lesser Degree of Heat to raise the Water with its Earthy Charge, into them. Then the Shrubs and higher Vegetables in their Turns; and lastly, the Trees. As the Heat encreases, it grows too powerful, and hurries the Matter with too great Rapidity thro' finer, and more tender Plants. These therefore go off and decay; and others that are more hardy and vigorous, and require a greater degree of Heat, succeed in their Order. By which Mechanism, provident Nature furnishes us with a very various and differing Entertainment; and what is best suited to each Season, all the Year round.

As the Heat of the several Seasons affords us a different Face of Things, so the several distant Climates shew different Scenes of Nature, and Productions of the Earth.

The hotter Countries, yield ordinarily the largest and tallest Trees, and those too in a much greater Variety than the colder ever do. Even those Plants which are common to both, attain to a much greater Bulk in the Southern, than in the Northern Climes; nay, there are some Regions so Bleak and Chill, that they raise no *Vegetables* at all, to any considerable Size. This we learn from *Greenland*, from *Ireland*, and other Places of like *cold Site* and *Condition*. In these no Tree ever appears, and the very Shrubs they afford, are few, little, and low.

Again, In the warmer Climates, and such as do furnish forth Trees, and the larger *Vegetables*, if there happen a Remission, or Diminution of the usual Heat, their Productions will be impeded or diminished in Proportion.

Our late colder Summers have given us Proof enough of this. For tho' the Heat we have had, was sufficient to raise the *Vegetative Matter* into the lower *Plants*, into our Corns, our Wheat, Barley, Peaſe, and the like; and we have had Plenty of Strawberries, Rasberries, Currants, Gooseberries, and the Fruits of such other *Vegetables*, as are low and near the Earth: Yea, and a moderate store of Cherries, Mulberries, Plumbs, Filberts, and some others that grow at a somewhat greater height; yet our Apples, our Pears, Walnuts, and the Productions of the taller Trees have been fewer, and those not so kindly, so throughly ripen'd, and brought to that Perfection they were in the former more benign and warm Seasons. The Dwarf-apple and Pear-trees have succeeded better; and indeed in Trees of the same kind, those that keep closest to the Earth, always produce the most and best Fruit. For which reason it is that the Gardiners check and restrain the Growth of their better Fruit-Trees, and prevent their running up too great a Height: Now, even the lower Fruits and Greens have had some share in the common Calamity, and fallen short both in Number and Goodness of what the hotter and kinder Seasons were wont to shew us.

As to our Grapes, Abricots, Peaches, Nectarins, and Figs, being transplanted hither out of hotter Climes, 'tis the less wonder we have of late had so general a Failure of them.

Nor is it the Sun, or the ordinary Emission of the Subterranean Heat only, that promotes *Vegetation*; but any other indifferently, according to its Power and Degree.

This we are taught by our Stoves, Hot-beds, and the like. All Heat is of like kind; and wherever is the same Cause, there will be constantly the same Effect.

There's a *Procedure* in every part of Nature, that is perfect Regularly, and Geometrical, if we can but find it out; and the farther our Searches carry us, the more shall we have Occasion to *admire* this, and the better 'twill compensate our Industry.

VEHICLE, in the General, is that which carries or bears any thing along; as the *Serum*, or watery Humour, they say is the Vehicle which serves to convey the Blood Particles, and to disperse them all

all over the Body: And in Pharmacy, that Liquid in which any Powder, or ſuch like Medicine, is taken, they call a proper Vehicle for it.

VEJOURS, are ſuch as are ſent by the Court to take View of any Place in Queſtion, for the better Deciſion of the Right. It ſignifies alſo ſuch as are ſent to view thoſe that Eſſoin themſelves *de malo Lecti*, whether they be in Truth ſo ſick as they cannot appear, or whether they counterfeit. This Word is alſo uſed for thoſe that are appointed to view an Offence, as a Man murdered, *&c.* See *View*.

VEIN, is a Veſſel in an Animal Body, made to receive and bring the Blood back again from the Arteries.

The Veins conſiſt of four Tunicks, a Nervous, a Glandulous, a Muſcular, and a Membranaceous one. The Branches of the *Vena Cava*, above the Heart, are called *Jugular Veins*, which go towards the Head; they which go towards the Arms, are called *Axillary*; that about the Heart *Coronary*; in the Lungs *Pulmonary*; in the Liver *Hepatick*, or *Liver Vein*; in the *Diaphragma*, *Phrenica*; in the Thighs *Crural*; in the Reins *Emulgents*; and ſo from its various Ramification, it is variouſly denominated. *Blanchard.*

VENA *Cava*: See *Cava Vena.*

VENA *Portæ*, is a notable Vein, ſo called from the two Eminences, called by *Hippocrates* πυλαὶ, between which it enters the Liver. The

VENA *Portæ*, as it enters into the Liver, is inveſted with another Coat, which ſome call *Vagina Portæ*, its Sheath, others *Capſula* or *involucrum*, its Caſe, or Cover, and *Capſula communis*, becauſe the *Porus bilarius* is involved in it as well as the *Porta*.

This outer Coat it has immediately from the Membrane that cloaths the Liver; that is, it is continued from it, though it be of a clear other Subſtance, namely more denſe and carnous; it is inveſted with it in all its Ramifications, and ſo having a double Coat, is in that reſpect an Artery; as alſo in that it brings Blood to its Liver for its Nouriſhment, as well as for other Uſes; and laſtly, into the *Capſula*, it has an obſcure Pulſation (according to Dr. *Gliſſon.*)

When it is enter'd about half an Inch into the Liver, it is carried partly to the Right Hand, partly to the Left, and ſo is ſhap'd into a *Sinus* as it were, and thence is divided into five large Branches, four whereof are diffus'd all over the hollow Side of the Liver, but the fifth aſcends ſtreight to its upper Side, where it diſperſes it ſelf. The ſaid *Sinus* is more conſpicuous in an *Embryo*, becauſe the great Influx of nutritious Juice by the Umbilical Veins enlarge it much. Some make it a ſort of a Heart, obſerving it in an obſcurer kind of *Syſtole* and *Diaſtole*, whereby the Motion of the Blood in the Branches of the *Porta* within the Liver, is promoted in like manner, as it is in the *Arteria pulmonaris*, and *Aorta* by the Right and Left Ventricles of the Heart. Without which Pulſation, they think the Blood would hardly paſs out of the larger Branches of the *Porta* into the narrower, and ſo on into the Roots of the *Cava*.

In an *Embryo* very obſervable is the *Tubulus*, or *Canalis Venoſus*, which paſſes directly out of this *Sinus*, into the *Cava*, almoſt oppoſite to the Mouth of the Umbelical Vein that opens into the *Sinus*.

This *Canalis*, or Pipe, is of the ſame Subſtance and Tincture with a Vein, and enters into the *Cava* juſt as it penetrates the *Diaphragma*; and there alſo two other great Branches out of the Liver are inſerted into the *Cava*; and in the ſame Place this Pipe is alſo knit to the ſuſpenſory Ligament, as it is called, and after the Child is born, grows it ſelf into a Ligament, being in a manner oppoſite to the Umbilical Ligament.

Its Uſe in the *Fœtus*, is for the freer and readier Motion of the Blood and Chyle out of the Umbilical Vein into the *Cava*, ſeeing the Current is hardly ſtrong enough to pervade the *Parenchyma* of the Liver; nor indeed is there any Reaſon why the ſaid Liquors ſhould paſs there-through, ſeeing there is either little or no Bile therein; or however, they are not yet in a Condition to have the ſame ſeparated from them. But to return to the Diviſions of the *Porta*.

The Ancients taught, that they were only ſpread in the ſinous or hollow Part of the Liver; but Dr. *Gliſſon*, in his Accurate Anatomy of it affirms the *Porta* to be diſperſed very equally in all its Parts, upper as well as lower.

And whereas it has been a conſtant Doctrine, That the Branches of the *Porta* open by *Anaſtomoſes*, into thoſe of the *Cava*; the ſame learned Author, and many others ſince him, have obſerved, That there are no ſuch *Anaſtomoſes* at all, but that the Blood doth ouze through the glandulous *Parenchyma* of the Liver, out of the Capillary Veins of the *Porta*, into thoſe of the *Cava*. He that would be fullier informed hereof, may conſult his moſt accurate Book *de Hepate*: But we will now paſs to the Branches of the *Porta*, when it is gone out of the Liver.

This Trunk having paſt a little from the Liver, before it be ſevered into Branches, puts forth two Twigs, out of its upper and fore-part, which are inſerted into the *Cyſtis fellea*, or Gall-Bladder, (and are from thence called *Cyſtice gemellæ*) about the Neck of it, and ſpread by enumerable Twigs through its external Coat.

A third Twig alſo ariſes ſingle from it, which is larger than either of the former, and is inſerted into the Bottom of the right ſide of the Stomach, from whence it aſcends by its hinder ſide up to the *Pylorus*, which gives it the Name of *Pylorica*; it is otherwiſe called, *Gaſtrica dextra.*

Having ſent forth theſe three Twigs, the Trunk paſſeth down, and bending a little towards the left ſide, it is parted into two remarkable Branches; whereof the upper is called *Siniſter*, or the *Left*, and is the leſſer; the lower *Dexter* or the *Right*, which is the larger. The *Left* is beſtowed upon the Stomach, the *Omentum*, a Part of the *Colon*, and the Spleen; the Right is ſpread through the Guts and Meſentery; the Left is called, *Vena Splenica*; but the Right, *Vena Meſenterica.*

The *Vena Splenica*, runs acroſs the Body towards the left ſide, being ſuſtained by the hinder Leaf of the Cawl, and hath two Branches iſſuing out of it, before it comes to the Spleen, *viz.* the *Superior* and the *Inferior.*

The *Superior* is called *Gaſtrica*, or *Ventricularis*, becauſe it is beſtowed upon the Stomach; it aſcends obliquely towards the left part of the Stomach, into the back ſide whereof it is inſerted, and divides it ſelf into three Sprigs, of which the two outmoſt are ſpent on the Body of the Stomach, but the middle aſcends on its back-ſide up to its upper, or left Orifice, which it encompaſſes like a Garland, and is called *Coronaria.* From the *Inferior* Branch two Twigs ſpring; the one is ſmall, and ſends

Twigs

Twigs to the right Side of the inner Leaf of the *Omentum*, and to the *Colon* annexed to it. This is called *Epiplois*, or *Omentalis dextra*. The other is ſpent upon the ſame Leaf of the *Omentum*, with that part of the *Colon* which it ties to the Back, and ts called, *Epipolis*, or *Omentalis poſtica*.

When the *Ramus Splenicus* hath juſt approached to the Spleen, it ſends out two other Twigs, the upper and lower. The *Upper* is called, *Vas breve venoſum*, and is implanted into the left Part of the Bottom of the Stomach. It is ſometimes ſingle, in which caſe it is properly called, *Vas breve* in the ſingular Number; but more often there are two, three, or more of them, and then theſe Veſſeis, be they one or more, do ſometimes ſpring from the *Ramus Splenicus*, after it has entred the Spleen.

This *Vas breve*, was a Veſſel much renowned by the Ancients, who believe it carried an acid Juice from the Spleen to the Stomach, to ſtir up Appetite, and to help the Fermentation of the Meat in it; but it is certain both by Ligature (whereby it filleth toward the Stomach, and emptieth toward the Spleen) and alſo by the general Nature of Veins, whoſe ſmaller Branches and Twigs ſtill receive the ſuperfluous Arterial Blood, from the part whereinto they are inſerted, and conduct it by the larger Channels toward the heart: I ſay, it is certain from hence, that this ſame *Vas breve* carries nothing to the Stomach, but only brings from thence, into the *Ramus Splenicus*, the Remains of the Arterial Blood.

From the *lower* two Twigs iſſue.

The firſt is called, *Gaſtroepiplois ſiniſtra*; this is beſtowed upon the left Part of the Bottom of the Stomach, and the Fore-leaf of the *Omentum*, chiefly on its left Part.

The ſecond ſpringeth moſt commonly indeed from the *Ramus Splenicus*, but ſometimes from the left Meſenterick Vein; and running along the *Inteſtinum Rectum*, is inſerted into the *Anus*, by many Twigs. This is called, *Hæmorrhoidalis interna*, as that which ſpringeth from the *Vena Cava*, is called, *Hæmorrhoidalis externa*.

Now followeth the *Vena Meſenterica*, or the right Branch of the *Vena Portæ*. Before it be divided into Branches, it ſendeth forth two Twigs.

The firſt is called, *Gaſtroepiplois dextra*; this is beſtowed upon the right Part of the Bottom of the Stomach, and the right Side of the upper Leaf of the Cawl.

The ſecond is called, *Inteſtinalis*, or *Duodena*: It is inſerted into the Middle of the *Duodenum*, and the Beginning of the *Jejunum*, and runneth lengthways of them; whence ſome Capillary Twigs go to the *Pancreas*, and the upper Part of the *Omentum*.

After theſe Twigs are paſt from it, it enters by one Trunk into the Meſentery, where preſently it is divided into two Branches, to wit, *Meſenterica dextra*, and *ſiniſtra*.

Meſenterica dextra (placed on the right Side) is double, and ſendeth a great Number of Branches to the *Jejunum*, *Ilium*, *Cæcum*, and the right part of the *Colon*, which aſcendeth up by the right Kidney and runs under the Liver.

It hath fourteen remarkable, though nameleſs Branches; and theſe are afterwards divided into innumerable ſmall Twigs. Theſe are thoſe Veins that are called the *Meſeraicks*, whoſe Branches are ſupported by the Glandules of the Meſentery, but enter not into them; for the Glands open into the *Venæ Lacteæ*.

Meſenterica ſiniſtra, paſſeth thro' the Middle of the Meſentery, to that Part of the *Colon* which deſcendeth from the left Part of the Stomach, and to the *Inteſtinum Rectum*.

The Uſe of the *Porta*, before the Circulation of the Blood, and the *Venæ Lacteæ* were found out, was taught to be for the carrying of Nouriſhment to the Inteſtines and other Parts contained in the *Abdomen*, and alſo to bring back from the Guts the purer Part of the Chyle to the Liver to make Blood of, and a thicker fæculent Part of it to the Spleen, to be excocted by it into an acid Juice, and then carried to the Stomach by the *Vas breve venoſum*, for the exciting of Hunger.

As for this laſt Opinion, it appears by Ligature, That the *Vas breve* carries its Contents from the Stomach to the *Ramus Splenicus*, and it is nothing but the Blood remaining from the Nutrition of the Stomach, (that was brought thither by the Arteries) which is now a conveying back to the Liver, and ſo to the Heart again in its Circulation.

And as for the *Meſeraicks* carrying Nouriſhment to the Guts, or bringing back Chyle, thoſe Errors have been ſufficiently laid open before now. But their true Uſe is only to bring back to the Liver from the Guts, Cawl, and other Entrails, that Blood which remains after their Nutrition, and which was carried to them by their reſpective Arteries.

VENÆ *Lacteæ*, the *Lacteal Veins*, are ſo called, from the white Colour of the Chyle they carry. Theſe were not diſcovered as ſuch 'till about the Year 1622. When *Gaſpar Aſellius* found them out in diſſecting a live Dog fed well. Since whom, many others have made more accurate Diſcoveries of them. They are ſlender pellucid Veſſels, having but a ſingle Coat, and are diſperſed in great Numbers thro' the Meſentery, and appointed for carrying the Chyle. Their Riſe is from the innermoſt Membrane of the Inteſtines, where their Mouths are hid under a kind of ſpongy Cruſt, or *Mucus*, thro' which, by the Preſſion of the Guts the Chyle is ſtrained, and received by the Mouths of thoſe Veſſels. From whence they proceed the neareſt or readieſt way to ſuch Glandules of the Meſentery as are neareſt them; but in their Paſſage many ſmaller ones uniting to another, do commonly grow into one large Trunk, and this a pretty way before they inſinuate themſelves into the Glands they are marching to. But then at their Entrance into the Gland, and ſometimes a little before, this Trunk ſeparates again into new Branches more and ſmaller than the other. And hitherto they bear the Name of *Radicales*, or *Venæ Lacteæ primi generis*. After this, out of the Gland there ſpring again new Capillary ones, which by and by meeting together, make one Trunk again, as before, which keeping its Courſe towards the Centre of the Meſentery, enters as many Glands as lie in its way, being divided into new Branches juſt before its Entrance into each Gland, as before: But whilſt all the Trunk bend one way, they alſo meeting with one another, do in Proceſs ſeveral of them grow into one; and at length all the Trunks arrive at the great or middle Gland of the Meſentery (call'd improperly *Pancreas*) which moſt of them enter into, but ſome of them paſs over its Surface, and by and by they all empty themſelves into the great or common Receptacle of the Chyle that lies behind the ſaid Gland; thoſe that were inſerted into it riſing out of it in like manner, as they did before out of the leſſer Glands. As they run from one Gland

to

to another, they are called *ſecundi generis*, or of the ſecond Kind; and from their having paſs'd all the Glands to their opening into the common Receptacle, &c. they are called *tertii generis*, or of the third Kind.

VENÆ *Lymphaticæ*, the *Lymphatick Veins*, receive the *Lympha* from the conglobated Glandules, and diſcharge themſelves either into the Sanguinary Veins, or into the Receptacle of the Chile.

VENÆ *Preputii*, are Veins ariſing from the Capillary Extremities of the Artery of the *Penis* called *Pudenda*, theſe uniting into larger Branches, paſs into thoſe Veins which ariſe from the *Corpora Cavernoſa Penis*, and paſſing under the common Integuments, do empty themſelves into the upper Vein of that continued from the *Saphena Vein* of the Foot. *Cowper's Myſt. Reformata in Append.*

VENÆ *Sectio*, is the ſame with *Phlebotomy*, or Blood-letting.

VENDITIONI *exponas*, is a Writ Judicial, directed to the Under-Sheriff, commanding him to ſell Goods which he hath formerly by Commandment taken into his Hands, for the ſatisfying a Judgment given in the King's Court.

VENIRE *facias*, is a Writ Judicial directed to the Under-Sheriff, and goeth out of the Record, and lies where two Parties plead and come to Iſſue; for then the Party, Plaintiff, or Defendant, ſhall have this Writ directed to the Sheriff to cauſe Twelve Men of the ſame Country to ſay the Truth upon the Iſſue taken. And if this Inqueſt come not at the Day of the Writ return'd, then ſhall go a *Habeas Corpora*, and after a Diſtreſs, until they come. And it is alſo a Proceſs upon an *Audita Querela*, or upon an Indictment in the King's-Bench, or *Venire facias ad computandum*, againſt Tenant, by *Elegit*.

VENIRE *facias tot Matronas*: See *Ventre inſpiciendo*.

VENT, in Gunnery, ſignifies the Difference between the Diameter of a Bullet, and the Diameter of the Bore of the Piece; and it ought to be $\frac{1}{20}$ of the Diameter of the Bore: See *Ordnance*.

VENTER *Infimus*: See *Hypogaſtrium*.

VENTERS, according to the Definition of Anatomiſts, are the three principal Cavities, or hollow Parts of Animal Bodies, *viz.* thoſe of the *Belly*, *Cheſt* and *Head*; or the *Abdomen*, the *Thorax*, and the *Caput*.

VENTOSE, a *Cupping-Glaſs*: See *Cucurbicula*. The Ingenious Mr. *Hawksbee* hath now found a way of applying Cupping-glaſſes without Fire, by means of a ſmall Air-pump, which do mighty well, and put the Patient to no Pain or Fright.

VENTRE *Inſpiciendo*, is a Writ for the Search of a Woman that ſaith ſhe is with Child, and thereby with-holdeth Land from him that is next Heir at Law.

VENTRES: See *Cavitates*.

VENTRICLE, the Stomach, is a Membranous Bowel in the *Abdomen*, under the *Diaphragma*, betwixt the Liver and the Spleen, conſiſting of four Tunicks; a Nervous, Fibrous, Glandulous, and Membranous one: It hath two Orifices, one on the Right Hand, called *Pylorus* and *Junitor*, whereat the Meat is ſent out into the Guts: Another on the Left Hand, at which the Meat enters. Its Office is to concoct or ferment the Meat: It is alſo called *Stomachus* and *Aqualiculus*.

VENTRICULI *cerebri*, the Ventricles of the Brain, are four; the Uſe of them is to receive the Serous Humours, and to bring them by the *Pelvis* into the *Pituitary Glandule*, or into the *Proceſſus Mamillares*, by the *Os Cribriforme* to the Noſtrils. They are nothing but Complications of the Brain, which happen there as it were by Accident. *Blanchard*.

VENTRICULI *Cordis*, the Ventricles of the Heart, are two: The firſt, or Right Ventricle, receives the Blood from the *Vena Cava*, and ſends it to the Lungs; the Left Ventricle receives the Blood from the Lungs, and ſends it through the whole Body by the *Aorta*, or great Artery, and its Branches: In the *Syſtole*, or Contraction of the Ventricles, the Blood is ſent out: In the *Diaſtole*, or Dilatation, it is let into the Heart.

VENUE, or *Venew*, or *Viſne*, are Terms uſed in Law, ſignifying the Place next to that where any thing that comes to be tried happen'd to be done: And therefore for the better Diſcovery of the Truth of the Matter in Fact upon every Trial, ſome of the Jury muſt be of the ſame Hundred, or ſometimes of the ſame Pariſh, or Neighbourhood, in which the thing is ſuppoſed to be done, who by Intendment may have the beſt Knowledge of the Matter.

VENUS. The time of the Periodical Revolution of this Planet round the Sun, is 224 Days and $\frac{2}{3}$ of a Day, or $7\frac{1}{2}$ of our Months.

According to Mr. *Caſſini*, the greateſt Diſtance of *Venus* from the *Earth* is 38415, the mean Diſtance 22000, and the leaſt Diſtance 5585 Semidiameters of the Earth.

And the Diameter of *Venus* is equal to 7 Semidiameters of the Earth; therefore the Globe of *Venus* muſt be near 43 times greater than that of the Earth. But Dr. *Gregory* ſaith, That to an Eye placed in *Venus*, the Sun's Diameter would appear once and $\frac{1}{2}$ as big again as it doth to us, and therefore his Disk will be more than double of what it appears to us: And the *Light* and *Heat* in this Planet, and its Gravity towards the Sun, will be in the ſame Proportion in reſpect of ours.

The Length of the Day in *Venus*, is but 23 Hours.

The Eye here would behold 4 Planets above it, *viz.* our *Earth*, *Mars*, *Jupiter* and *Saturn*; and one below it, which is *Mercury*: And when our Earth is in Oppoſition to the Sun, it will appear then (in the Night) to ſhine with a full Orb, and be very bright. The Moon will appear always to accompany the Earth, and never to be ſeen from her above $\frac{1}{2}$ a Degree. *Mercury* will never appear to be above 38 Degrees diſtant from the Sun.

Kepler ſaith, The Inclination of the Orbit of *Venus*, is 3 Degrees and 22 Minutes.

October $\frac{14}{24}$ 1666, *Caſſini* obſerved ſeveral Spots in the Body of this Planet, by whoſe Motion he judged (tho' he was not certain) That ſhe moved either by a Circulation, or a kind of Libration round her Axis, in about 23 Hours.

A. D. 1672, and 1686, The ſame Aſtronomer, with a Teleſcope of 34 Foot, believes he ſaw a *Satellite* moving round this Planet, and diſtant from it about $\frac{3}{5}$ of *Venus*'s Diameter. It had the ſame Phaſis with *Venus*, but was without any well defined Form, and its Diameter ſcarce exceeded $\frac{1}{4}$ of that of *Venus*.

Dr. *Gregory* thinks it more than probable, that this was a *Satellite*; and ſuppoſes the Reaſon why it is not uſually ſeen, to be the Unfitneſs of its Surface to reflect the Rays of the Sun's Light; as is the caſe of the Spots in the Moon, of which if the whole Disk of the Moon were compoſed, he thinks

the Planet could not be ſeen in *Venus*. *Aſtron. Phy. & Geom.* p. 472.

Herigone, *Kepler*, and *Rhætenſis*, or *Schyrlæus de Rhæitus*, conjecture that *Venus* moves round her Axis in about 14 Hours; as *Kircher* and *Schottus* pretend to have diſcovered, by Obſervation of certain Spots in her.

VERB, in Grammar, is a variable Part of Speech, expreſſing the Action of the Mind, which affirms that a Thing is ſo, or not ſo: And 'tis either *Perſonal*, which is conjugated or formed thro' all the Three Perſons; or *Impersonal*, which is only found in the Third Perſon Singular.

VERDEGREASE, is the Ruſt of Copper gathered by ſtratifying Plates of Copper with the Husks of preſſed Grapes, and then ſcraping off the Ruſt of the Plates contracted by lying in thoſe Husks for ſome time. But the Painters call *Verdegreaſe*, or *Verdeter*, a kind of Magiſtery of the common Verdegreaſe; which is diſſolved in diſtilled Vinegar, and then Cryſtaliz'd in a cool Place. Theſe are called Cryſtals of *Venus*, made by Vinegar.

VERDEROR, is a Judicial Officer of the King's Foreſt, choſen by the King's Writ in the full County of the ſame Shire where the Foreſt is; and is ſworn to maintain and keep the Aſſizes of the Foreſt; to view, receive and enrol the Attachments and Preſentments of all manner of Treſpaſſes of Vert and Veniſon in the Foreſt.

VERDICT, is the Anſwer of a Jury made upon any Cauſe, Civil or Criminal, committed by the Court to their Examination. And it is either *General*, or *Special*: A *General Verdict*, is that which is given or brought into the Court in like *general* Terms, to the *general Iſſue*, as in Action of Diſſeſin, the Defendant pleadeth, *No Wrong*, *no Diſſeſin*; then the Iſſue is *General*, whether the Fact be wrong, or not; which being committed to the Jury, they, upon Conſideration of their Evidence, come in, and ſay, either for the Plaintiff, That it is a Wrong and Diſſeſin; or for the Defendant, That it is no Wrong, no Diſſeſin. A *Special Verdict* is, when they ſay at large, That ſuch a Thing, and ſuch a Thing, they found to be done by the Defendant or Tenant, ſo declaring the Courſe of the Fact, as in their Opinion it is proved; and as to the Law upon the Fact, they pray the Judgment of the Court. And this *Special Verdict*, if it contain any ample Declaration of the Cauſe from the Beginning to the End, is alſo called, *A Verdict at large*.

VERDOY; the Term in Heraldry for a Bordure of a Coat of Arms, being charged with any Kinds or Parts of Flowers, Fruits, Seeds, Plants, *&c.*

VERGE, is the Compaſs of the King's Court, which bounds the Juriſdiction of the Lord-Steward of the King's Houſhold, and of the Coroner of the King's Houſe; and that ſeems to have been twelve Miles round.

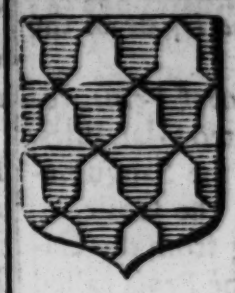
Verge, is alſo uſed for a Stick or Rod, by which One is admitted Tenant, and holding it in his Hand, takes the Oath of Fealty to the Lord of the Mannor, and for that cauſe is called *Tenant by the Verge*. Alſo, the Spindle of the Balance of a Watch is called the *Verge*.

VERMICULARES: See *Lumbricales*.

VERMICULATION, is an Infection of Plants by Worms.

VERMIFORMIS *Proceſſus*, is the Prominence the *Cerebellum*, ſo called from its Shape.

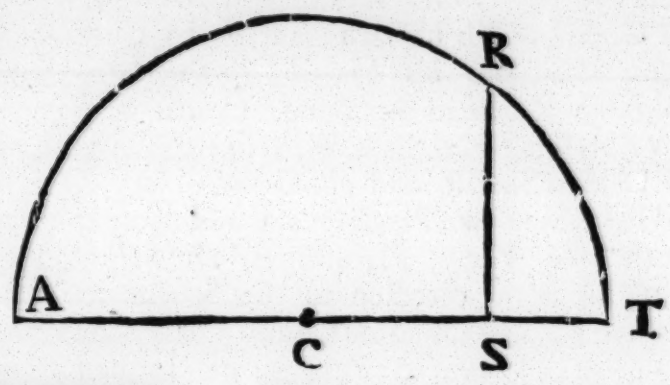
VERMIVOROUS, are ſuch Animals, as feed upon Worms.



VERRY, or *Vairy*, in Heraldry, is of two Sorts. If the Colours (which is a ſort of Chequer-work, of the Shape of little Bells) be Argent and Azure, 'tis enough to ſay *Vairy* alone: But if the Colours are any other, they muſt be named expreſſly. They engrave it thus.

VERSED-*Sine* of an Arch, is a Segment of the Diameter of a Circle, lying between the Foot of the Right Sine, and the lower Extremity of the Ark: See more under the Word *Trigonometry*.

Thus S T is the Verſed Sine of the Ark R T; and A S the Verſed Sine of the Ark A R, which is the Supplement of the former.



VERT; the Heralds Word for a Green Colour; and 'tis called Vert in the Blazon of the Coats of all under the Degree of Noble: But in Coats of Nobles 'tis called *Emerauld*; and in thoſe of King's 'tis called *Venus*. In Engraving 'tis expreſſed by Lines drawn athwart, beginning at the Sinifter Corner of the Eſcutcheon, thus.

VERT, in the Foreſt-Law, ſignifies every thing that grows and bears a *green* Leaf within the Foreſt, that may cover a Deer. And 'tis either *Over-vert* or *Nether-vert*: *Over-vert*, is the great Woods, and in Law-Books are uſually called *Hault-Bois*: *Nether-vert* is the under Woods, otherwiſe call'd *South-Bois*. There is alſo a *Special-vert*; that is, all Trees that grows in the King's Woods within the Foreſt; and thoſe that grow there in other Mens Woods, if they be ſuch Trees as bear Fruit to feed the Deer.

VERTEBRÆ; the *Vertebres* or Joints of the Neck and Back-Bone of any Animal: In a Man they account ſeven in the Neck, 12 in the Back or *Dorſum*, 5 in the Loins, and 5 of the *Os Sacrum*.

VERTEBRALIS, or *Cervicalis*, is a Pair of Muſcles, which extend all the *Vertebræ* of the Body.

VERTEX, is that Point in the Heaven juſt over our Heads, and the ſame with *Zenith*; which ſee.

The Point of any Angle is called alſo its *Vertex*; and that Point of the Curve of a Conick Section, where the Axis cuts it, is called alſo the *Vertex* of that Section.

VERTEX, in Anatomy, is alſo the Crown of the Head, or the middle Part of it, ſeated between the Bounds of the *Sinciput* and *Occiput*.

VERTEX of a Cone, Pyramid, Conick Section, *&c.* is the Point of the upper Extremity of the Axis, or

or the Top of the Figure. So the *Vertex* of an Angle, is the Angular Point; and thoſe Angles which being oppoſite to one another, do touch only in the Angular Point, are called *Vertical* Angles.

VERTEX *of a Glaſs* (in Opticks) is the ſame with its Pole; which ſee.

VERTICAL *Circles*: See *Azimuths*.

VERTICAL *Line*: See *Line Vertical*.

VERTICAL *oppoſite Angles*: See *Angles*.

VERTICAL *Plain* in Perſpective: See *Plain*.

VERTICAL *Point*, the ſame with *Vertex*: So that in Aſtronomy, a Star is ſaid to be *Vertical*, when it happens to be in that Point which is juſt over any Place.

VERTICILLATE *Plants*, are by the Botaniſts ſaid to be ſuch as have their Flowers intermixed with ſmall Leaves, growing in kinds of *Whirls* about the Joints of the Stalk, as *Penny-Royal*, *Hore-hound*, &c. See *Plants*.

The peculiar Characteriſticks of this Genius of Plants, Mr. *Ray* ſaith, are, Their Leaves growing by Pairs, one juſt againſt another on the Stalk. The Flower *Monopetalous*, but uſually hanging down with a kind of Lip, or turn'd ſomething like the Form of an Helmet, four Seeds after each Flower, to which the *Perianthium* of the Flower ſerves inſtead of a *Capſula Seminalis*.

Mr. *Ray* makes two kinds of theſe *Verticillate Plants*.

I. The *Fruticoſæ*, or ſuch whoſe Superficies is Perennial; and theſe have either,

1. A plain Flower, as the *Chamædrys vulgaris*, *Teucrium*, and the *Marum Syriacum*.

2. Such as have a Flower with a Lip, which they call a *Labiated* Flower, or one ſomething in the Form of a Helmet, which they call *Galeated*; as the *Sacria Stæchas*, *Hyſſopus*, *Roſmarinus*, *Satureia*, *Marum vulgare*, *Thymum vulgare*, and the *Polium montanum*.

II. The *Verticillatæ Herbaceæ*, or ſuch whoſe Stalks are not Perennial; and theſe are the *Menthæ*, *Verbena*, *Dictamnus Creticus*, *Origanum*, *Majorana*, *Ocimum*, *Horminum*, *Galeopſis*, *Nepeta*, *Betonica*, *Prunella*, *Stachys*, *Clinopodium vulgare*, *Lamium*, *Moluca Hedera terreſtris*, *Galericulata*, *Calamintha*, *Meliſſa*, *Marrubium Commune*, *Nigrum*, and *Aquaticum*, *Chamæpetys*, *Scarodonia*, *Scordium*, *Bugula*, *Syderitis*, *Cardiaca*.

VERTICITY, the Property of the Loadſtone or a Touch'd-Needle to point *North* and *South*, or towards the Poles of the World: See *Magnet* and *Magnetiſm*.

VERTIGO: See *Scotomia*.

VERY LORD and *Very Tenant*, are Terms in Law, ſignifying thoſe that be immediate *Lord* and *Tenant* one to another.

VESICA: So the Chymiſts call the large Copper Body Tinned within ſide, which is commonly uſed in Diſtillation of Ardent Spirits, becauſe 'tis in Figure ſomething like a blown Bladder. This is called alſo a *Cucurbite*, and commonly, a *Body*: See its Figure in *Cucurbite*.

VESICA *Urinaria*, the Bladder, is a Veſſel appointed to receive the Urine ſeparated in the Kidneys, and brought to it by the Ureters.

It is ſeated in the *Hypogaſtrium*, betwixt the two Coats of the *Peritonæum*, in that Cavity that is formed of the *Os Sacrum*, *Coxæ* and *Pubis*, and is called *Pelvis*. In Men, it lies upon the *Inteſtinum rectum*; in Women, it adheres to the Neck of the Womb, which is placed betwixt the Bladder and the ſtreight Gut: In both, it is knit before to the *Oſſa Pubis*. Moreover, it is knit to the Navel by the *Uracha*.

Its Subſtance is made up of three Membranes.

The firſt and outmoſt is borrowed from the *Peritonæum*. *Riolanus* ſays, This Coat is a Duplicature of the *Peritonæum*, within which, the Bladder lies hid, ſuſpended like a Bottle turned the Mouth downwards. On its outſide, in Man, it is beſmear'd with Fat, but not in Beaſts.

The ſecond is thicker, and endowed with carnous Fibres; yea, *Aquapendens*, *Spigelius*, *Walæus*, and *Bartholin*, will have it to be a true Muſcle, ſerving for the Compreſſion of the Bladder, to ſqueeze out the Urine; as the Sphincter ſerveth for Conſtriction to retain it.

The third and innermoſt, is white and bright, of exquiſite Senſe, as thoſe know too well who are troubled with the Stone.

Within, it is covered with a ſlippery mucous Humour, ſuch as the Gall-bladder has on its inſide, and ſuch as the Inteſtines abound with, which, without Doubt, muſt be ſpued out of ſome Glands in this inmoſt Coat, tho' they be hardly diſcernable. This doth defend it from the Acrimony of the Urine.

Its Membranes have all Sorts of *Fibres*. And when theſe Membranes and Fibres are too long or too far extended with Plenty of Urine, they loſe the Power of contracting themſelves, whence there iſſues a Stoppage of Urine.

It is *perforated* in three Parts, *viz.* in the Sides, where the Ureters are inſerted, to let in the Urine; and before at its Neck, to let it out.

It hath two *Parts*, to wit, the Bottom, and the Neck.

The *Bottom* comprehends the upper, wider and more membranous Part of the Bladder, to which the *Urachus* being tied, reaches the Navel, which together with the bordering Umbelical Arteries, become a ſtrong Ligament in the Adult, hindering the Bladder to preſs upon its Neck. But as for the Arteries, *Riolanus in Animadv. ad Bauch.* affirms, That they contribute nothing to the Suſpenſion of the Bladder, neither reaching to the Navel in the Adult, nor touching the Body of the Bladder of the *Urachus*.

The *Neck* it lower than the Bottom, thicker and ſtraiter. In Men, it is longer and narrower, and being carried to the Riſe of the *Penis*, opens into the *Urethra*; in Women, it is ſhorter and wider, and is implanted into the upper Side of the *Vagina* of the Womb: In both, it is carnous and muſcular, woven of very many Fibres, eſpecially Tranſverſe or Orbicular, which lie hid within the ſtreight Fibres that ſurround the whole Body of

the Bladder, and thele make the Sphincter, which conſtringes the Neck of the Bladder ſo, as no Urine can paſs out againſt ones Will, unleſs when it is affected with the Palſy, Ulcer or other Malady, by which there ſometimes happens an involuntary Piſſing.

The Bladder is oblong and round, in Shape like unto a Pear.

Its *Cavity* is but one ordinarily, yet ſometimes it has been found to have a membranous Partition, that divides it into two, which yet had a Hole in it for the Communication of one Cavity with the other. Such a Partition was obſerved in the Bladder of the Great *Caſaubon*.

It hath *Arteries* and *Veins* from the *Hypogaſtricæ*, which are inſerted into the Sides of its Neck, where they are immediately branched into two, whereof one is ſpent upon the Neck, and the other on the Bottom. *Nerves* it hath (according to Dr. *Willis*) from the loweſt *Plexus* of the Intercoſtals in the *Abdomen*, and from the Marrow of the *Os Sacrum*. For the ſaid *Plexus* ſending two Nerves into the *Pelvis*, they have each of them a vertebral Nerve joined to them, and ſo make two new *Plexus*, from one of which there paſſes a Nerve, that being divided into many Branches, is on each Side diſtributed into the Bladder, and its *Sphincter Muſcle*.

The Uſe of the Bladder is to receive the Urine from the Ureters; and to contain it, like a Chamber-pot, until the Time of Excretion, when it is ſqueezed out of it, by the help partly of its own carnous Membrane, and partly of the Muſcles of the *Abdomen*.

Bartholin quotes ſome Obſervations of *Borrichius*, concerning the Bladder, worthy to be noted, *viz.* " If it be boil'd in Acids, it turns into a Mucilage; " if it be in Salt Liquors, it is thickned; if in Ole- " ous, or in the Liquor of the Alkali Salts of Tar- " tar, or Herbs burnt to Aſhes, it is neither thick- " ned, nor turns into a Mucilage, but is burnt, as " if it were laid on burning Coals, and may al- " moſt be crumbled to Powder. By which (ſays " he) it appears, with what great Danger to the " Bladder, Men inject into it, either acid, ſalt, or " oleous Liquor, for breaking the Stone.

VESICATORIA, are Medicines which act upon, and rarify the Spirits and ſerous Particles, gather themſelves betwixt the Skin and *Cuticula*, and conſequently ſeparate them, and raiſe little Bladders full of ſerous Matter, which are called *Bliſters*.

VESICULA *Fellis*: See *Folliculus Fellis*.

VESICULÆ *Seminales*, the Seed Bladders, are little Cells like thoſe in a Pomgranate, or ſomewhat reſembling a Bunch of Grapes. *De Graef* compares them to the Guts of a little Bird variouſly contorted.

They conſiſt of one thin Membrane, through which ſome ſmall Twigs of both Veins, Arteries, and Nerves run. They are about three Fingers-breadth long, and one broad; but in ſome Places broader, and ſome narrower, as they run in and out. They are two (one for each *Vas deferens*) divided from one another by a little Interſtice; and they do ſeverally, by a peculiar Paſſage, emit the *Semen* contained in them into the *Urethra*.

They are very anfractuous and winding, and (as was ſaid) conſiſt of many little Cells, that they ſhould not pour out all the *Semen* contain'd in them in one Act of Copulation, but might retain it for ſeveral. They have no Communication one with another, not even in their very opening into the *Urethra*; but the *Semen* that is brought to the *Veſiculæ Seminales* on the righe Side, by the right *Vas deferens*, iſſues by its proper Paſſage into the *Urethra*, and that which is brought to the left likewiſe. So that, if by any Accident, the *Veſiculæ* on one Side he burſt or cut (as in Cutting for the Stone they generally are) yet thoſe on the other, being entire, may ſtill ſuffice for Generation. Now when the *Semen* is emitted out of theſe *Veſiculæ* in the Act of Generation, it paſſes out the ſame way it came in, which in this caſe may eaſily be, (tho' otherwiſe it be unuſual there ſhould be a contrary Motion of the ſame Veſſel) for, as it comes in from the *Vaſa doferentia*, it drills along gently, without any Force; but in *Coitu*, when the Muſcles of the *Penis*, and all the bordering Parts, are much Tumified, it is expreſſed or ſquirted out of them with ſome Violence; and paſſing along, their Neck, (which is a Continuation of the *Vaſa deferentia*) ouzes through a Carbuncle (like Quickſilver thro' Leather) into the *Urethra*, or the Duct of the *Penis*, that is common both to the *Semen* and Urine. I ſay, it ouzes from the Necks of the *Veſiculæ* thro' a Carbuncle into the *Urethra*, for there is one placed as a Valve before the Orifice of each of them, partly to hinder the coming of the Urine into them, partly to hinder the involuntary Effuſion of the *Semen*.

Now, though naturally the little Holes through which the *Semen* paſſes out of the Necks of the *Veſiculæ* into the *Urethra*, be almoſt imperceptible, yet if they be either eroded by the Acrimony of the *Semen* (ſuch Acrimony as is contracted by impure Embraces, or in Claps, as we call them) or if of themſelves they be debilitated, and ſo become more Lax (as ſometimes happens) to old or impotent Men, that meddle too much) then there happens a *Gonnorhæa* or continual Efflux of *Semen*: And ſo *Vaſalius* and *Spigelius* have obſerved them much dilated, in diſſecting ſuch as have died with a *Gonnorrhæa* upon them.

VESPERTILIONUM *alæ*, are two broad membranous Ligaments, on each Side one, wherewith the bottom of the Womb is looſely tied to the Bones of the Flank. *Artæus* likens them to Bats-wings, whence the Name. *Blanchard*.

VESPERTINE, in Aſtronomy, when a Planet ſets after the Sun, it is ſaid by ſome to be *Veſpertine*.

VESSELS, in Architecture, are certain Ornaments, uſually ſet over the *Cornices*, and ſo nam'd, becauſe they repreſent divers ſorts of *Veſſels*, which were in uſe among the Ancients.

VESTIBULUM, is a Cavity in the *Os Petroſum*, behind the *Feneſtra Ovalis*, it is covered with a fine Membrane; in it open the ſemicircular Pipes of the Labyrinth. The upper Turning of the *Cochlea*, and the Auditory Nerve pierce into it alſo.

VESTIGIA *of Tendons* are the little Hollows in the Shells of Fiſhes, which are formed on purpoſe for the faſtening or rooting of the Tendons of their Muſcles. Theſe are plainly found on all the Foſſile Shells; and this is a Demonſtration, that once they really belonged to Fiſhes, and are not formed Stones.

VESTURE, in Law, ſignifies a Poſſeſſion or an Admittance to a Poſſeſſion or Seiſin. Thus it is alſo taken by the *Feudiſts*, with whom *Inveſtitura* ſignifies

ſies a Delivery of Poſſeſſion by a Spear or Staff, and *Veſtura* Poſſeſſion it ſelf.

VETERNUS: See *Lethargus.*

VERU, a Comet, according to ſome Writers, reſembling a Spit, being nearly the ſame kind, as the *Lonchites*, only its Head is rounder, and its Train longer and ſharper pointed.

VETITUM *namium. Namium* is a Diſtreſs, and *Vetitum* forbidden: Thus when the Bailiff of a Lord diſtrains Beaſts or Goods, and the Lord forbids his Bailiff to deliver them when the Sheriff comes to replevy them; and to that end, drives them to Places unknown; or when without any Words they are ſo eloined, as they cannot be replevied, divers Lords of Hundreds, and Courts-Barons, have Power to hold Plea *De vitito namio*: See *Naam.*

VI *& armis*, an Expreſſion in a Charge or Indictment, to ſhew the forcible and violent Commiſſion of any Crime.

VI *Laïca amovenda*, when the Biſhop of a Dioceſs has certified into the Court of *Chancery*, that the Rector or Vicar of any Church within his Juridiction, is kept out of his Manſe, or Glebe, or Church, by any Lay-force or intruding Power; then may a Writ be granted to the Sheriff, to remove all ſuch Violence, and ſuch Uſurpation; which Writ is therefore called, *De vi Laïca amovenda.*

VI *Laïca removenda*, is a Writ that lies where Debate is between two Parſons or Proviſors for a Church, and one of them enters into it with a great Number of Lay-men, and holds the other out *Vi & Armis*; he that is holden out, ſhall have this Writ directed to the Sheriff, That he remove the Force. And this Writ is returnable, and ſhall not be granted, until the Biſhop of the Dioceſs, where ſuch Church is, hath certified into the *Chancery*, ſuch Reſiſting and Force.

VIA *Lactea*: See *Milky-way.*

VIBRATION, is the Swing or Motion of a Pendulum; or of a Weight hung by a String on a Pin: See the Proportions of the Vibrations of Pendulums, under *Pendulum.*

VIBRISSÆ, are the Hairs which grow in the Noſtrils: They, with the *Mucus*, which the Glands ſeparate, ſtop any Filth from aſcending too high up into the Noſtrils.

VICARIO *deliberando occaſione cujuſdam Recognitionis*, &c. is a Writ that lies for a Spiritual Perſon impriſoned, upon Forfeiture of a Recognizance, without the King's Writ.

VICENETUM: See *Venue.*

VICIS *& venellis Mundandis*, is a Writ that lies againſt a Mayor or Bailiff of a Town, *&c.* for the clear keeping of their Streets.

VISCOUNTIEL, in Law, ſignifies as much as belonging to the Sheriff; as *Writs Viſcountiel* are ſuch Writs as are Triable in the County or Sheriff's Courts. *Viſcountiel*, ſignifies alſo, certain Farms for which the Sheriff pays a Rent to the King, and makes what Profit he can of them.

VIEW, in Law, ſignifies the Act of Viewers; for when an Action real or perſonal is brought, and the Tenant knows not well what Land it is that the Demandant asks, then he may pray the *View*; which is, that he may *ſee* the Land which is claimed.

VIEW *of Frank-pledge*, is the Office which the Sheriff in his County-Court, or the Bailiff in his Hundred, performs in looking to the King's Peace, and ſeeing that every Man be in ſome *Pledge.*

VILLAIN, is the ſame with Servant or Bondman; and there were formerly in *England* two ſorts of theſe Villains: *Villains in groſs*, who were bound immediately to the Perſons of their Lords, and to their Heirs; and *Villains Regardent to a Mannor*; theſe the Civilians call *Glebæ Aſcriptitios*; and they were bound to their Lord as Members belonging to ſuch a Mannor, of which he was Owner. This latter was a pure *Villain*, of whom the Lord took Redemption to marry his Daughter, and to make him Free; and he might put him out of his Lands and Tenements at his Will; might beat and chaſtize him, but not maim him. We have now no ſuch Slaves as theſe.

VILLENAGE, ſignifies a ſervile kind of Tenure, anciently belonging to Lands or Tenements, whereby the Tenant was bound to do all ſuch Services as the Lord commanded. Of this *Villenage*, there are ſeveral ſorts, but the Slavery of ſuch a Cuſtom is now laid down *in favorem libertatis*, tho' the Statute concerning them be unrepealed.

VILLI, in Botany, are ſmall Hairs like the Grain of *Pluſh* or *Shag*, with which, as with a kind of Excreſcence, ſome Trees do abound. Of this kind is the *Uſnea Officinarum.*

VINDEMIATRIX, a Fixed Star of the third Magnitude, in the Conſtellation *Virgo*, whoſe Longitude is 185 degr. 23 min. Latitude 16 degr. 15 min.

VINUM *Hypocraticum*, is a Wine wherein Sugar and Spices have been infuſed, and is afterwards ſtrained through a Bag, which they call *Manica Hippocratis*; which ſee. *Blanchard.*

VIOL, a kind of Hawſer (in a Ship) made uſe of to purchaſe in the Cable, when the Main-Capſtan cannot do it, becauſe the Ground in which the Anchor is let fall, is too ſtiff, or elſe the Sea runs too high, ſo that they cannot weigh it; then for more help, they take a Hawſer, and opening one Strand thereof, they put therein Nippers, (that is, ſmall Ropes, with a little Truck at one end) and with theſe they bind faſt this Hawſer to the Cable, and then they bring it to the *Jeer-Capſtan*, and ſo heave upon it: And this *Viol* will purchaſe far more than the Main-Capſtan can. This *Viol* is faſtned together with an Eye and a Wale-knot, or elſe with two Eyes ſeized together.

VIRGÆ, is a Meteor, repreſenting a *Bundle of Rods*, and made by the Sun's-beams piercing the more lax and open Parts of a watry Cloud.

VIRGINS *Milk* is made by diſſolving *Saccharum Saturni* in a great deal of Water: It will turn white as Milk; whence the Name. If the Diſſolution be left to ſettle, the white Matter will precipitate, and may be uſed as a *Magiſtery* of *Saturn.*

VIRGO, one of the 12 Signs of the Zodiack, being the 6th according to Order.

VIRGULA *Divinatoria*, is a Hazle Rod ſhaped into two Branches like a Y, which muſt be cut at the time of ſome certain Planetary Aſpect, and by which (as ſome Writers pretend) you may eaſily find out a Vein of rich Metal or valuable Oar in the Earth.

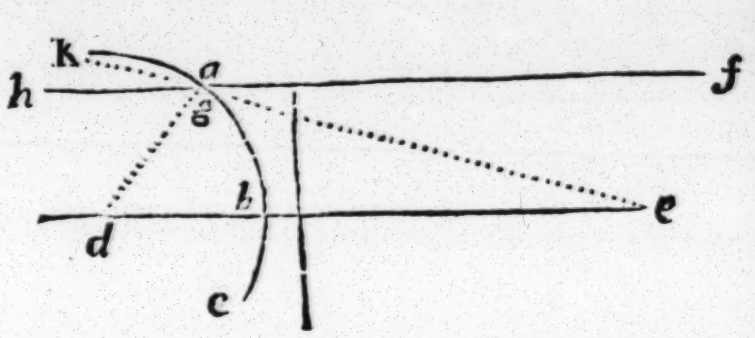
Mr. *Boyle* tells us, That ſome Authors report the Fact: But I judge we may very reaſonably ſuſpect, if not deny the Truth of the Relation, for all this; for he himſelf owns he could never find any thing

thing in it: And ſo ſaith *Kircher*, tho' a Perſon otherwiſe ſubject enough to tell ſtrange Stories.

Some uſe, as is ſaid above, a forked Rod, holding the two Ends in their Hands: Others tie a Hazle-Wand to another ſtreight Stick, and holding it in their Hand, do ſo walk over the Hills and Places where they expect Metals. But they all own the Rod to be very croſs-grain'd, and that it will *work*, as they call it, in ſome Mens Hands only, and at ſome certain Times, and not at others, in the Hands of the ſame Perſons.

VIRIDARIO *eligenda*, is a Writ that lies for the Choice of a *Verderor* in the Foreſt.

VIRTUAL *Focus*, or *Point of Divergence* in a Concave-Glaſs, is the Point *e* in the following Figure.



Let the Concavity of the Claſs be *a b c*, and its Axis *d e*: Let *f g* be a Ray of Light falling on the Glaſs, parallel to the Axis *d e*; and let *d* be the Center of the Ark *a b c*. This Ray *f g*, after it hath paſſed the Glaſs at its Emerſion at *g*, will not proceed directly to *h*, but be refracted from the Perpendicular *d g*, and will become the Ray *g k*. Draw then directly *g k*, ſo as that it may croſs the Axis in *e*. The Point *e* ſo found, Mr. *Molyneux* calls the *Virtual Focus*, or *Point of Divergence*. P. 56. *Dioptr. Nov.*

VIS, or *Force*; as *vi & armis*, by Force of Arms. And this *Vis* is fivefold, *Vis impulſiva*, *ablativa*, *expulſiva*, *turbativa*, and *inquietativa*. *Vis ablativa*, is the taking away of moveable Things: And hence accrues an Action, *Quare vi & armis*, &c. *Vis compulſiva* is, when any one is caſt out of his Poſſeſſion by Force and Arms. *Vis turbativa*, is when any one is diſturbed in his Poſſeſſion, as when two ſtrive to poſſeſs the ſame Thing. *Vis inquietativa*, is when one Man will not ſuffer another quietly to enjoy his Right, or to do any thing in his own Bounds or Limits. And from all theſe ſome ſort of Action will ariſe.

VIS *Centrifuga*, is the Force by which any Body revolving round another, endeavours to fly off from the Axis of the Motion, in a Tangent to that Curve.

The Centrifugal Force is always proportional to the Periphery which any Body deſcribes in its Motion round the Axis of its Motion, by the firſt Theorem of Mr. *Huguen's de vi Centrifuga*.

VIS *Centripeta*, is that by which any Body (from what Cauſe ſoever) tends towards any Point as to its Center.

Of this kind is *Gravity*, by which Bodies tend towards the Center of the Earth: And ſuch is the *Magnetical Force* by which Iron tends towards the Center of the Magnet: And of this kind is that Force or Power wharever it be, by which all the Planets are continually drawn from a Rectilineal Motion, and forced to revolve in Curves.

The Quantity of this Centripetal Force, is of three kinds; *Abſoluta*, *Acceleratrix*, and *Motrix*.

The *Abſolute Quantity* of it, is its Meaſure, greater or leſs, according to the Efficacy of the Cauſe that produces it; and which exerts it ſelf on all Bodies in the Regions round about: As the Magnetical Vertue in ſome Magnets is greater than in others, tho' of the ſame Dimenſions.

Vis Centripetæ Quantitas Acceleratrix, is its Meaſure proportionable to the Velocity which it produces in a given Time. Thus the Power of a Loadſtone is greater at a leſs, and leſſer at a greater Diſtance from the Stone. Gravity is greater in Valleys, and leſs on the Tops of high Mountains, (as is plain from the Experiments of Pendulums) and is yet leſs at remoter Diſtances from the Earth: But at equal Diſtances, 'tis always the ſame, becauſe all Bodies, heavy or light, great or ſmall, abſtracting from the Reſiſtance of the Medium, are equally accelerated in their Deſcent.

Vis Centripetæ Quantitas Motrix, is its Meaſure proportionable to the Motion which it generates in a given time: As the Weight is greater in a greater Body, and leſs in a leſſer; and in the ſame Body, it is greater near the Earth, and leſs in remote Regions. This Force is the *Gravity* or Tendency towards the Center of the whole Body, and is all one with its *Weight*, being always diſcoverable by ſome equal and contrary Force hindering the Deſcent of the heavy Body.

The *Vires Centripetæ*, are always as the Squares of the Velocities divided by the Radii of the Circles deſcribed round the Center.

And alſo reciprocally, as the Squares of the Periodical Revolutions divided by the Radii.

Wherefore if the Perodical Times be equal, both the Centripetal Forces and Velocities, will be as the Radii; *& vice versâ*.

If the Squares of the Times of the Perodical Revolutions are as the Radii, the Centripetal Forces are equal; and the Velocities in half the Ratio of the Radii; *& vice versâ*.

If the Squares of the Periodical Times are as the Squares of the Radii, the Centripetal Forces are reciprocally as the Radii, and the Velocities equal, and *vice versâ*.

If the Squares of the Times of the Periodical Revolutions are as the Cubes of the Radii, or *Diſtances from the Center*, (which is the Caſe of all theſe Planets moving ronnd the Sun, and of the *Moon's* or *Secondary Planets* moving round the Primary) then the Centripetal Forces (or Gravity of Bodies) are as the Squares of the Radii or Diſtances from the Center, (as we find it to be) and the Velocities are in half the Ratio of the Radii, and *vice versâ*: See Sir *Iſaac Newton's Princip. Phli. Mathemat.* p. 39.

If the Centripetal Force of any Body moving round another, be as the Diſtance; that Body moves in an Ellipſis, having its Center in the Center of that Force; or perhaps in a Circle equal to that Ellipſis. *Idem.*

As to which, *Gallilæus* hath this Theorem, That if ſuch an Ellipſis, its Foci becoming infinitely diſtant, ſhould change into a Parabola, the Body would move into the Curve of ſuch a Parabola; and the *Vis Centripeta* reſpecting now a Center infinitely diſtant, would grow *Equable*. To which Sir *Iſaac Newton* adds, That if a Parabolick Section of a Cone, by the Inclination of its Plane to the Side

Side of the Cone, ſhould be turned into an Hyperbola, the Body would continue to move in its Perimeter; and its *Centripetal Force*, would be changed into a *Centrifugal one*.

If any Body freely revolve round a Center, as in the caſe of the Planets round the Sun, its Centripetal and Centrifugal Forces muſt be equal.

VIS *Impreſſa*, is an Impulſe, Force, or Action, communicated to, and exerciſed upon any Body, in order to change its preſent State, either of Reſt or Motion, uniformly forward in a right Line. *Newt. Princip. Mat.* This *Force* conſiſts entirely in Action, and after that ceaſes, cannot remain in any Body: For the Body continues in its new State, whether of Motion or Reſt, by the *vis Inertiæ* only.

VIS *Inſitæ Materiæ*, is the bare Power of Reſiſtance only, by which every Body, as much as it may, endeavours to continue in that State in which it is, either of Reſt, or Motion, uniformly forward in a right Line. This is always proportionable to the Body or Maſs which it is in, and differs nothing from the *Inactivity* of the Matter or Body, but only in the manner of Conceiving it: And therefore, this *Vis Inſitæ*, may moſt properly be call'd, *Vis Inertiæ*. *Newt. Princip. Math.*

VIS *Motrix*, is the Power which produces the Motion of any Body from Place to Place: Thus Gravity is a *Vis Motrix* downwards, or towards the Center of the Earth.

VISCERA, are the Bowels contained in the three great Cavities of the Body, as the Anatomiſts call them. They are called alſo *Exta* and *Interranea*.

VISIBLE *Horizon*: See *Horizon*.

VISIBLE *Place* of a Star: See *Apparent Place*.

VISIBLE *Species*: See *Speciales Viſibiles*.

VISION, is a Senſation in the Brain, proceeding from a due and various Motion of the Optick Nerve, produced in the Bottom of the Eye, by the Rays of Light coming from any Object; by which means the Soul perceives the illuminated Thing, together with its Quantity, Quality, and Modification.

Whether the Picture of the Object be made on the *Tunica Retina*, or on the *Choroides*, there is a great Diſpute between Mr. *Pecquet* and Mr. *Mariotte*, in the *Philoſ. Tranſ.* N° 59, &c.

As to the manner how this noble Senſe of Seeing is produced, there were many Hypotheſes among the Ancients.

1. The *Stoicks* imagined, That certain viſual Rays went from the Brain through the Optick Nerve and Eye, and from thence to the Object; and there (juſt like a Blind Man's Staff) feel out the Figure, Colour, and Dimenſions of the Object.

2. The *Pythagoreans* thought, That there went ſome viſual Species out of the Eye to the Object, which were immediately reflected back again from thence to the Eye, and ſo produced *Viſion*.

3. *Plato* ſuppoſed, That both from the Eye and the Object, there came ſubſtantial Effluvia, which meeting half way, and encountring the Occular Effluvia, the latter were beat back again to the Eye, and there communicated the Impreſſion they had received from thoſe Effluvia which came from the Object; and ſo cauſed the Senſe of Seeing.

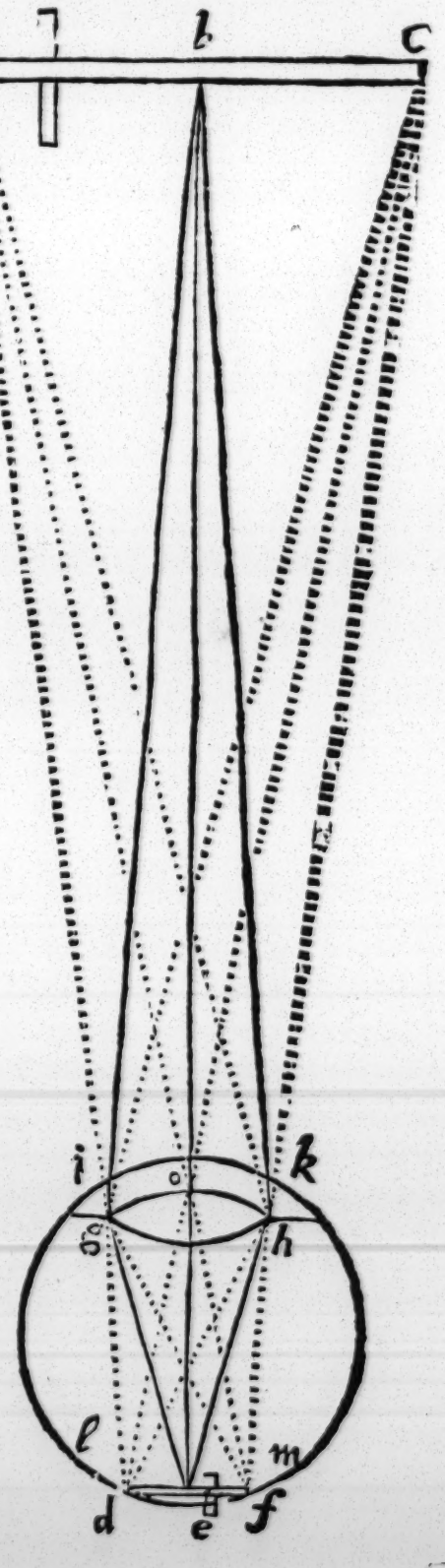
4. *Ariſtotle* aſſerted, That the Colours of all Objects did move the tranſparent Medium, as that did the Eye, and thereby communicate their Images to the Brain, or *commune Senſorium*.

5. *Epicurus*, judiciouſly rejecting the Notion of an Emanation of viſible Species from the Eye; and not thinking the Action of the intermediate Air or Medium ſufficient to account for Viſion, rightly concluded, That the Senſe of Viſion was produced by a ſubſtantial material Efflux from the Object to the Eye.

6. *Cartez* ſuppoſes Viſion performed by bare Motion only, without any material Emanation from the Object; but only that the Light (which with him alſo is not a Body, but the Motion of the finer Parts of the *Medium*) moves the Eye juſt after the ſame manner as the Object is ſuppoſed to have determin'd it; which Motion is continued along the Optick Nerve, up into the Brain, where it moves the *Conarion*, or *Glandula Pinealis*, with him the Seat of the Soul; and, by that means produces internal Senſation, and enables the Soul to judge accordingly.

The Manner of the Viſion with the naked Eye, according to Mr. Molyneux *his Explication of it, in* Diopt. Nov. *p.* 103.

Suppoſe *a b c* an Object, *i k l e m* the Globe of the Eye, furniſhed with all its Coats and Humours; but here the Cryſtalline Humour *g o b* is only expreſs'd, as being principally concern'd in forming the Image on the Fund of the Eye.



1. From

1. From each Point of the Object, we may conceive Rays flowing to the Pupil of the Eye *i k*; as here from the middle Point *b*, there proceed the Rays *b g*, *b o*, *b h*; theſe by means of the Coats and Humours of the Eye, and eſpecially by the Cryſtalline Humour *g h*, are refracted and brought together on the *Retina* or Fund of the Eye in the Point *e*, and there the Point *b* is repreſented. For we may conceive the Chryſtalline Humour *g h*, as it were a Convex-glaſs, in the Hole of a dark Chamber *i l m k*, and that *d e f* is the diſtinct Baſe of this Glaſs.

What is here ſaid of the Point *b*, and its Repreſentation at *e*, may be underſtood of all the other Points in the Object, as of *a* and *e*, and their Repreſentations at *f* and *d*. For, according to Sir *Iſaac Newton*'s beſt Hypotheſis of Light, each Ray has its innate Colour, and ſo will repreſent it where it falls.

2. As in a dark Chamber that has a Hole furniſhed with a Convex-glaſs, if the Paper that is to receive the Image in the diſtinct Baſe, be either nigher to, or farther from the Glaſs, than its due Diſtance, the Repreſentation thereon is confuſed: For then the Radius Pencils do not exactly determine with their Appices on the Paper; but thoſe from one Point are mix'd and confuſed with thoſe from the adjacent Point: So in the Caſe of *Plain Viſion*, 'tis requiſite that the Pencils ſhould exactly determine their Appices at *d e f*, on the *Retina*, or elſe Viſion is not diſtinct.

Therefore, Nature has ſo contriv'd the Eye, That it ſhould have a Power of adapting it ſelf in ſome meaſure to nigh and diſtant Objects, for they require different Conformation of the Eye, becauſe the Rays proceeding from the Luminous Points of nigh Objects, do more diverge than thoſe from more remote Objects: But whether this Variety of Conformation conſiſts in the Cryſtallines approaching nigher to, or removing farther from the *Retina*; or in the Cryſtallines aſſuming a different Convexity, ſometimes greater, ſometimes leſs, according as is requiſite, is left to the Scrutiny of others; and particularly the Curious Anatomiſts. This only may be ſaid, That either of theſe Methods will ſerve to explain the various *Phænomena* of the Eye: And that both theſe may attend each other, *viz.* a leſs Convex-Cryſtalline requires an Elongation of the Eye, and a more Convex-Cryſtalline requires a ſhortning thereof; as a more flat Convex Object-glaſs, or of a larger Sphere, requires a longer Tube; and one protuberant, bulging, or of a ſmaller Sphere, requires a ſhorter Tube.

3. By the former Figure we perceive the Rays from each Point of the Object are all confuſed together on the Pugil in *g h*, ſo that the Eye is placed in the Point of the greateſt Confuſion: But by means of the Humours and Coats thereof, each Cone of Rays is ſeparated, and brought by it ſelf to determine in its proper Point on the *Retina*, there painting diſtinctly the Vivid Repreſentation of the Object, which Repreſentation is there perceived by the *Senſitive Soul*.

4. We are likewiſe to obſerve, That the Repreſentation of the Object *a b c*, on the Fund of the Eye *f e d* is inverted: For ſo likewiſe it is on the Paper in a dark Room; there being no other way for the Radius Cones to enter the Eye, or the dark Chamber, but by their Axis *a o*, *b o*, *c o*, croſſing in the Pole *o* of the Cryſtalline, or Glaſs.

But how comes it to paſs, that the Eye receiving the Repreſentation of a part of an Object on that Part of its Fund which is lowermoſt, or nigheſt the Center of the Earth, perceives that Part of the Object as uppermoſt, or fartheſt from the Center of the Earth? In anſwer to this, let us imagine, that the Eye, in the Point *f*, receives an Impulſe or Stroke by the Protruſion forwards of the Luminous Axis *a o f*, from the Point of the Object *a*; muſt not the viſive Faculty be neceſſarily directed hereby to conſider the Stroke, as coming from the Top *a*, rather than from the Bottom *c*, and conſequently ſhould be directed to conclude *a* the Repreſentation of the Top?

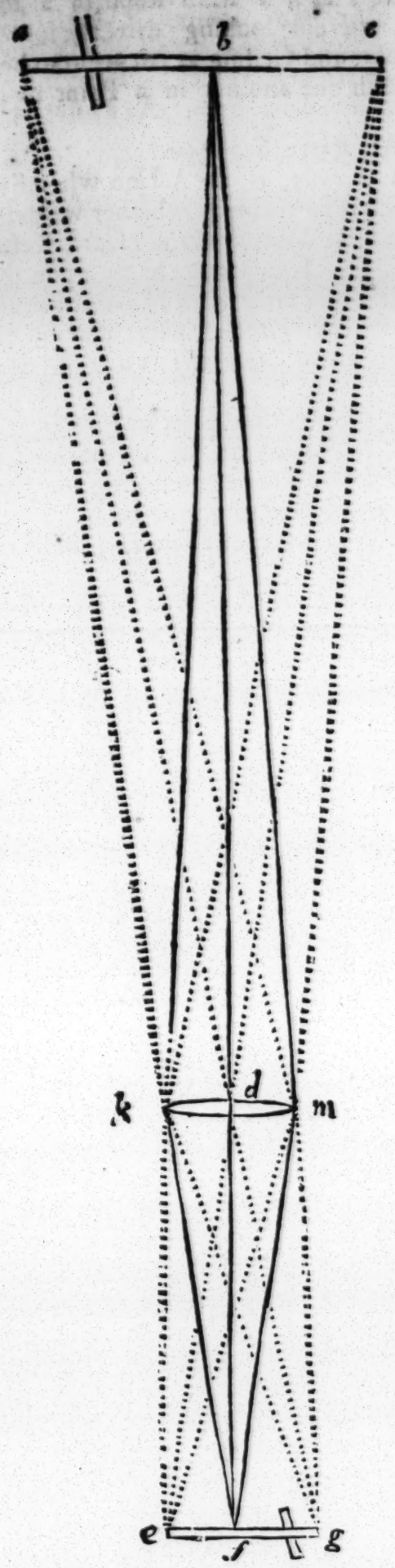
Therefore we may be ſatisfied by ſuppoſing a Man ſtanding on his Head: For here, tho' the upper Parts of Objects are painted on the upper Parts of the Eye, yet the Objects are judged to be erect. And from this Poſture of a Man, the Reaſon appears, why we have uſed the Words *fartheſt from*, and *nigheſt to the Center of the Earth*, rather than *upper* and *lower*: For in this Poſture, becauſe the *upper Parts* of the Objects are painted on that Part of the Eye nigheſt the Earth, (tho' really the *upper Part* of the Eye) they are judged to be fartheſt removed from the Earth.

What is ſaid of *Erect* and *Reverſe*, may be underſtood of *Siniſter* and *Dexter*.

5. The Image of an *Erect Object* being repreſented on the Fund of the Eye *Inverted*, and yet the Senſitive Faculty judging the Object *Erect*, it follows, That when the Image of an *Erect* Object is painted on the Fund of the Eye *Erect*, the Senſe judges that Object to be *Inverted*.

6. The Magnitude of an Object, is eſtimated by the Angle the Object ſubtends before the Eye. Thus, the Length of the Object *a c*, is eſtimated by the Angle *a o c*, *f o d*, and this is called the *Optick Angle*.

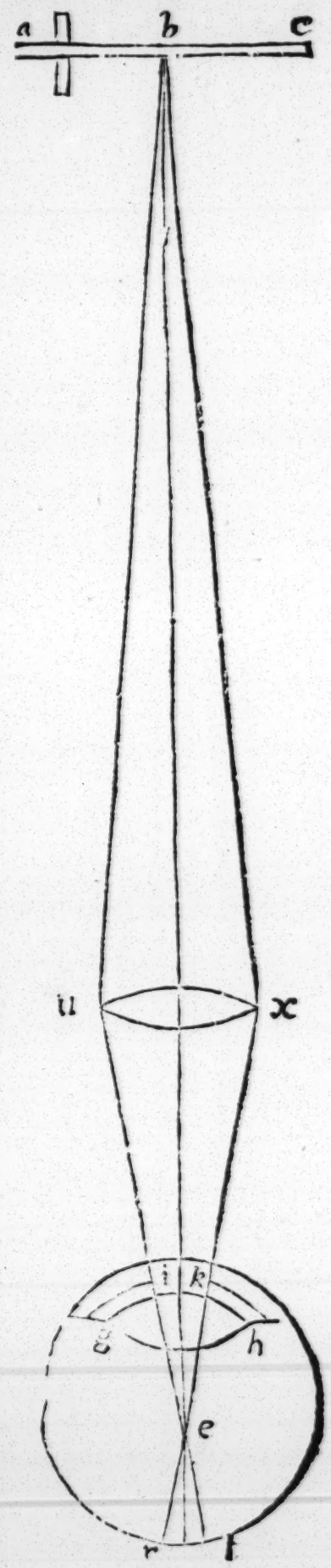
Whence it follows, that if the Eye were placed inſtead of the Glaſs at *d* (*Fig.* 2.) and *a b c*, or *e f g* were Objects, the Eye would perceive them of equal Bigneſs.



The Point *o*, which is the Vertex of the Optick Angle, is variouſly aſſigned by various Authors; ſome placing it in the Centre of the Eye; others in the Vertex of the Cryſtalline; others in the Vertex of the outward Coat or Cerena of the Eye; but 'tis a Matter of no great Conſequence where-ever we place it; for according to the Bigneſs of this Angle *a o c*, the Image on the Fund of the Eye is bigger or leſs.

7. We perceive the Rays that flow from the Point *b*, do proceed to the Eye *Diverging*, as *b g*, *b o*, *b h*: And if the Object *a c* were infinitely diſtant from the Eye, or ſo diſtant from the Eye, that the Breadth of the Pupil *i k* were inſenſible in Compariſon to this Diſtance; then the Rays *b g*, *b o*, *b h*, would proceed as it were parallel, and ſo fall on the Eye: In both which Caſes, by means of the Refractions of the Eye, they are brought together, and Point the Image of the Point *b*, on the Fund of the Eye at *e*.

But if the diverging Rays *b u*, *b x*, (*Fig.* 1.) that flow from the Point *b*, meet the Convex-glaſs *v x*, and are thereby made to converge, as *v i*, *x k*, and ſo fall on the Eye, and there paſſing through the Chryſtalline *g h*, are made to converge yet more, as *i e*, *k e*: Here they croſs in the Point *e*, before they reach the *Retina r t*, and conſequently do point thereon the Image of the Point *b* confuſedly, for 'tis planted on the Space *r t*; whereas to cauſe diſtinct Viſion, it ſhould only be painted on a correſpondent Point on the *Retina*.

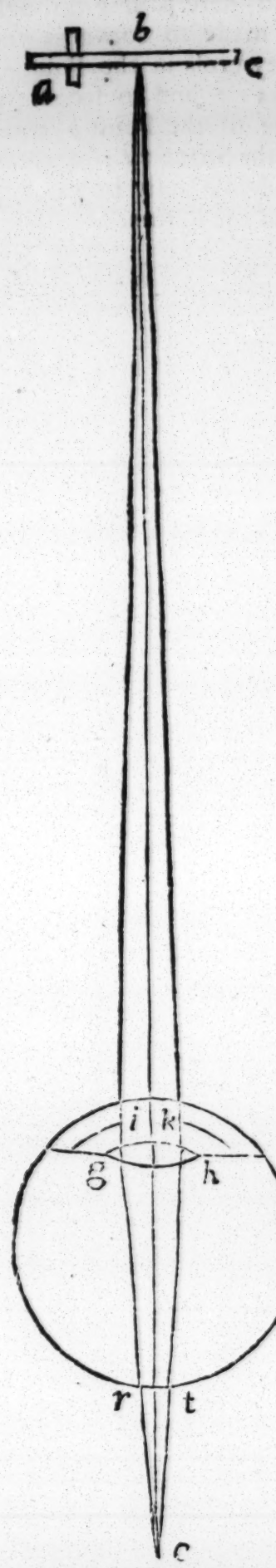


And this is the Fault of their Eyes, who are called *Myopes*, *Purblind*, or *Short-ſighted*: For in them the Cryſtalline is too Convex, (as in *Fig.* 3. both the Convex-glaſs and Cryſtalline joyn'd together, make too great a Convexity) uniting the Rays before they arrive at the *Retina*. And therefore they are help'd by *Concave-glaſſes*, which take off from the too great Convexity of their Cryſtalline, ſome part of its Refractive Power: Or rather theſe Concaves make the Rays diverge ſo, that their Cryſtalline ſhall be ſufficient only to bring them again together, ſo that they be not touched, till they arrive at the Fund of the Eye.

Myopes are alſo helped, by holding the Object very near; for then the Rays that fall on their Eye from any ſingle Point, do more diverge, than when the Eye is farther from the Point, and conſequently their too Convex Cryſtalline doth but ſuffice to bring them together on the *Retina*.

3. On the contrary, the Eyes of Old Men have their Cryſtalline too flat, (as *Fig.* 4.) and cannot correct the Divergence of the Rays *b u*, *b k*, to make them between the *Retina r t*, but beyond the Eye at *e*. Wherefore for their help 'tis requiſite they add the adventitious Convexity of a Glaſs; that both it and the Cryſtalline together, may be ſufficient to unite the Rays juſt at the *Retina*: And from hence it appears, that Spectacles help

Old Men, not by magnifying an Object, but by making its Appearance diſtinct; for Old Men cannot read the largeſt Print without Spectacles, and yet with Spectacles they read the ſmalleſt; tho' theſe with Spectacles do not appear ſo large, as thoſe without Spectacles.



9. What is ſaid of the confuſed or diſtinct Repreſentation of a Point in the Object, may be underſtood of the confuſed or diſtinct Repreſentation of the whole Object; at leaſt, for thoſe Parts that lie pretty nigh adjacent to that Point that is looked at. For here we do not ſee a Point, in the ſtrict Senſe of the Mathematicians, but in a Phyſical Senſe, for the ſmalleſt part imaginable; and the whole Object conſiſting of ſuch Points, what is ſhewn of one Point, may be underſtood of every Point in the Object.

Diſtinct Viſion, is cauſed, when the Pencils of Rays from each Point of an Object, do accurately determine in correſpondent Points of the Image on the *Retina*.

Confuſed Viſion, is cauſed when theſe Pencils do intermix one with another.

Clear Viſion, is cauſed by a great Quantity of Rays in the ſame Pencil illuminating the correſpondent Points of the Image ſtrongly and vigorouſly.

Faint Viſion, is when a few Rays make up one Pencil: And tho' this may be *diſtinct*, yet 'tis *dark* and *obſcure*; at leaſt, not ſo *bright* and *ſtrong*, as if more Rays concurred.

VISITATION, is that Office or Action that is perform'd by a Biſhop in every Dioceſe once every three Years, or by the Arch-deacon once a Year, by viſiting the Churches and their Rectors, *&c.*

VISNE: See *Venue*.

VISORIUS: See *Optick Nerves*.

VISU *Franci plegii*, is a Writ to exempt him from coming to the *View of the Frank Pledge*, who is not Reſident within the Hundred; for Men are bound to this *View*, by reaſon of their Habitation, and not of Lands held where they dwell not.

VISUAL *Point* in a Perſpective, is a Point in the Horizontal Line, wherein all the Ocular Rays unite; as if a Man ſtood in a long ſtrait Gallery, wherein looking directly forward, the Sides, Floor, and Ceiling at laſt ſeem to be united, and to touch one another in a Point or common Centre.

VISUAL *Rays*: See *Rays*.

VITAL *Faculty*, is an Action whereby a Man lives, which is performed, whether we deſign it or no; ſuch are the Motion of the Heart, Reſpiration, Nutrition, *&c.* It depends chiefly upon the *Cerebellum*. It is the ſame with Natural Faculty, tho' the Ancients diſtinguiſhed them, placing the Natural in the Liver, and the Vital in the Heart. *Blanchard*.

VITAL *Flame*: See *Flamma Vitalis*.

VITAL *Indication*, in the Art of Medicine, is ſuch an one as requires the reſtoring and preſerving of the natural Strength of the Body.

VITALIGO, a ſort of Leproſie; there are three kinds of them.

Alphus, where the Colour is White, ſomething rough, and not continued, like ſo many Drops here and there; but ſometimes it ſpreads broader, and with ſome Intermiſſions.

Melas differs in Colour, becauſe it is Black, and like a Shade; in the reſt they agree.

Leuce has ſomething like *Alphus*, but it is whiter, and deſcends deeper, and in it the Hairs are White, and like Down: All theſe ſpread, but in ſome quicker, in others ſlower.

VITRIFICATION, the turning of any Body into Glaſs by the Force of Fire: This (by the Chymiſts) is look'd upon as the Ultimate Action of Fire, and Bodies when once they have gain'd the Form of a Glaſs, do (generally ſpeaking) continue in that Form, and are not capable of putting on any other Shape.

Moſt kinds of *Vitrifications* (as alſo *Calcinations*) are made by Salts uniting and incorporating with the Metalline Particles.

VITRIOL of *Copper* or *Venus*, is *Blue Chryſtals* made by a Solution of Copper in Spirit of Nitre, Evaporation, and Chryſtallization in a cool Place. Theſe are uſed as Cauſticks, but they will diſſolve if expos'd to the Air.

There are other Chryſtals of *Venus* made by diſtilled Vinegar, and they are what is called *Verdegreaſe*; which ſee.

VITRIOL *of Mars*, or *Salt of Steel*, is made by diſſolving Steel in ſome proper *Acid Menſtruum*, then Evaporating and Chryſtallizing to gain the as above in Copper.

VITRIOL *of Silver*, or of the *Moon*: See *Chryſtals of Silver*.

VITRIOLATE *Tartar*: See *Tartar Vitriolate*.

VITRIOUS *Humour*, or *Glaſſie Humour of the Eye*, is the third Humour of the Eye, ſo called from its Reſemblance of the melted Glaſs. 'Tis thicker than the *Aqueous*, but not ſo ſolid as the *Chryſtalline*. 'Tis round or convex behind, and ſomewhat plain before, only hollowed a little in the Middle where it receives the *Chryſtalline*. It exceeds both the other Humours in Quantity.

VITRIOUS *Tunicle*, a thin Film, or Coat, which is ſaid to ſeparate the *Glaſſie Humour* from the *Chryſtalline*; tho' there are ſome who abſolutely deny, That there is any ſuch Coat in the Eye, before the Humours are taken out and expoſed to the Air.

VIVA VOCE: See *Depoſitions.*

VIVIPAROUS *Animals*, are ſuch as bring forth their Young living and perfect; by which they are diſtinguiſhed from *Oviparous* ones, which lay Eggs, which after that, are hatched in living Creatures.

ULNA, or *Focile Majus*, is the greater Bone betwixt the Arm and the Wriſt, which is jointed upward with the Shoulder by *Ginglymus* (which ſee;) and therefore it has there both Proceſſes and Cavities; two oblong Proceſſes, and as it were triangular, and rugged, that the Ligaments may knit it ſtrongly. The foremoſt and uppermoſt is leſs, and goes into the Cavity of the Shoulder: The backward Proceſs is thicker and larger, ends in an obtuſe Angle, and enters the hinder Cavity of the Shoulder; the *Latins* call it *Gibberus:* In the middle of theſe there's a great Cavity like a Semicircle.

It has yet another external lateral Cavity for the Head of the *Radius*, or leſſer Bone of the *Cubit*; it is jointed at the lower End with the Wriſt, both by a Cartilage in the Middle, and by an acute Proceſs, and therefore called *Styloides*, (being like a ſharp-pointed Pen uſed in *Writing-Tables*) whence there ariſes a Ligament, which faſtens the *Cubit*, and the *Joint* of the Wriſt *together.*

UMBELICUS in an *Ellipſis*, &c. is that *Focus* about which *the Motion* of any Revolving Body is made, and which it reſpects as its *Center:* So that either *Focus* may be called by this Name.

UMBELLIFEROUS *Plants*, are by *Botaniſts* accounted, ſuch as have their Tops branched and ſpread out like a Ladies *Umbrella*; on each *little* Sub-diviſion of which there is a ſmall Flower growing; as *Fennel*, *Dill*, *Parſley*, &c.

This Flower is always *Pentapetalous*, and is ſucceeded by two naked Seeds lying joining *together*, which are the true Diſtinctions of *theſe Plants* from *others.*

The *Umbelliferous* are a very large Genus of *Plants*, and by our *Accurate Botaniſt*, Mr. *Ray*, are thus diſtinguiſhed.

Umbelliferous Plants, are either,

I. Such as have a compounded Leaf, of a Triangular and *Pinnate* Form: And the Seeds of theſe are either,

1. Broad, flat, and plain, like Leaves almoſt; as the *Sphondylium*, *Paſtinaca Latifolia*, *Panax Heracleum Tordylium*, *Orcoſelinum*, *Thyſſelinum*, *Apium Cicutæ foliis*, *Daucus Alſaticus Carvifolia*, *Anethum*, *Pucedanum*, *Thapſia*, *Ferula*, &c.

2. With a Seed more tumid, and leſs compreſſed and flat than the former: As the *Cachrys*, *Laſerpitium*, *Cicutaria vulgaris*, *Scandix*, *Cerefolium*, *Myrrhis Sativa Angelica*, *Leviſticum*, *Siler Montanum*, *Bulbocaſtanum*, *Siſarum*, *Oenanthe*, *Sium*, *Pimpinella Apium*, *Cicuta*, *Viſnaga*, *Saxifraga*, *Crithmum*, *Fœniculum*, *Daucus Vulgaris*, *Aniſum*, *Caucalci*, *Coriandrum Paſtinaca Marina*, &c.

II. Such as have a ſimple, or an undivided Leafe, or at leaſt one, only a little jagged: As the *Perfoliata*, *Buplerum*, *Aſtrantia Nigra*, *Sanicula*, and the *Seſeli Æthiopicum.*

UMBELICAL *Region*, is that Part of the *Abdomen* lying round about the Navel.

UMBELICAL *Veſſels*, are the *Veins*, *Arteries*, &c. that belong to the Navel, or rather are enwrapped in the *Navel-ſtring.*

The Navel-ſtring is membranous, wreathed, and unequal, ariſing out of the Middle of the *Abdomen*, (*viz.* the *Navel*) and reaching to the *Placenta Uterina:* 'Tis uſually half an Ell in Length, and as thick as ones Finger. It was convenient to be ſo long and lax, that when the *Fœtus* in the Womb grows ſtrong, it might not break it by its ſprawling and tumbling about; and after it is born, the Secundine, or *After-birth*, might be drawn out the better by it.

The way that it paſſes from the Navel to the *Placenta*, is very unconſtant; for ſometimes it goes upon the Right-hand to the Neck, which having encompaſſed, it deſcends to the *Placenta*, and ſometimes it goes on the Left-hand up to the Neck, &c. Sometimes it comes not to the Neck at all, but goes firſt a little up towards its Breaſt, and then turns round its Back, and from thence paſſes to the *Placenta.*

The Veſſels contain'd in this *String*, (and which are enwrapped to a common Coat, called *Funiculus*, or *Inteſtinulum*) are four, one Vein, two Arteries, and the *Urachus.* For as for the Nerves which *Verheyen* ſuſpects to be contained in it, or the *Lacteal Veſſels* which *Bidloo* thinks he has obſerved, I ſhall not reckon them among theſe Veſſels, becauſe theſe Authors ſpeak but faintly of them.

The *Vein* is larger than the *Arteries*, and ariſes from the Liver of the *Fœtus*, (*viz.* out of its Fiſſure) by the Trunk of the *Vena Portæ* (of which it ſeems to be but a Branch) and from thence paſſing out of the Navel, it runs along the *Funiculus* to the *Placenta*, into which it is implanted by innumerable Roots; but in its Paſſage it ſends ſome little Twigs into the *Arteries.*

The *Ancients*, that thought the *Fœtus* was nouriſhed by the *Mother's Blood* only, taught the ſole *Uſe* of this Vein to be, to carry Blood from the *Placenta* to it: And ſince it has been found out, and believed that it is nouriſhed alſo (if not only) by Chyle, or *Succus Nutritius*, ſome have continued the ſame Office to this Vein, and think that the Chyle is brought by Lacteal Veſſels ariſing out of the *Placenta*, as (they ſay) it was brought thither by the Mother's Lacteals. And indeed if any certain Diſcovery had been made of theſe ſame *Lacteæ*, we ſhould have embraced this Opinion as the moſt probable. But we are not to form *Hypotheſes* out of *Rational Notions* only, but much rather from what appears to the Eyes of the Diſſector.

We do affirm therefore, That the *Umbelical Vein* ſerves for conveying to the *Fœtus* the Nutritious Juice ſeparated in the *Placenta* from the *Mother's Arteries.* How this Separation is made, and how it is firſt of all turned into Blood, we ſhall conſider by and by.

But together with this Juice there returns ſo much of the Arterial Blood (that comes from the *Fœtus*) as is not ſpent upon the Nouriſhment of the *Placenta*, or of the *Chorion* and *Amnios:* Which Liquors thus mixed, though by the *Umbelical Vein*, they are poured into the *Sinus* of the *Porta*, yet are they not diſtributed through the Liver by the uſual Channels thereof only, but by the Venal Duct, is the greateſt Part thereof conveyed in a

direct Course and full Stream into the *Cava* about the Liver.

Besides this Vein, which is common to all Creatures, there have been observ'd in Whelps and Conies, (and may perhaps in others) two small Veins more, that arising from the fourth involving Membrane peculiar to them, pass directly from the *Umbelicus* to the Mesentery of the *Fœtus*, as the other great one does to its Liver; which may strengthen the Opinion, That the Chyle, or *Succus Nutritius* is brought to the *Fœtus* by the *Umbilical Vein* (or *Veins.*) These Veins Dr. *Needham* calls *Omphalo-Mesentericæ*.

In the *Funiculus* are included also two *Arteries*, which are not both of them together so big as the Vein: They spring out of the inner Iliacal Branches of the great Artery: (Dr. *Needham* judges them to be derived immediately from the Extremity of the *Aorta*, before its Division) and passing by the Sides of the Bladder, they rise up to the Navel, out of which they are conducted to the *Placenta*, in the same common Cover with the Vein and *Urachus*, with which they are twined and wreathed not unlike a Rope. I say, they are inserted into the *Placenta*, and with the Vein make a most admirable Neck-like Texture. But there is one Branch of each of them which is manifestly inserted into the *Amnios*. Dr. *Harvey* says, The Vein is conspicuous a pretty while before these Arteries appear.

In the Creatures mention'd in the foregoing Paragraph, there are besides these Arteries, others answering to, and accompanying the Veins called, *Omphalo-Mesentericæ*, abovementioned.

Blood and Vital Spirit are not carried by them from the Mother to the *Fœtus*, as many from *Galen* have taught; but on the contrary. Spirituous Blood is driven from the *Fœtus*, by the beating of its Heart, to the *Placenta* and the Membranes for their Refection and Nourishment; from which what Blood remains, circulates back again in the Umbilical Vein, together with the *Succus Nutritius* afresh inbibed by its Capillaries dispersed in the *Placenta*. But besides Arterial Blood, there flows out of the Navel by them, part of the *Succus Nutritius*, that was imported by the Umbilical Vein; namely, That of it which is more crass and cerrene, which by one Circulation through the Heart, (or it may be many) could not be changed into Blood: This Part, I say, flows out by these Arteries, which by their Branches that are dispersed through the *Amnios*, disimbogue it by their little Mouths into it: For what Use shall be declared presently.

But besides these Uses which are commonly ascribed to these Umbilical Veins and Arteries by Anatomists, *Verheyen* (with some Probability) assigns another.

Says he, "It is worth Inquiry, for what Purpose the Blood of the *Fœtus* is sent in such great "Quantity out of its Body into the *Placenta*: Seeing, without doubt, a far less Quantity of Blood "would suffice for its Nourishment: For no Part "in the whole Body, if you except the Lungs and "Liver, has such abundance of Blood-Vessels as "the *Placenta*. This must needs be for a certain "common Use, which we judge to be a-kin to "the Use of the Lungs, in those who being born, "enjoy a freer Air: Namely, That as these do by "the Help of the Lungs plentifully draw in from "the Air a certain Matter highly necessary for the "feeding the Vital Flame; so in the *Fœtus*, where "the Lungs lie idle, such like Matter being receiv"ed into the Mother's Blood by her Respiration, "is separated therefrom by help of the *Placenta*, "and mixt with the Blood of the *Fœtus* (in the "Umbilical Vein;) and as in the Lungs of Breath"ing Persons, some Heterogenous *Matter* is con"tinually separated from the Blood; so in the "*Placenta* certain *Recrements* of the Blood are de"posited out of the *Umbilical Arteries* into the "Veins of the *Mother*."

And here I shall transcribe a *Material Objection, with the Answer to it*, out of *Diemerbroeck*.

Objection.

How can these Vessels, (Vein and Arteries) when they have grown from the Belly of the Fœtus, *to that Length as to reach the Membranes, penetrate and pass through them to the* Placenta?

Answer.

This is done in the same manner as the Roots of Herbs, Shrubs and Trees penetrate into the hard Ground, yea, often into thick Plants, Walls and Stones, (which Water cannot enter) and root themselves firmly in them. For just so the first sharp-pointed and most fine ends of the *Umbilical Vessels*, insinuate themselves by little and little into the Pores of the Membranes (for the Figuration of those Pores are fitted for their Entrance) and pass through them, and yet the Liquors contained in these Membranes cannot flow out by them: And when those Vessels inhering in the Pores, grow more out into Length, by little and little, the said Pores are more and more widened, (according to the Encrease of the Vessels) and are inseparably united unto, and grow in them.

The fourth *Umbilical Vessel*, is the *Urachus*, or *Urinary Vessel*. This is a small, membranous, round Pipe, endowed with a very strait Cavity arising from the bottom of the Bladder up to the Navel, out of which it passes along within the common Cover, and opens into the *Allantoides*.

It is more apparently pervious in many of the larger Brutes, than it is in Man; in whom some have denied it any Cavity; but that it is hollow in him, is confirmed by many Histories of Persons adult, who having the ordinary Urinary Passage along the *Penis* stopt, the Passage in this Vessel has been unlocked, and they have made Water by the Navel, which could not have been imagined to have happen'd, if it had been originally a Ligament without any *Meatus*.

Bartholin, and others have affirmed, That the *Urachus* in Men reaches no further than the Navel: How then comes that Humour into the *Allantoides*, that has perfectly the same Taste with the Urine in the Bladder? But their Error sprung from hence, That they thought a Humane *Fœtus* had no *Allantoides*, and that Humour that is found in it, they thought had been contained in the *Chorion*. But this is in short refuted above, but more fully and accurately by Dr. *Needham*, *Lib. de formato Fœtu, cap.* 3.

As to the Perviousness of the *Urachus*, I shall add this further, That in Abortions of five or six Months old, the Bladder of the *Embryo* is always full of Urine, out of which, if in the following Months it should not be emptied by the *Urachus*, the Bladder would soon burst, seeing there is daily some

ſome *Serum* ſeparated from the Blood in the Kidnies, and ſent to the Bladder; and the more the *Fœtus* increaſes, the more muſt need be ſeparated. Yea, Dr. *Needham* affirms, That one may either preſs the Liquor contained in the *Allantoides* by the *Urachus* into the Bladder, and with a Pipe blow Wind out of the Bladder by the ſame way into the *Allantoides*.

Its Uſe has been ſufficiently declared in the preceding Paragraph; as alſo above, when we delivered the Uſe of the *Allantoides*, which we ſhall not repeat.

Theſe four Veſſels (as has been ſaid above) have one *common Cover*, which alſo keeps each of them from touching the other: It is called *Inteſtinulum* and *Funiculus*, (by which it with its Veſſels is ſometimes underſtood.) It is membranous, round and hollow, indifferent thick, conſiſting of a double Coat, (the inner from the *Peritonæum*, and the outer from the *Panniculus carnoſus.*) Sometimes it ſelf only is wreathed about like a Rope, the Veſſels included in it running ſtreight along its Cavity; and ſometimes they are wreathed together with it.

It hath ſeveral *Knots* upon it here and there, which Dr. *Wharton* thinks to be *Papillæ*, or little Glands through which the Lacteal (or Nutritious Juice) diſtils out of the Cavity of the *Funiculus*, into the Cavity of the *Amnios*.

I cannot tell whether this be ſo, or no; but the Uſe that doting Midwives make of them to gueſs by their Number how many Children more the Mother ſhall have, and by their Colour, whether thoſe Children ſhall be Male or Female, is more ridiculous than ſuperſtitious.

UMBILICK *Points*, in *Mathematicks*, are the ſame with *Focus's*; which ſee.

UMBILICUS, the Navel, is a Part in the Center of the *Abdomen*, to which the Navel-ſtring in a *Fœtus* is joined, which is cut off after the Delivery.

UNCIÆ, in *Algebra*, ſignifie thoſe Numbers which are prefix'd before the Letters of the Members of any Power produced from a *Binomial*, *Reſidual*, or *Multinomial Root*.

Thus in the fourth Power of $a+b$; that is, $aaaa+4\ aaab+6\ aabb+4\ abbb+bbbb$, the *Unciæ* are 4, 6, 4.

The wonderful Sir *Iſaac Newton* gives this *Theorem* for finding the *Unciæ* of any Power ariſing from a *Binomial Root*.

Let the Index of that Power be called m; then will the *Unciæ* ariſe from ſuch a continual Multiplication as this, *viz.*

$$1\times\frac{m-0}{1}\times\frac{m-1}{2}\times\frac{m-2}{3}\times\frac{m-3}{4}\times\frac{m-4}{5},\ \&c.$$

Thus if the *Unciæ* of the *Biquadrate*, or fourth Power were required; the Rule is,

$$1\times\frac{4-0}{1}(=4)\times\frac{4-1}{2}(=6)\times\frac{4-2}{3}(=4)\times\frac{4-3}{1}(=1)$$

Which ſhews, that the *Unciæ* are 1, 4, 6, 4, 1.

UNCORE *Priſt*, in Law, is a Plea for the Defendant, being ſued for a Debt due at a Day paſt, to ſave the Forfeiture of his Bond, ſaying, That he tendred the Debt at the Time and Place, and that there was none to receive, and that he is ſtill ready to pay the ſame.

UNDIMIA, the ſame with *Oedema*.

UNGUIS, a Nail, is a ſimilar, flexible, white, and hard Part, which defends the Fingers from external Injuries, and in ſome meaſure adorns them. The Root of it is joined to a certain Ligament, and by reaſon of the neighbouring Tendons it becomes ſenſible: They ſeem to be made of a Collection of very little Pipes, which adhere extremely thick to one another, and ſhoot out into length. Where they begin, there you find certain nervous Fibres like ſo many ſmall Nipples lengthen'd, the lengthen'd Parts whereof, are ſeen as far as the Nail: If they be forcibly torn off, they leave divers Holes, ſo that the Horney Subſtance of the Nails looks like a Net. Under the Nails there's a pappy ſort of Body, which has its Veſſels of Excretion.

The *Apices*, or Tops of the Nails, are they which grow beyond the Fleſh; the Parts which are out, are called the *Segmina*, the Paring of the Nails; the Parts under the Nails, are the *κρυπτα*, the hidden Parts; the white Semi-lunar Part next the Root, is the Riſe of the Nail; the very Beginnings that grow into the Skin, are call'd the Roots of the Nail; the Sides, the Clefts; the white Spots, *Nubeculæ*, little Clouds, *&c. Blanchard.*

UNGUIS, the ſame with *Hypopyon*; which ſee.

UNGUIS *Os*, is a little thin Bone, which lies in the great Angle of the Orbit of the Eye, it has a Hole in which the Lachrymal Glands lies.

UNGULA, is a ſort of hooked Inſtrument uſed by Surgeons, to draw a dead *Fœtus* out of the Womb.

UNIFORM *Motions* are the ſame with equal, or rather *Equable ones*; which ſee.

UNIFORM *Flowers* of Plants, the Botaniſts call ſuch as are all round of the ſame Figure; or whoſe fore and back Part, and whoſe right and left Parts are exactly alike; but when they are not ſo, they call them Difform Flowers.

UNION, (a Term among Painters) is the mutual Agreeableneſs and Sympathy of the Colours in a Piece of Painting.

UNION, Dr. *Grew* makes Union in a Phyſical Senſe, to be one of the three Ways of Mixture; and he defines it to be the Union of Atoms, or Particles which touch in a Plain; as in the Chryſtallization of Salts, and other like Bodies.

UNION, in Muſick, is one or the ſame Sound, whether produced by one ſingle Voice, or divers Voices ſounding in the ſame Tone; ſo that an *Uniſon* in this Science, may be conſidered as an Unite in Arithmetick, or as a Point in Geometry, not diviſible into any Parts, in regard that it is the firſt Term to any Interval. When the Ancients divided their *Monochord*, ſo that the Parts were as 1 to 1, they called them *Uniſons*.

UNITE, is the ſame with the Figure 1, being one ſingle individual Part of diſcreet Quantity. If a Number conſiſt of 4 or 5 Places, that which is outermoſt towards the Right-hand, is called the *Place of Unites*.

Number in general, is by *Euclid* defined to be *μονάδων πλῆθος*, a Multitude, or Aggregate of *Unites*; and in this Senſe *Unity* is not a Number. But *Unity*, as it may be taken for an Individual *Unite*,

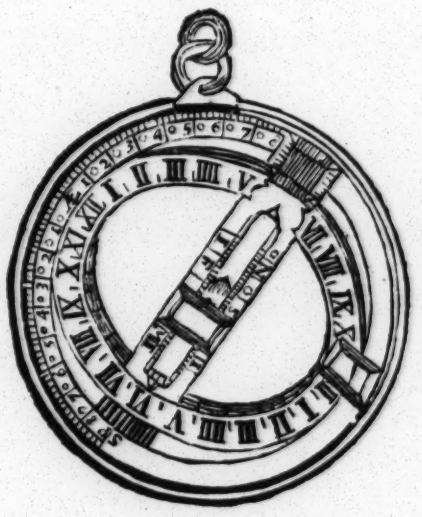
Unite, is certainly as much a Number as 10, 20, 100, &c.

UNITY *of Poſſeſſion*, in the Civil Law, is called, *Conſolidatio fructus & proprietatis*, and ſignifies *Joint Poſſeſſion* of two Rights by ſeveral Titles.

As for Example: If I take a Leaſe of Land from one upon a certain Rent, and afterwards I buy the Fee-ſimple, this is an *Unity of Poſſeſſion*, by which the Leaſe is extinguiſhed, by reaſon that I, which before had the Occupation only for my Rent, am become Lord of the ſame, and am to pay my Rent to none but my ſelf.

UNIVERSAL *Equinoctial Dial*, is made of two Rings of Braſs or Silver, that open and fold together, with a Bridge or Axis, and a Slider, and a little Ring to hang or hold it up by: It is divided on one ſide of the great Ring into 90 Degrees, and ſometimes on the other into two Quadrants, or 180 Degrees, but one is enough: The innermoſt Ring is divided into 24 Hours, ſub-divided on the Face, and on the outſide of the Ring, into every five Minutes. The Axis has the Sun's Declination on one ſide, and the Days of the Month and the Sun's Place on the other.

To uſe it for the Hour, the Perpendicular Line or Stroke which is on the Slider, which moves on the outer Ring, muſt be ſet to the Latitude of the Place, and the Hole in the Slider on the Bridge either to the Sun's Place in the Ecliptick, the Day of the Month, or his Declination; and then the Rings being opened, and ſet ſquare to one another, move the Dial about two and fro, 'till the Sun ſhine through the Hole, and on the inner Edge of the innermoſt Ring, and there it will ſhew the true Hour.



UNIVOCAL Terms in Logick, are ſuch whoſe Name and Nature is the ſame; and 'tis uſed in Oppoſition to Equivocals, whoſe Names are the ſame, but their Natures very different; for a Thing to be predicated *Univocally* of any others, is to be attributed to all of them alike, and in the ſame proper Senſe.

UNLAWFUL *Aſſembly*, is the Meeting of three or more Perſons together, by Force, to commit ſome *unlawful Act*, and ſo abiding together, tho' not endeavouring the Execution of it, as to aſſault, or beat any Perſon, to enter into his Houſe or Land, &c.

UNLIKE Quantities and Signs in *Algebra*: See like *Signs* and *Quantities*.

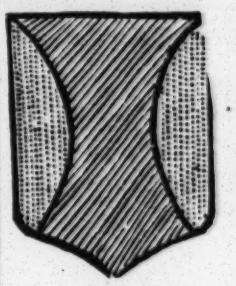
UNLIMITED *Problem (Inordonnè)* according to Mr. *Ozanam*, is ſuch a Problem in *Mathematicks*, as is capable of *Infinite Solutions*: As to divide a Triangle given into two equal Parts, to make a Circle paſs through two Points aſſigned, &c.

UNQUES *Priſt*, in Law, is a Plea whereby a Man profeſſeth himſelf *always* ready to do or perform that which the Defendant requires: As if a Woman ſues the Tenant for her Dower, and he coming in at the Day offers to averr, That he was *always ready*, and ſtill is to perform it In this Caſe, except the Demandant ſhall averr the contrary, he ſhall recover no Damages: When this Plea will ſerve to avoid Charges, and when not: See *Kitchin*, *fol.* 243.

VOCAL *Nerves*, the ſame with *Recurrent*; which ſee.

VOID *Baſtion*: See *Baſtion*.

VOIDED, a Term in Heraldry, when there are Lines drawn within, and parallel to the Out-lines of any Ordinary: This expreſſes an Exemption of ſomething of the Thing voidable, and makes the Field appear tranſparent thro' the Charge.



VOIDER, ſo the Heralds call one of the *Ordinaries*, whoſe Figure is much like that of the *Flaſque* or *Flanch*, only it does not bend or bow in ſo much: This Armour they ſay, is the Reward of a Gentlewoman that has well ſerved her Prince. They are always born by Pairs.

The Field is *Tenn*, two *Voiders*, *Or*.

VOIR *dire*, is when 'tis pray'd upon a Trial at Law, that a Witneſs may be ſworn upon *Voir dire*; the Meaning is, he ſhall upon his Oath ſpeak or declare the Truth, whether he ſhall get or loſe by the Matter in Controverſie; and if he be unconcern'd, his Teſtimony is allowed, otherwiſe not.

VOLATILE *Salt* of *Vegetables* is uſually drawn into a Retort from the Fruits and Seeds fermented, and ſeems to be only the *Eſſential Salt* driven up higher, and Volatilized by the Spirits during *the Fermentation* and *Diſtillation*.

The *Volatile Salt* of *Animals*, is drawn much the ſame way as that of *Vegetables*.

VOLATILE *Spirit of Sal Armoniack*, is made either by mixing Quick-lime, or Salt of Tartar, with *Sal Armoniack*, and then pouring a ſufficient Quantity of Water upon it, the Matter is diſtilled in a Retort when Quick-lime is uſed, otherwiſe in a Glaſs Body, or Cucurbite; by this means the Lime or the Salt of Tartar doth deſtroy the Strength of the Acid Sea Salt, that held bound and fixt the *Volatile Salts* of *Urine* and *Soot* of which *Sal Armoniack* is made; whereby they being at Liberty are driven out by the Fire, and diſſolved in the Water that was poured on the Mixture, and ſo compoſe this *Volatile Salt*.

Spirit of *Sal Armoniack* made with Quick-lime, is an excellent Thing to make Precipitations with; deſtroying all kinds of Acids almoſt, and is uſed to precipitate Solutions of Gold.

If you mix together equal Parts of this Spirit made with Tartar, and of Spirit of Wine, a *Coagulum* will ariſe on their being ſhaken together; but not if you uſe the Spirit of *Sal Armoniack* made with Quick-lime.

If after either of theſe Mixtures to make Spirit of *Sal Armoniack* be put into the Body or Retort, Spirit of Wine be poured on, and then the Spirit drawn off; this is called Spirit of *Sal Armoniack* dulcified.

VOLA-

VOLATILE *Spirit*, is a *Volatile Salt* diſſolved in a ſufficient Quantity of Phlegm or Water.

VOLATILES are (by ſome made) a Species of Animals which fly in the Air, as Birds do.

VOLATILITY, is the Property of ſuch mixt Bodies, whoſe Corpuſcles or Particles, of which they are compoſed, will riſe up by that Degree of Heat, as is proper to ſublime it.

Mr. *Boyle*, in his Notes about the Mechanical Production of this Quality of *Volatility*, ſuppoſes, or rather proves theſe four Attributes, or Qualifications, requiſite to denominate a Body Volatile.

1. That its conſtituent Particles, or Corpuſcles, be very ſmall; for beſides that ſuch Minute Parts are more eaſily put into Motion by the Action of Fire and Heat, and conſequently are more apt to be elevated, than other Parts which are more groſs; theſe can continue their Motion upwards with leſs Reſiſtance, and with a leſs Tendency, to deſcend down by their own Gravity. Wherefore,

2. 'Tis neceſſary that the Corpuſcles of Volatile Bodies, ſhould not only be very ſmall, but they muſt alſo not be too ſolid and heavy; for the great Specifick Weight of ſuch Bodies will hinder them from riſing.

3. 'Tis neceſſary alſo, that they be conveniently *ſhaped* for Motion; for if they be of hooked, branched, or any other irrigular and catching Figure, tho' they may be both very ſmall and light, yet they will be apt to be entangled one in another or to hang or ſtick to other Bodies; and this probably is the Reaſon why Water is more eaſily elevated by Heat, and brought to exhale than Oil, tho' it be ſpecifically heavier than it, and its likely hath its Parts ſmaller too.

4. 'Tis neceſſary that the Parts do not too cloſely adhere to one another, ſo as on that account to be indiſpoſed for the Separation by the Heat of an ordinary Degree of Fire.

And this Honourable Gentleman largely ſhews, that this Quality of *Volatility* is producible by ſuch Mechanical Means as will produce ſome or all of the Qualifications above-mentioned.

VOLITION, is an Act of the Mind, knowingly exerting that Dominion it takes it ſelf to have over any Part of the Man, by employing it in, or with-holding it from any particular Action.

VOLSELIA, or *Vulſella*, is an Inſtrument to pull up Hairs with by their Roots, the ſame with Tweezers, or a Chyrurgeon's little Tongs, which are of different Shape according to the Diverſity of their Uſe.

VOLUMUS, is the firſt Word of a Clauſe in the King's Writs of Protection and Letters-Patents.

Of Protections, ſome are *Cum clauſula Volumus*; and of theſe there are four Kinds, *viz.*

1. *Quia Profecturus.*
2. *Quia Moraturus.*
3. *Quia indebitatus nobis exiſtit.*
5. When any one ſent out into the King's Service beyond Sea in War, is impriſoned.

VOLUNT, a Law Term, is when the Tenant holds at the Will of the Leſſor, or Lord, and that is in two ways.

Firſt, When I make a Leaſe to a Man of Lands to hold at my *Will*, then I may put him out when I pleaſe; but if he ſow the Ground, and I put him out, then he ſhall have his Corn with Egreſs and Regreſs, 'till it be ripe to cut and carry it out of the Ground; and ſuch *Tenant at Will*, is not bound to repair and ſuſtain the Houſe as Tenant for Years is: But if he make wilful Waſt, the Leſſor ſhall have againſt him an Action of *Treſpaſs*.

The other *Tenant at Will, of the Lord*, is by Copy of Court-Roll, according to the Cuſtom of the Mannor; and ſuch a Tenant may ſurrender the Land into the Hands of the Lord, according to the Cuſtom, to the Uſe of another for Life, in Fee, or in Taile; and then he ſhall take the Land of the Lord, or his Steward, by Copy, and ſhall make Fine to the Lord.

VOLUTA, in Architecture, is that Part of the Capitals of the *Ionick*, *Corinthian*, and *Compoſit* Orders, which is ſuppoſed to repreſent the Bark of Trees twiſted, and turned into Spiral Lines; or, as ſome ſay, the Head-dreſſes of Virgins in their long Hair. *Voluta*'s are different in theſe three *Orders:* Thoſe that appear above the Stems in the *Corinthian* Order (according to *Vitruvius*) are 16 in Number in every Capital, whereas there are only 4 in the *Ionick* Order, and 8 in the *Compoſit*. But theſe *Voluta*'s are more eſpecially remarkable in the *Ionick* Capital, repreſenting a kind of Pillow or Cuſhion laid between the *Abacus* and the *Echinus*, as if it were to be fear'd leſt the Weight of the *Abacus*, or of the *Entablature* above it, might break or deface the *Echinus*; whence the ſame Ancient Architect took Occaſion to call the *Voluta*, *Pulvinus*, or Bolſter.

VOLVULUS: See *Ileon* and *Chordapſus*.

VOMER, is a Bone ſituated in the Middle of the lower Part of the Noſe. It has a Cleft in the upper Side, in which Cleft it receives the lower Edge of the *Septum Naſi*. In its further End it receives a ſmall *Apophyſe* of the *Sphœnoides*, and its under Side joins the *Os Palati*.

VOMICA, is a Fault in the Lungs, from Heterogeneous Blood, which lodged perhaps in one of the little Bladders, or Cells there, occaſions neither a Fever nor a Cough; but afterward, when it is encreaſed, it oppreſſes the neighbouring Sanguiferous Veſſels, and impregnates the Blood as it paſſes along with its *Effluviums*; whereupon there ſucceeds a ſmall Fever, accompanied with Inquietude and Leanneſs; at laſt when it is full grown and concocted into Matter, it makes a Neſt as it were, and lodges there. *Blanchard.*

VORTEX, according to the *Carteſian* Philoſophy, is a Syſtem of Particles of Matter moving round like a Whirl-pool, and having no void Interſtices, or Vacuities between the Particles. This Vortex thus moving round, will occaſion any Bodies that ſwim in the Syſtem, to move round as that doth, and that ſwifter or ſlower, according as they are farther off, or nearer to the Centre.

By ſuch *Vortices* as theſe, they endeavour to ſolve the Motion of the Heavenly Bodies round the Sun in the Centre of the Vortex. But the Excellent Sir *Iſaac Newton* had demonſtrated, That the Planets cannot be carried round their Centre by the Motion of any *Corporeal Vortex*: Becauſe if they

they were, the Vortices themſelves muſt be carried round after the ſame manner as Aſtronomers have diſcovered that the Planets perform their Revolutions; which is ſo, that their Periodical Times are always in a *Seſquialteral Ratio* of their Diſtances from their Centres; or that *the Squares of the Times of their Periodical Revolutions are as the Cubes of their middle Diſtances from their Centres.*

But he proves, That the Periodical Times of the Parts of the Vortex will always be only as the Squares of their Diſtances from the Centre of their Motion.

Beſides, the Planets, according to the true *Copernican Hypotheſis*, being carried about the Sun in Ellipſes, and having the Sun in the *Umbilicus* of each Figure, *by Lines drawn from themſelves to the Sun, do always deſcribe Areas proportional to the Times of their Revolutions*, which he ſhews, the Parts of no Vortex can do: See *Scol. Prop. ult. Lib.* 2. *Princip.*

Again, as the Ingenious Mr. *Keil* obſerves in his Examination of Dr. *Burnet*'s *Theory*: If the Earth were carried in a Vortex, it would move faſter, in the Proportion of 3 to 2, when it is in *Virgo*, than when it is in *Piſces*, which all Experience proves to be falſe: See a large Refutation of all the *Carteſian* Doctrine of the Vortices in Dr. *Gregory*'s *Aſtronom. Phyſ. & Geometr. Lib.* 1. *Sect.* 10.

VOUCHER, is a Term in Law, ſignifying when the Tenant calls another into the Court, that is Bound to him to Warranty: And 'tis either to defend the Right againſt the Demandant, or to yield him other Lands, *&c.* in Value, and extend to Lands or Tenements, of Freehold or Inheritance: And it ſeems in ſome meaſure to agree to the Contract in the Civil Law, whereby the Vendee bindeth the Vendor, ſometimes in the ſimple Value of the Things bought, ſometime in the double, to *Warrant* the ſecure enjoying the Thing bought; yet there is this Difference between *the Civil*, and the *Common Law*, that the *Civil Law* binds every Man to warrant the Security of that which he ſelleth, which the *Common Law* doth not, except it be ſpecially covenanted.

The Proceſs whereby the *Vouchee* is called, is a *Summoneas ad Warrantiſandum*: And if the Sheriff return upon that Writ, that the Party hath nothing whereby he may be ſummoned, then goes out another Writ called, *Sequentur ſub ſuo periculo.*

A Recovery with a *ſingle Voucher*, is, when there is but *one Voucher*: And with a *double Voucher*, is, when the *Vouchee* voucheth over, and ſo a *treble Voucher.*

There is alſo a *Foreign Voucher*, when the Tenant being impleaded in a particular Juriſdiction of that Court, which might more aptly be called *a Voucher* of a Foreign.

Voucher ſignifies alſo a Leiger-Book, or Book of Accompt, wherein are entred the Acquittances or Warrants for the Accomptant's Diſcharge.

VOYDANCE, is a Want of an Incumbent upon a Benefice, and this double, either *in Law*, as when a Man hath more Benefices incompatible; or in *Deed*, as when the Incumbent is dead, or actually deprived.

UPRIGHT *South Dyals*: See *Prime Verticals.*

URACHUS, is one of the Umbilical Veſſels, being a ſmall Membranous round Pipe, with a very ſtrait Cavity ariſing from the bottom of the Bladder up to the Navel, out of which it paſſes along with the common Cover, and opens into the *Allantoides* of the *Fœtus*: 'Tis more pervious in ſome of the larger Brutes than in Men, in whom ſome have denied it to be hollow; but that ſeems contradicted by the Inſtances we have had of Mens making Water by the Navel, when the Paſſage of the *Penis* hath been quite ſtopped. *Bartholin* and ſome others ſay, That the *Uracus* in Men reaches no farther than the Navel: But how then comes that Humour into the *Allantoides*, which has perfectly the ſame Taſte with the Urine in the Bladder? The Miſtake ſeems to ariſe from that wrong Notion, That a Humane *Fœtus* hath no *Allantois*, which hath been by *Needham* and others ſufficiently refuted.

The Uſe of the *Urachus* is to convey the Urine from the Bladder of the *Fœtus* into the *Allantoides*, which is placed between the *Chorion* and the *Amnion.*

URETER, is a Fiſtulous Membranaceous Veſſel, which proceeds from both Reins, and opens between the Membranes of the Bladder, by which the Urine paſſes from the Reins to the Bladder; *Celſus* calls it the White Vein.

URETHRA, or *Fiſtula*, is the Urinary Paſſages, whereby the Urine is diſcharged: It ſerves in Males alſo for the Ejection of the Semen. The Seminal little Bladders empty themſelves into it by 2 Holes at the beginning of it, when there is occaſion; which Bladders or Veſſels are ſurrounded with Glandulous Proſtates, perforated with ſeveral Holes, to which there is a little piece of Fleſh affixed. *Blanchard.*

Mr. *Cowper* obſerves, That the *Urethra* hath a *Corpus Cavernoſum*, like to that of the *Penis*, which you will find deſcribed under the Words *Corpora Cavernoſa*; but this of the *Urethra*, differs much in Figure from them: The ſuperior Part of this *Corpus Cavernoſum* lying between the two *Crura* of the former, he calls *Bulbus*, from its Figure; it is covered with the *Muſculus Accelerator Urinæ*; it poſſeſſeth all the lower Part of the *Urethra*, extending its ſelf in the *Perinæum*; it hath moreover, a *Septum Intermedium* (tho' not taken Notice of by Anatomiſts) dividing the right Side of the *Bulbus* from the left, which deſcending to the End of the Bulbous Part, is there obliterated.

The Uſe of this *Septum* is (as Mr. *Cowper* thinks) to direct the Refluent Blood to the exporting Ducts, its two Veins that carry the Blood back.

As this *Corpus Cavernoſum* deſcends on the inferior Part of the *Urethra*, it is leſſened; but when it approaches the Extremities of the two other *Corpora Cavernoſa* it again dilates it ſelf and covers them, compoſing that Body which they call the *Glans* or *Balanus.*

URINOUS *Salts*, are that Tribe of Volatile Salts drawn from Animal, or other Subſtances that are contrary to Acids: And Mr. *Boyle* ſays, They are diſtinguiſhable from *Lixiviat Salts*, by this Teſt, That they will turn a Solution of Sublimate into a White Colour, whereas Lixiviate Salts turn it into a Yellow one.

URSA *Major*, a Northern Conſtellation, conſiſting of 27 Stars, and is otherwiſe called *Charles's Wain*, and the *Great Bear.*

USAGE: See *Preſcription.*

USE, in Law, properly ſignifies the Profits or Benefits of Lands or Tenements: For every Deed conſiſts of 2 principal Parts; namely, *The Premiſes*, and *the Conſequents.*

The Premiſes, is the former Part thereof, being all that which precedeth the *Habendum*, or Limitation of the Eſtate, which are the Perſons contracting, and the Thing contracted.

The *Conſequent* is that which follows the *Premiſes*, and that is the *Habendum*, in which are two Limitations: The one of the Eſtate or Property, which the Party Paſſive ſhall receive by the Deed: The other of the *Uſe*; which is to expreſs in the ſaid *Habendum*, to or for what *Uſe* and Benefit he ſhall have the ſame Eſtate, and of the Limitation of ſuch *Uſes* many Precedents are ſet down in Law Books.

USER *de Action*, a Term in Law, ſignifying the purſuing or bringing an *Action*, which in what Place and Country it ought to be; See *Bro. tit. Lieu* and *Country*, *Fol.* 64.

USUCAPTION, in Law, ſignifies the enjoying a Thing by continuance of Time, or receiving the Profits, long Poſſeſſion or Preſcription.

USURY, is the Gain of any thing above the Principal, or that which was lent; exact only in Conſideration of the Loan, whether it be Money, Corn, Apparel, Wares, or ſuch like.

UTERUS, the Womb, an Organical Part, wherein Generation and Conception are made, being ſeated in the *Hypogaſtrium*.

UTLAGATIO *Viri*.

UTLAGATO *capiendo quando utlagatur in uno comitatu & poſtea fugis in alium*, is a Writ, the Nature whereof is ſufficiently expreſt by the Name.

UTLARY, or *Utlawry*, is a Puniſhment for ſuch as being called into Law, and lawfully ſought, do contemptuouſly refuſe to appear after an *Original Writ*, with a *nihil habet*, three Writs of *Capias*, *Alias & Pluries*, returned by the Sheriff *non eſt inventus*, and an *Exigent* with a *Proclamation*, thereupon awarded. And *Bracton* ſays, he muſt be called at five Counties, a Month between every County; and if he appear not within that Time, he ſhall be pronounced out of the King's Protection, and deprived of the Benefit of the Law. The Effect of this is divers; for if he be *Outlawed* at the Suit of another in a civil Cauſe, he ſhall forfeit all his Goods and Chattels to the King. If upon Felony, then he ſhall forfeit all his Lands and Tenements which he hath in Fee, or for Life, and his Goods and Chattels. A Minor nor Woman cannot be *Outlawed*: For where a Man is ſaid to be *Outlawed*, a Woman is termed *Waived*.

UTRUM: See *Aſſiſe*.

UTTER-BARRISTERS, are ſuch, who for their long Study, and great Induſtry beſtow'd upon the Knowledge of the Common Law, are called from their Contemplation to Practice, and in the Face of the World, to take upon them the Protection and Defence of Clients; the Time before any ought to be called to the Bar, was formerly eight Years, but now reduced to ſeven; and the Exerciſes done by him (if he were not called, *Ex gratia*) was Twelve *Grand Moats* performed in the Inns of Chancery, in the Time of the Grand Readings, and Twenty four *Petty Moats*, at the Inns of Chancery, in the Term-times, before the Readers of the reſpective Inns of Chancery.

A *Barriſter* newly called, is to attend the ſix next long Vacations, the Exerciſes of the Houſe, *viz.* in *Lent* and *Summer*, and is therefore for thoſe three Years called, a *Vacation-Barriſter*.

And they are alſo called, *Utter-Barriſters*, *i. e.* Pleaders without the Bar, to diſtinguiſh them from Benchers, or thoſe that have been Readers, who are ſometimes admitted to plead within the Bar, as the King's, Queen's, or Prince's Council are.

UVA, the ſame with *Cion*; which ſee.

UVEA *Membrana ſive Tunica*, is the Fore-part of the *Choroides*; being almoſt altogether continuous on the Inſide to the *Tunica Sclerotis*; it is perforated in the Fore-part, and leaves a Space for the Apple of the Eye, which may be contracted or dilated: Its exterior Surface is of various Colours, whence it is called *Iris*, and in this is the Difference of Mens Eyes as to Colour; as Black, Grey, *&c.* The Inſide of this Uveous Tunick is cover'd with a Black Lining, that the Cavity of the Eye may be the darker.

UVIGENA, or UVIGERA, the ſame with *Cion*.

VULGAR *Fractions*: See *Fractions*.

VULTUR *Volans*: See *Aquila*.

UVULA, is a double Production of the Internal Membrane of the Mouth; its Subſtance is very lax, and it has a Number of ſmall Glands as in the Palate: It is ſomewhat long and of a Conick Figure: It hangs from the Roof of the Mouth near the Paſſage which comes from the Noſe, above the Seat of the Larynx between the Tonſils: It is moved by 2 Pair of Muſcles, called *Pterigoſtaphilinus Externus & Internus*: Its Uſe is to hinder Drink, *&c.* from falling down into the *Aſpera Arteria*.

WADHOOK, among the Gunners, is a Rod or great Wyre of Iron, turn'd in a Serpentine manner; and in its End, is put upon a Handle or Staff, to draw out *Wads* or *Okum*, that the Piece may be unloaded.

WAFT: To waft a Ship, is to convey her ſafe, as Men of War do by Merchants Ships. But to *make a Waft*, is to hang out ſome Coat, Sea-gown, or the like, in the main Shrowds of the Ship, as a Sign for Men to come on Board, *&c.* And often ſuch a *Waft*, is a Sign a Ship is in great Danger by a Leak, *&c.* and therefore wants Help from the Shore, or from ſome other Ship.

WAGONER: See *Charles Wayn.*

WAIFE, or *Weyfe*, is, when a Thief having felonioufly ſtolen Goods, and being nearly followed with *Huy and Cry*, or elſe overcharged with the Burden or Trouble of the Goods; for his own Eaſe, and more ſpeedy Flight, flies away and leaves the Goods behind him; then the King's Officer, or the Bailiff of the Lord of the Mannor, (within whoſe Juriſdiction they be left) who by Preſcription or Grant from the King, hath the Franchiſe of *Waife*, may ſeize the Goods ſo wav'd to his Lord's Uſe, except the Owner come with freſh Suit after the Felon, and ſue an Appeal within a Year and a Day, or give Evidence againſt him at his Arraignment, *&c.* In which Caſes, the firſt Owner ſhall have Reſtitution of his Goods ſo ſtolen and *waived*. *Waifes* alſo ſignifie Things loſt, and Eſtrays, which muſt by the Lord of the Franchiſe where they are found, be cauſed to be Cried and Publiſhed in Markets and Churches near about, elſe the Year and Day does not run to the Prejudice of the Loſer.

WAIVE, is a Woman that is Outlaw'd; and ſhe is called *Waive*, as forſaken of the Law, and not an *Outlaw*, as a Man is; for Women are not Sworn in Leets to the King, nor to the Law, as Men are, who therefore are within the Law; whereas Women are not, and for that Cauſe they cannot be *Outlawed*, ſince they never were within it.

WAKE of a Ship, is the ſmooth Water that runs from a Ship's Stern, when ſhe is under Sail. This is alſo called her Wake; and by it a good Gueſs may be made of the *Speed* ſhe makes. And particularly, they judge from this *Wake*, whether a Ship *go as ſhe looks*, (as they expect it) *i. e.* whether ſhe makes her Way right as her Head lies, as ſhe doth, when her *Wake is right a-Stern*: But if this *Wake* be a Point or two to Leeward, they judge that ſhe ſlides and falls to the *Leeward* of her Courſe.

They ſay alſo, when a Ship *ſtays a Weather of Wake*; that is, when in her Staying, ſhe is ſo quick, that ſhe don't fall to Leeward upon a Tack, but that when ſhe is tack'd, her *Wake* is to Leeward; then 'tis a Sign that ſhe feels her Helm very well, and is nimble of Steerage.

Alſo, when one Ship giving Chaſe to another, is got as far into the Wind as ſhe, and ſails directly after her, they ſay, *She is got into her Wake.*

WALE, or *Wail*; a Term at Sea for thoſe outmoſt Timbers in Ship's Side, on which Men ſet their Feet when they clamber up a Ship's Side. Theſe are reckoned from the Water, and called her 1ſt, 2d, or 3d *Wale* or *Bend.*

WALE-*Knot*, is a round Knot or Knob made with three Strands of a Rope, ſo that it cannot ſlip, by which (in a Ship) the *Tacks*, *Top-ſail Sheets*, and *Stoppers* are made faſt: As alſo, ſome other Ropes.

WALE-*Reared*; ſo the Seamen call a Ship, when after ſhe comes to her Bearing, ſhe is not narrow in her upper Work, nor *houſed in*, as their Word is, but is built ſtreight up. Which Way of Building, tho' it don't look well, nor is, as they ſay, *Ship-ſhaken*, yet it hath this Advantage, That a Ship is thereby more *Roomy* within-board; that is, ſhe is larger within, and alſo becomes thereby a *Holſom Ship in the Sea*, eſpecially if her Bearing be well laid out.

WALT; a Ship is *Walt*, when ſhe hath not her due Ballaſt, *i. e.* not enough to enable her to bear her Sails.

WALVIARIA *Mulieris*, a Term in Law, ſignifying as much as *Utlagatio Viri*, or the Outlawing of a Man: See *Utlagation.*

WAPP, is that Rope in a Ship wherewith the Shrowds are ſet taught with Wale-knots; one End is made faſt to the Shrowds, and to the other are brought the Laniards.

WARD, is a Word that has divers Significations; as a *Ward* in *London*, is a Portion of the City committed to the ſpecial Charge of one of the Aldermen of the City. Alſo, a Foreſt is divided into *Wards.* And a Priſon is called a *Ward.* As alſo, the Heir of the King's Tenant, that held by Knight's Service, or in *Capite*, was called a *Ward* during his Nonage. But this laſt is taken away by the *Stat.* 12. *Car.* 2. *cap.* 24.

WARDEN, being the ſame with Guardian, but is commonly uſed for him that hath the Cuſtody and Charge of any Perſon or Thing, by Office.

WARNING-*Wheel*, in a Clock, is the *Third* or *Fourth Wheel*, (according to its Diſtance from the *Firſt Wheel.*)

WARP; to *warp* a Ship, is to hale her up by a Hawſer, or any other Rope, (ſufficient for that purpoſe) with an Anchor bent to it. It's uſed when a Wind is wanting to carry her into, or out of a Harbour; and this is termed Warping; and the Hawſer, or any Rope ſufficient, and uſed to hale her up, is called a Warp.

WARRANT *of Attorney*, is that whereby a Man appoints another to do ſomething in his Name, and warranteth his Action. It ſeems to differ from a *Letter of Attorney*, which paſſeth uſually under the Hand and Seal of him that makes it before any creditable Witneſſes; whereas a *Warrant of Attorney*, in Perſonal, Mixt, and ſome Real Actions, is put in of courſe by the Attornies, for the Plaintiffs or Demandants, Tenants or Defendants. But a *Warrant of Attorney* to ſuffer a Common Recovery by the Tenant or Vouchee, is acknowledged before ſuch Perſons, as a Commiſſion for the doing thereof directs.

WARRANTIA *Chartæ*, is a Writ that lies for him, who being infeoff'd in Lands or Tenements with a Clauſe of Warranty, and is impleaded in an *Aſſize*, or *Writ of Entry*, wherein he cannot Vouch or Call to *Warranty*: For in this Caſe his Remedy is to take out this Writ againſt the Feoffer or his Heirs.

WARRANTIA *Diei*, is a Writ lying in Caſe where a Man having a Day aſſign'd Perſonally to appear in Court to any Action wherein he is Sued, is in the mean Time, by Commandment, employ'd in the King's Service, ſo that he cannot come at the Day aſſign'd; this Writ is directed to the Juſtices, to the End that they may neither take, nor record him in Default for that Day.

WARRANTY, is a Promiſe or Covenant by Deed made by the Bargainer, for himſelf and his Heirs, to *warrant* or ſecure the Bargainee and his Heirs, againſt all Men, for the enjoying any thing agreed on between them, and this *Warranty* paſſeth from the Seller to the Buyer, from the Feoffer to the Feoffee, from him that releaſeth, to him that is releaſed from an Action real, and ſuch like. *Warranty*, is either *real* or *perſonal*: *Real*, when it is annexed to Lands or Tenements granted for Life, *&c.* And this is either in *Deed*, or in *Law*: *Perſonal*, which either reſpects the Property of the Thing ſold, or the Quality of it. *Real Warranty*, in reſpect of the Eſtate, is either *Lineal*, *Collateral*, or *commencing by Diſſeiſin*; of which *Littleton* gives an Account in the laſt Chapter of his Tenure.

WASTE *Boards*, are Boards ſometimes ſet upon the Sides of a Boat, to keep the Sea from breaking into her.

WASTE-*Cloths*, are Cloths hung up on the uppermoſt Work of a Ship's Hull, to ſhadow the Men from an Enemy in the *Fight*; and therefore by ſome they are called *Fights*.

WASTE-*Trees*, are thoſe Timbers of a Ship which lie in the Waſte.

WASTE of a Ship, is that Part of her between the two Maſts, *i. e.* between the *Main-maſt* and the *Fore-maſt*.

WASTE, in Law, hath divers Significations.

Firſt, It is a Spoil, made either in Houſes, Woods, Lands, *&c.* by the Tenant for Life, or Years to the Prejudice of the Heir, or of him in Reverſion or Remainder; whereupon the *Writ of Waſte* is brought for the Recovery of the Thing waſted, and treble Damages.

Waſte of the Foreſt, is moſt properly where a Man cuts down his own Woods within the Foreſt, without Licence of the King, or Lord-Chief-Juſtice in *Eyre*.

Secondly, *Waſte* is taken for thoſe Lands, which are not in any Man's Occupation, but lie common; which ſeem to be ſo called, becauſe the Lord cannot make ſuch Profit of them, as of his other Lands, by reaſon of that Uſe which others have of it, in paſſing to and fro: Upon this none may build, cut down Trees, dig, *&c.* without the Lord's Licence.

WATCH, at Sea, ſignifies the Space of 4 Hours, becauſe half the Company or Crew *watch* and do Duty in their Turns, ſo long at a Time. All a Ship's Company is divided into two Parts, the *Larboard* and the *Starboard* Watch. The *Maſter* of the Ship Commands the latter, and the *Chief Mate* the former. Sometimes, when a Ship is in Harbour, they watch but a *Quarter-watch*, as they call it; that is, but a quarter of the Company watch at a Time; becauſe they have then but little to do, or look after.

WATCH *Glaſs*, being four Hours, is uſed at Sea, to ſhift or change their Watches. There are alſo *Half-watches*, *Hour-glaſſes*, *Minute*, and *half Minute-glaſſes*; by which laſt, they count the Knots when they leave the Log, in order to find the Ship's Way.

WATCH-*work*, is the internal Parts of any Movement or Watch, which is deſigned to ſhew the Hour, or any other Diviſion of Time without Striking; for whatever is contrived to produce that Effect, is called *Clock-work*; and that Part of the Movement is called the *Striking-part*.

The general Rules for the Calculation of *Watch-work*, are reducible to theſe Heads.

1. 'Tis certain that the ſame Motion may be perform'd either with one Wheel and one Pinion, or by many Wheels and many Pinions, provided that the Number of Turns of all thoſe Wheels bear the Proportion to all thoſe Pinions, which that one Wheel bears to its Pinion; or (which is the ſame thing) that the Number produced by multiplying all the Wheels together, be to the Number produced by multiplying all the Pinions together, as that one Wheel is to that one Pinion.

Thus, ſuppoſe you had Uſe for a Wheel of 1440 Teeth, with a Pinion of 28 Leaves, you may make it into three Wheels and Pinions, *viz.*

4) 36, 7) 8, 1) 5.

For if the three Wheels 36, 8 and 5, be multipy'd together, 'twill give 1440 for the Wheels, and if the 3 Pinions 4, 7 and 1, be alſo multiplied together, you'll have 28 for the Pinions.

It matters not in what Order the Wheels and Pinions are ſet, or which Pinion runs in which Wheel; only for Contrivance ſake, the biggeſt Numbers are commonly ſet to drive the reſt.

2. Two Wheels and Pinions of different Numbers may perform the ſame Motion. As a Wheel of 36 drives a Pinion of 4, all one as a Wheel of 45 drives a Pinion of 5; or a Wheel of 90 drives a Pinion of 10. The Turns of each are 9.

3. If in breaking your Train into Parcels, any of your Quotients ſhould not pleaſe you; or if you would alter any other two Numbers which are to be multiplied together, you may vary them by this Rule. Divide your two Numbers by any two other Numbers which will meaſure them; then multiply the Quotients by the alternate Diviſors; the Product of theſe two laſt Numbers found, ſhall be equal to the Product of the two Numbers firſt given.

Thus, if you would vary 36 times 8, divide theſe by any two Numbers that will evenly meaſure them; as 36 by 4, it gives 9; and 8 by 1, it gives 8; now (by the Rule) 9 times 1 is 9, and 8 times 4 is 32: (See the Operation.)

9 8
36 × 8
4 1

32 × 9

So that for 36 × 8, you have 32 × 9, which is equal to it, and each equal to 288.

And if you Divide 36 by 6, and 8 by 2, then Multiply, as before is ſaid, you'll have 24 × 12 = 36 × 8 = 288.

6 4
36 × 8
6 2

24 × 12

4. If it happens that you have a Wheel and Pinion fall out with croſs Numbers, too big to be cut in Wheels, and yet not to be altered by the former Rules; then in ſeeking for your Pinion of Report, you may find out two Numbers of the ſame, or a near Proportion, by this Rule, *viz.* As either of the two given Numbers Is to the other : : So is 360 To a fourth. Divide that fourth Number, as alſo 360 by 4, 5. 6, 8, 9, 10, 12, 15, (each of which Numbers doth exactly meaſure 360) or by any one of thoſe Numbers that bringeth a Quotient neareſt to an Integer.

As ſuppoſe you had theſe two Numbers, 147 the Wheel, and 170 the Pinion, which are too great to be cut into ſmall Wheels, and yet cannot be reduced into leſs, becauſe they have no other common Meaſure, but Unity; Say therefore, As 170 : 147 : : 360 : 311. Or as 147 : 170 : : 360 : 416. Divide the 4th Number, and 360 by one of the foregoing Numbers; as 311 and 360 by 6, it gives 52 and 60; Divide them by 8, you will have 39 and 45. Alſo, if you Divide 360 and 416 by 8, you'll have 45 and 52 exactly. Wherefore inſtead of the two Numbers 147 and 170, you may take 52 and 60, or 39 and 45, or 45 and 52, *&c.*

6) 311 (52
360 (60
8) 311 (39
360 (45

5. When you come to Practice in Calculating a Piece of *Watch-work*, the firſt thing you are to do, is, to pitch upon your Train or Beats of the Ballance in an Hour; as whether a ſwift Train, of about 20000 Beats, (which is the uſual Train of a common 30 Hour Pocket-watch) or a ſlower Train of about 16000, (the Train of the new Pendulum Pocket-watches) or any other Train.

Having choſen your Train, then reſolve upon the Number of Turns you intend your Fuſy ſhall have, and upon the Number of Hours you would have your Piece to go: As ſuppoſe 12 Turns, and to go 30 Hours, or 192 Hours (*i. e.* eight Days,) *&c.*

Then proceed to find out the Beats of the Ballance or Pendulum in one Turn of the Fuſy, by the Direction given under the Word *Beat*, thus in Numbers, 12 : 16 : : 20000 : 26666. Wherefore, 26666 are the Beats in one Turn of the Fuſy or great Wheel, and are equal to the Quotients of all the Wheels unto the Ballance multiplied together: But now this Number is to be broken into a convenient Parcel of Quotients; which is to be done thus:

Firſt, halve your Number of Beats, *viz.* 26666, and you'll have 13333; then pitch upon the Number of your Crown-wheel, as ſuppoſe 17. Divide 13333 by 17, and you'll have 784 for the Quotients (or Turns) of the reſt of the Wheels and Pinions; which being too big for one or two Quotients, may be beſt broken into three; chuſe therefore three Numbers, which when multiplied all together continually, will come neareſt 784. As ſuppoſe 10, 9 and 9, multiplied continually, gives 810, which is ſomewhat too much; therefore try again other Numbers, 11, 9 and 8; theſe drawn one into another continually produce 792, which is as near as can be, and convenient Quotients.

Having thus contrived your Piece from the great Wheel to the Ballance; but the Numbers not falling out exactly, according as you at firſt propoſed, you muſt correct your Work thus:

Firſt, (by the Direction given under the Word *Beats*) Multiply 792, (the Product of all the Quotients pitched upon) by 17, the Notches of the Crown-wheel, the Product is 13464. which is half the Number of Beats in one Turn of the Fuſy; then (by a Rule given under the Word *Beat*) find the true Number of Beats in an Hour.

Thus, 16 : 12 : : 13464 : 10098, which is half the Beats in an Hour.

Then find what Quotient is to be laid upon the *Pinion of Report* (by the Rule given under that Word.)

Thus, 16 : 12 : : 12 : 9, the Quotient of the *Pinion of Report.*

Now having found your Quotients, 'tis eaſie to determine what Numbers your Pinions ſhall have; for chuſe what Numbers your Wheels ſhall have, and multiply the Pinion by their Quotients, and that produceth the Number for your Wheels, as you ſee in the Margin. Thus the Number of you *Pinion of Report* is 4, and its Quotient 9, therefore the Number for the Dial-wheel muſt be 4 × 9 or 36; ſo the next Pinion being 5, its Quotient 11, therefore the great Wheel muſt be 5 × 11 = 55, and ſo of the reſt.

4) 36 (9
5) 55 (11
5) 45 (9
5) 40 (8
17

Thus you have the common and practical Method of Calculating the Numbers of a 16 Hour Watch.

And this Watch may be made to go a longer Time by leſſening the Train, and altering the Pinion of Report.

As ſuppoſe you could conveniently ſlacken the Train to 16000, then by the Rule given under the Word *Beat*, ſay, As ½ 16000, or 8000 : 13464 : : 12 : 20. So that this Watch will go 20 Hours.

Then for the Pinion of Report, ſay, (by the Rule given under that Word) As 20 : 12 : : 12 : 7. So that 7 is the Quotient of the Pinion of Report.

And as to the Numbers, the Operation is the ſame as before, only the Dial-wheel is but 28, for its Quotient is altered to 7.

But if you would give Numbers to a Watch of about 10000 Beats in an Hour, to have 12 Turns of the Fuſy, to go 170 Hours, and 17 Notches in the Crown-wheel.

4) 28 (7
5) 55 (11
5) 45 (9
5) 48 (8
17

The

The Work is the ſame in a manner, as in the laſt Example, and conſequently thus:

As 12 : 170 :: 10000 : 141666, which fourth Number are the Beats in one Turn of the Fuſy; Its half 70833 being divided by 17, gives 1467 for the Quotients. And becauſe this Number is too big for three Quotients, therefore chuſe four, as 10, 8, 8, $6\frac{3}{5}$, whoſe Product into 17 maketh 71808, nearly equal to half the true Beats in one Turn of the Fuſy.

Then ſay, as 170 : 12 :: 71808 : 5069, which is half the true Train of your Watch.

And ſay again, 170 : 12 :: 12 : $\frac{144}{170}$, (or 170) 144, which expreſſes the Pinion of Report, and the Number of the Dial-wheel.

But theſe Numbers being too big to be cut in ſmall Wheels, therefore they muſt be varied by the fourth Rule of this, ſaying,

As 144 : 170 :: 360 : 425.
Or 170 : 144 :: 360 : 305.

Then dividing 360, and either of theſe two fourth Proportionals, (as directed by the Rule) ſuppoſe by 15, you'll have $\frac{24}{28}$ or $\frac{20}{24}$; then the Numbers of the whole Movement will ſtand thus:

24) 20 ($\frac{20}{24}$

6) 60 (10
6) 48 (8
5) 40 (8
5) 33 ($6\frac{3}{5}$

17

Thus much may ſerve concerning the Calculation of ordinary Watches, to ſhew the Hour of the Day: But in ſuch as ſhew Minutes and Seconds, the Proceſs is thus:

Firſt, having reſolved upon your Beats in an Hour, then by dividing your deſigned Train by 60, find the Beats in a Minute; and accordingly, find out ſuch proper Numbers for your Crown-wheel and Quotients, as that the Minute-wheel ſhall go round once in an Hour, and the Second-wheel once a Minute.

As ſuppoſe you ſhould chuſe a Pendulum of ſix Inches to go 8 Days, with 16 Turns of the Fuſy; a Pendulum of 6 Inches (by Mr. *Smith*'s Tables in *Horal. Diſq.*) vibrates 9368 in an Hour; and conſequently, dividing it by 60, gives 156, the Beats in a Minute. Half theſe Sums are 4684 and 78. Now the firſt Work is to break this 78 into good Proportion; which will fall into one Quotient, and the Crown-wheel. Let the Crown-wheel have 15 Notches; then 78 divided by 15, gives 5; ſo a Crown-wheel of 15, and a Wheel and Pinion, whoſe Quotient is 5, will go round in a Minute, to carry a Hand to ſhew *Seconds*. Next for a Hand to go round in an Hour, to ſhew Minutes. And becauſe there are 60 Minutes in an Hour, 'tis but breaking 60 into good Quotients (as ſuppoſe 10 and 6, or 8 and 7, or *&c.*) and 'tis done.

8) 40 (5
15

8) 64 (8
8) 60 ($7\frac{1}{2}$
8) 40 (5
15

Thus 4684 is broken, as near as can be, into proper Numbers.

But ſince it don't fall out exactly into the above-mentioned Numbers, you muſt correct (as you were directed before) and find out the true Number of Beats in an Hour, by multiplying 15 by 5, which makes 75; and 75 by 60, makes 4500, which is the half of the true Train. Then find the Beats in one Turn of the Fuſy, thus, 16 : 192 :: 4500 : 54000; which laſt are half the Beats in one Turn of the Fuſy. This 54000 being divided by 4500, (which are the true Numbers already pitched upon) the Quotient will be 12, which being not too big for one ſingle Quotient, needs not be divided into more, and the Work will ſtand thus:

9) 108 (12
8) 64 (8
8) 60 ($7\frac{1}{2}$
8) 40 (5
15

As to the Hour-hand, the great Wheel which performs only one Revolution in 12 Turns of the Minute-wheel, will ſhew the Hour; or you may order it to be done by the Minute-wheel.

For the Calculation of the Striking Part of any Clock, obſerve theſe Directions.

1. Conſider that here you need have regard only to the *Count-wheel*, *Striking-wheel*, and *Detent-wheel*, which move round in this Proportion.

The *Count wheel*, commonly goes round once in 12 or 24 Hours: The *Detent-wheel* moves round every Stroke the Clock ſtriketh, or ſometimes but once in two Strokes; wherefore it follows, That,

2. As many Pins as are in the Pin-wheel, ſo many Turns hath the Detent-wheel in one Turn of the Pin-wheel; or (which is the ſame) the Pins of the Pin-wheel, are the Quotient of that Wheel, divided by the Pinion of the Detent-wheel. But if the Detent-wheel moveth but once round in two Strokes of the Clock, then the ſaid Quotient is but half the Number of Pins.

3. As many Turns of the Pin-wheel as are required to perform the Strokes of 12 Hours, (which are 78) ſo many Turns muſt the Pinion of Report have, to turn round the Count-wheel once: Or thus, the Quotient of 78 divided by the Number of Striking-pins, ſhall be the Quotient for the Pinion of Report, and the Count-wheel; and this is in caſe the Pinion of Report be fixed to the Arbor of the Pin-wheel, as is commonly done. This Example will make all plain: The Locking-wheel being 48, the Pinion of Report 8, the Pin-wheel 78, the Striking-pins are 13, and ſo of the reſt. Note alſo, That 78 divided by 13, gives 6, the Quotient of the Pinion of Report.

8) 48 (6

6) 78 (13
6) 60 (10
6) 48 (8

As for the *Warning-wheel* and *Flying-wheel*, it matters little what Number they have, their Uſe being only to bridle the Rapidity of the Motion of the other Wheels.

4. The following Rules will alſo be of great Uſe in this kind of Calculation; and by their Help theſe Problems may readily be reſolved.

1. *To find how many Strokes the Clock ſtriketh in one Turn of the Fuſy or Barrel.*

As the Number of Turns of the Great-wheel, or Fuſy, Is to the Days of the Clock's continuance : : So is the Number of Strokes in 24 Hours, *viz.* 156,

To

to the Strokes in one Turn of the Fuſy or Great-wheel.

2. *To find how many Days the Clock will go.*

As the Number of Strokes in 24 Hours, *viz.* 156, Is to the Strokes in one Turn of the Fuſy : : So is the Turns of the Fuſy or Great-wheel, To the Days of the Clock's Continuance or Going.

3. *To find the Number of Turns of the Fuſy or Barrel.*

As the Strokes in one Turn of the Fuſy, Is to the Strokes in 24 Hours, *viz.* 156 : : So is the Clock's Continuance, To the Number of Turns of the Fuſy or Great-wheel.

4. *To fit the Pinion of Report on the Spindle of the Great-wheel.*

As the Number of Strokes in the Clock's Continuance, or in all its Turns of the Fuſy, to the Turns of the Fuſy : : So are the Strokes in 12 Hours, which are 78, To the Quotient of the Pinion of Report, fixed upon the Arbor of the Great-wheel.

5. *To fix the Pinion of Report to any Wheel.*

Divide 78 by the Number of Strokes in one Turn of the Wheel you intend to fix your Pinion of Report upon, and your Quotient ſhall be that of the Pinion of Report.

6. *To find the Strokes in the Clock's Continuance*, viz.

As 12 : Is to 78 : : So are the Hours of the Clock's Continuance : To the Number of Strokes in that Time.

Or thus rather ; Multiply the Strokes in one Turn of the Great-wheel by the Number of Turns of the Fuſy, the Product are the Strokes in the Clock's Continuance.

The Uſe of theſe Rules appears plain by the following Examples.

1. In ſmall Pieces ; having pitched upon the Number of Turns, and the Continuance of your Clock, find (by *Rule* 6.) the Strokes in its Continuance ; then (if you make the Great-wheel the Pinion-wheel) divide theſe Strokes by the Number of Turns, and you have the Number of Striking-pins ; Or divide by the Number of Pins, and you have the Number of Turns.

Thus a Clock of 30 Hours, with 15 Turns of the Great-wheel, hath 195 Strokes.

For (by *Rule* 6.) 12 : 78 : : 30 : 195.

Dividing { 15 } 195 { 13, the Striking-pin.
by { 13 } 195 { 15, the Number of Turns.

2. In Calculating the Numbers of a Clock of much longer Continuance, you muſt make your Pin-wheel further diſtant from the Great-wheel : And having pitched upon your Turns, find out the Number of Strokes in one Turn of the Great-wheel or Fuſy, (by *Rule* 1.) Thus in an 8 Day Piece of 16 Turns, As 16 : 8 : : 156 : 78. Alſo, in a Piece of 32 Days and 16 Turns, 16 : 32 : : 156 : 312.

Theſe Strokes thus found, are the Number which is to be broken into a convenient Parcel of Quotients, thus :

Firſt, reſolve upon the Number of your Striking-pins, by which divide the laſt mentioned Number, the Quotient ariſing ſhall be one or more Quotients for the Wheels and Pinions. Thus in the Month-piece, if you take your Pins 8, divide 312 by it, the Quotient is 39 ; but that being too big for one muſt be cut into two Quotients for Wheels and Pinions, or as near as poſſible, which are either 7 and 5, or $6\frac{1}{2}$, and 6, which laſt is equal to 39, and therefore may ſtand, and 'twill be thus :

10) 65 ($6\frac{1}{2}$
8) 48 (6
6) 48 (8 Pins.

The Quotient being thus determined, and accordingly the Wheels and Pinions ; then find a Quotient for the Pinion of Report, to carry round the Count-wheel once in 12 Hours, or as you pleaſe. If you fix your Pinion of Report on the Great-wheel Arbor, you muſt work by the fourth *Rule*.

Thus in the laſt Example, the Strokes in the Continuance are 4992 (by *Rule* 6.) then (by *Rule* 4.) as 4992 : 16 : : 78 : $\frac{4992}{1248}$, or 4992) 1248, which is the Pinion and the Wheel.

But theſe Numbers being not the uſual Numbers of a Month-piece, but only made uſe of here for Illuſtration ſake ; and in Practice they commonly increaſe the Number of Strikings, and ſo make the Second-wheel the Striking-wheel. Suppoſe you take 24 Pins, divide 312 by it, and the Quotient is 13, which is little enough for one Quotient, and may therefore ſtand thus :

8) 104 (13
6) 72 (12, 24 Pins ;

Where the Quotient of the Firſt-wheel is 13. In the Second-wheel of 72 Teeth, are the 24 Pins, altho' its Quotient is but 12, becauſe the Hoop-wheel is double, and goes round but once in two Strokes of the Pin-wheel. In this the Pinion of Report is the ſame with the laſt, if fixed upon the Arbor of the Great-wheel. But if fixed on the Arbor of the Second or Pin-wheel, its Quotient is found by *Rule* 5, *viz.* 78 divided by 24, gives the Quotient of the Pinion of Report $3\frac{1}{4}$, thus 12) 39 ($3\frac{1}{4}$ The Pinion of Report being then 12, the Count-wheel will be 39.

The Calculation of a Year-piece is the ſame ; however, to perfect the Reader therein, we ſhall give this Example.

Suppoſe your Piece were to go 395 Days with 16 Turns, and 26 Striking-pins. There are 3851 Strokes in one Turn of the Great-wheel (by the *Rule* 1.) for 16 : 395 : : 156 : 3851. And 3851 divided by 26, leaves 148 to be broken into Quotients, for Wheels and Pinions, which may be 12 and 12 ; for 12 into 12, gives 144, which is as near as it can well be to 148 ; then the Work ſtands thus :

10) 120

10) 120 (12
8) 96 (12
78 (26 Pins.

In this Place, it would not be amiſs for you to correct your Work, and ſee how near your Number comes to what you deſigned at firſt, becauſe they did not fall out exact.

Firſt, for the true Continuance of your Clock, *Multiply the Quotients and Striking-pins together, and you'll have the true Number of Strokes in one Turn of the Great-wheel.* So here, 12 x 12 x 26 = 3744, which is the true Number of Strokes; then the true Continuance (by *Rule* 2) is 384, for

As 156 : 3744 :: 16 : 384

If this Continuance doth not pleaſe you, you may come nearer to your firſt propoſed Number of 395 Days by a ſmall Encreaſe of the Number of Turns, (by *Rule* 3) *viz.* making your Turns almoſt 16 ½; for,

As 3744 : 156 :: 395 : 16 ½ near.

But for the Pinion of Report, if you fix it on the Great-wheel, it will require an exceſſive Number; if you fix it upon the Pin-wheel, which is uſual, then (by *Rule* 5) it will ſtand thus, 13) 39 (3 the Quotient is 3, the Pinion of Report 13, and the Count-wheel 39.

If to any Clock it be required to fit *Quarters* or *Chimes*, &c. you may proceed thus.

1. You are to conſider, that Quarters are generally a diſtinct Part from the Clock-part, which ſtriketh the Hour; and the *Striking-wheel* may be the Firſt, Second-wheel, *&c.* according to your Clock's Continuance; unto which Wheel you may fix the Pinion of Report.

The *Locking-wheel* muſt be divided into 4, 8, or more unequal Parts, ſo as to ſtrike the Quarter, and lock at the firſt Notch, or the Half Hour, and lock at the ſecond Notch, *&c.* And in doing this you may make it to Chime the Quarters, or ſtrike them upon two Bells, or more.

'Tis uſual for the Pin-wheel or the Locking-wheel to unlock the Hour-part in theſe Clocks; which is eaſily done by ſome Jogg or Latch, at the End of the laſt Quarter, to lift up the Detents of the Hour-parts.

If you would have your Clock ſtrike at the Half Hour, as well as whole Hour, you muſt make the Locking-wheel of the Hour part double; that is, it muſt have two Notches of a ſort, to ſtrike 1, 2, 3, 4, *&c.* twice a-piece.

2. As for *Chimes*, I need ſay nothing of the Lifting-pieces and Detents, to lock and unlock; nor of the Wheels to bridle the Motion of the Barrel; only you are to obſerve, That the Barrel muſt be as long in turning round, as you are in Singing the Tune it is to Play.

As for the *Chime-Barrel*, it may be made up of certain Bars that run a-thwart it, with a convenient Number of Holes punched in them, to put in the Pins that are to draw each Hammer. By this means you may change the Tune, without changing the Barrel. Such is the *Royal-Exchange* Clock in *London*, and others. In this Caſe, the Pins or Nut which draw the Hammers, muſt hang down from the Bar, ſome more, ſome leſs, and ſome ſtanding upright in the Bar; the Reaſon whereof is, to play the Time of the Tune rightly.

For the Diſtance of each of theſe Bars may be a Semibrief, *&c.* of which hereafter.

But the uſual way is, to have the Pins that draw the Hammers, fixed on the Barrel. For the placing of which Pins, you may proceed by the way of Changes on Bells, *viz.* 1, 2, 3, 4 *&c.* Or rather make uſe of the Muſical Notes.

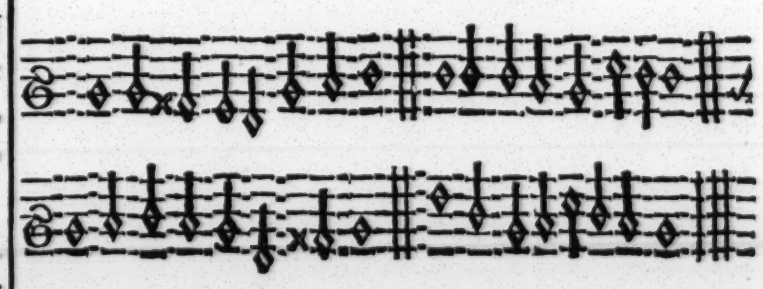
Where you muſt obſerve, what is the Compaſs of your Tune, or how many Notes or Bells there are from the higheſt to the loweſt; and accordingly, the Barrel muſt be divided from End to End.

Thus, in the following Examples, each of thoſe Tunes are 8 Notes in compaſs; and accordingly, the Barrel is divided into 8 Parts. Theſe Diviſions are ſtruck round the Barrel, oppoſite to which are the Hammer-tails.

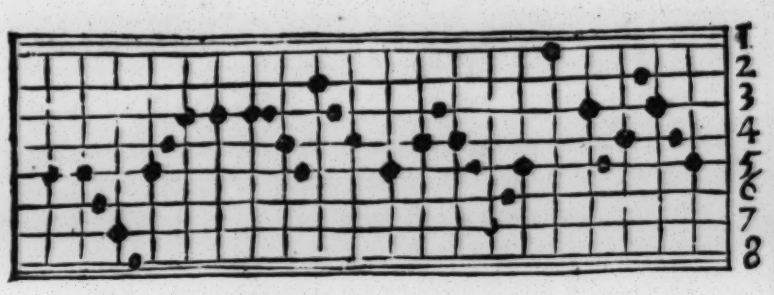
I ſpeak here, as if there was only one Hammer to each Bell, that you may more clearly apprehend what I am explaining. But when two Notes of the ſame Sound come together in a Tune, there muſt be two Hammers to that Bell, to ſtrike it. So that, if in all the Tunes you intend to Chime, of 8 Notes compaſs, there ſhould happen to be ſuch double Notes on every Bell, inſtead of 8 you muſt have 16 Hammers; and accordingly, you muſt divide your Barrel, and ſtrike 16 Strokes round it, oppoſite to each Hammer-tail.

Then you are to divide it round about into as many Diviſions, as there are Muſical Bars, Semibriefs, Minums, *&c.* in your Tune.

Thus the 100th Pſalm-tune hath 20 Semibriefs; and each Diviſion of it is a Semibrief. The firſt Note of it alſo is a Semibrief, and therefore on the Chime-Barrel muſt be a whole Diviſion from 5 to 5, as you may underſtand plainly, if you conceive the Surface of a *Chime-Barrel* to be repreſented by the following Tables, as if the Cylindrical Superficies of the Barrel were ſtretch'd out at length or extended on a Plain. And then ſuch a Table ſo dotted or divided, if it were to be wrapped round the Barrel, would ſhew the Places where all the Pins are to ſtand in the Barrel: For the Dots running about the Table, are the Places of the Pins that play the Tune.

The Notes of the 100 *Pſalm.*

A Table

A Table for Dividing the Chime-Barrel of the 100 *Pſalm.*



If you would have your Chimes compleat indeed, you ought to have a Set of Bells to the Gamut Notes; ſo as that each Bell having the true Sound of *Sol*, *La*, *Mi*, *Fa*, you may play any Tune with its Flats and Sharps; nay, you may by theſe means play both the Baſs and Treble, with one Barrel.

And by ſetting the Names of your Bells at the Head of any Tune, you may eaſily transfer that Tune to your Chime-Barrel, without any Skill in Muſick. But obſerve, That each Line in the Muſick is three Notes diſtant; that is, there is a Note between each Line, as well as upon it.

To Calculate a Piece of Clock-work that ſhall repreſent any of the Celeſtial Motions.

To effect which, you may either make thoſe Motions to depend on the Work already in the Movement, or elſe you may meaſure them by the Beats of a Balance or Pendulum.

If you would proceed the latter way, you muſt however contrive a Piece to go a certain Time, with a certain Number of Turns.

But to determine the Motion intended, you muſt proceed one of theſe two ways; either,

1. Find how many Beats are in the Revolution; divide theſe Beats by the Beats in one Turn of the Wheel or Pinion, which you intend ſhall drive the intended Revolution, and the Quotient ſhall be the Number to perform the ſame; which, if it be too big for one, may be broken into more Quotients. Thus, if you would repreſent the Synodical Revolution of the Moon, (which is 29 Days, 12 $\frac{3}{4}$ Hours) with a Pendulum that ſwings Seconds, the Movement to go 8 Days, with 16 Turns of the Fuſy, and the Great-wheel to drive the Revolution, divide 2551500 (the Beats in 29 Days, 12 $\frac{3}{4}$ Hours) by 4200, (the Beats in one Turn of the Great-wheel) and you'll have 59 in the Quotient; which being too big for one, may be put into two Quotients.

Or,

2. You may proceed as directed before in Calculating a Piece of Watch-work, *viz.* Chuſe your Train, Turns of the Fuſy, Continuance, *&c.* And then, inſtead of finding a Quotient for the Pinion of Report, find a Number, (which is all one as a Pinion of Report) to Specificate your Revolution by this Rule following.

As the Beats in one Turn of the Great-wheel is to the Train; So are the Hours of the Revolution to the Quotient of the Revolution.

Thus, to perform the Revolution of *Saturn*, (which in 29 Years, 183 Days) with a 16 Hour Watch, of 26928 Beats in one Turn of the Fuſy, and 20196 the Train; the Quotient of the Revolution will be 193824. For as 26928 : 20196 :: 258432, (the Hours in 22 Years and 183 Days) To 193824.

Here Note, That the Great-wheel Pinion is to drive the Revolution-work.

But if you would have the Revolution to be driven by the Dyal-wheel, and the Work already in the Movement, then you muſt firſt know the Days of the Revolution. And becauſe the Dyal-wheel commonly goeth round twice in a Day, therefore double the Number of the Days in the Revolution, and you have the Number of Turns of the Dyal-wheel in that Time. This Number of Turns, is what you are to break into a convenient Number of Quotients, for the Wheels and Pinions.

1. *A Motion to ſhew the Day of the Month.*

The Days in the largeſt Month are 31; thoſe doubled are 62, which are the Turns of the Dyal-wheel, which may be broken into theſe two Quotients 15 $\frac{1}{2}$ and 4, whoſe Product is 62; therefore chuſing your Wheels and Pinions (by the former Directions) your Work is done, and will ſtand thus:

4) 62 (15 $\frac{1}{2}$
5) 20 (4

Or if a larger Pinion than one of 5 be neceſſary, by reaſon it is concentrick to a Wheel, you may take 10 for the Pinion, and 40 for the Wheel; then 'twill ſtand thus:

4) 62 (15
10) 40 (4

And the Work will lie thus in the Movement, *viz.* Fix your Pinion 10 concentrical to the Dyal-wheel (or to turn round with it upon the ſame Spindle) This Pinion 10 drives the Wheel 40; which Wheel has the Pinion 4 in its Center, which carrieth about a Ring of 62 Teeth, divided on the upper Side into 31 Parts or Days.

Or, without the Trouble of many Wheels you may effect this Motion, *viz.* By a Ring divided into 30 or 31 Days, and as many Fangs or Teeth, which are caught and puſhed forward once in 24 Hours by a Pin in the Wheel, that goeth round in that Time. This is the uſual way in Royal Pendulums, and many other Watches; and therefore being common, there needs no more be ſaid of it.

2. *A Motion to ſhew the Age of the Moon.*

The *Moon* finiſheth her Courſe in 29 Days and a little above an half. This 29 $\frac{1}{2}$ Days, (not regarding the ſmall Exceſs) makes 59 twelve Hours or Turns of the Dyal-wheel, which is to be broken into convenient Quotients; which may be 5, 9, and 10, as here.

10) 59

10) 59 (59 4) 59 (14 3/4
4) 40 (10 10) 40 (4.

Or 14 3/4 and 4; ſo that if you fix a Pinion of 10 concentrical with your Dial-wheel, to drive a Wheel of 40, which drives a Pinion of 4, which carries about a Ring or Wheel of 59 Teeth once in 29 1/2 Days; which Ring may be alſo be divided into 29 1/2 Parts; or carry an Index to point to a Circle ſo divided.

3. *A Motion to ſhew the Day of the Year, the Sun's Place in the Ecliptick, Sun's Riſing or Setting, or any other Annual Motion of 365 Days.*

The Double of 365, is 730, the Turns of the Dial-wheel in one Year; which may be broken into theſe Quotients, *viz.* 18 1/4 and 10 and 4, thus.

4) 73 (18 1/4
4) 40 (10
5) 20 (4

Or into 18 1/4, 8 and 5 thus,

4) 73 (18 1/4
4) 32 (8
4) 20 (5

So that a Pinion of 5 is to lead a Wheel of 20, which again, by a Pinion of 40; and that by a Pinion of 4, carrieth about a Wheel or Ring of 73 divided into 12 Months, and their Days; or into the 12 Signs, and their Degrees, or into the Sun's Riſing and Setting, *&c.* And for the ſetting on of this laſt, Mr. *Oughtred* has given a Table in his *Opuſcula*.

4. *To ſhew the Tides at any Port.*

This is done without any other trouble, than the *Moon*'s Ring (mentioned in the 2 of this) to move round by a fixed Circle, divided into twice 12 Hours, and numbred the contrary way to the Age of the Moon.

To ſet this to go right, you muſt find out at what Point of the Compaſs the *Moon* makes Full Sea, at the Place you would have your Watch ſerve to: Convert that Point into Hours, allowing for every Point North or South loſt, 45 of an Hour.

Thus at *London-Bridge*, 'tis vulgarly thought to be High-water the *Moon* at North-Eaſt, and South-Weſt, which are four Points from the North or South.

Or thus: By the Tide-Tables, learn how many Hours from the *Moon*'s Southing, 'tis High-water.

Or thus: Find at what Hour it is High-water, at the Full and Change of the *Moon*; as at *London-Bridge*, the full Tide is reckoned to be three Hours from the *Moon*'s Southing, or at 3 of the Clock at the Full and Change. The Day of Conjunction, or *New-Moon*, with a little Stud to point, being ſet to the Hour ſo found, will afterwards point to the Hour of the full Tide.

This is the common way: But this Ring being always in Motion, whereas the Tides are not, a better way perhaps may be found out; as ſuppoſe by cauſing a Wheel or Ring to be moved forward only twice a Day, and to keep Time (as near as can be) with the Accurate Mr. *Flamſteed*'s moſt correct Tables.

5. *To calculate Numbers, to ſhew the Motion of the Planets, the ſlow Motion of the fixed Stars, the Sun's Apogæum, the Revolution of the Dragon's Head and Tail, whereby the Eclipſes of the Sun and Moon are found, the Revolution of the ſeveral Orbs, according to the* Ptolemaick *Syſtem, or of the Celeſtial Bodies themſelves, according to better Syſtems*, &c.

Beſides the Direction already given, there needs only thus much in general; *i. e.* Knowing the Years of any of theſe Revolutions, you may break that Number into Quotients, if you will make the Revolution depend upon the Year's Motion which is already in the Movement, and deſcribed in the 3d of this. Or if you would have it depend upon the Dial-wheel, or upon the Beats of a Pendulum, enough is ſaid before to direct you in this Matter.

In all theſe ſlow Motions, you may ſomewhat ſhorten your Labour by endleſs Screws to ſerve for Pinions, which are but as a Pinion of one Tooth.

An Inſtance of this you have in the Account Sir *Jonas Moore* gives of his large Sphere-going Clock-work, in his *Math. Compendium*, p. 117. where a Motion of 17100 Years is performed by ſix Wheels, being for the Sun's *Apogæum*. His Words are theſe.

" For the Great-wheel fixed is 96, a Spindle-
" wheel of 12 Bars turns round it 8 times in 24
" Hours; that is, in 3 Hours; after theſe, there
" are four Wheels, 20, 73, 24, 75, wrought by
" endleſs Screws, that are in Value but one;
" wherefore 3, 20, 73, 24, and 75, multiplied
" together continually produceth 7884000 Hours,
" which divided by 24, gives 3285000 Days,
" equal to 900 Years. Now on the laſt Wheel,
" 75 is a Pinion of 6, turning a great Wheel that
" carrieth the *Apogæum* Number 114; and 114
" divided by 6, gives 19 the Quotient; and 900
" Times 19, is 17100 Years.

WATER, which the Chymiſts call *Phlegm*, is the 4th of the 5 Chymical Principles, and one of the Paſſive ones. 'Tis never drawn pure and unmix'd, which makes it a little more deterſive than common Water.

This Principle, probably, contributes much to the Growth of Bodies, in that it both renders and keeps the Active Principles fluid. So that they are capable of being convey'd by Circulation into the Pores of the Mix'd; and alſo, becauſe it tempers their exhorbitant Motion, and keeps them together, ſo that they are not ſo eaſily and ſoon diſſipated.

In all ſuch Bodies, whoſe Active Subſtances are joined and united pretty cloſely together, as in common Salt, Tarter, all Plants that are not odoriferous, and in many Animal Bodies this Principle is the firſt that comes in Diſtillation. But when Water is mixed with volatile Salts, or with the Spirit of Wine, or is in any odoriferous Mixts, then the volatile Particles will riſe and come away firſt.

WATER-*Born*, is when a Ship even and juſt with the Ground, firſt begins to float or ſwim, being born up by the Water.

WATER-*Line* of a Ship, is that which diſtinguiſheth that Part of her which is under Water from that above, when ſhe is duly laden.

WATER-*Shot*, is a ſort of Riding at Anchor, when a Ship is *Moored* neither croſs the Tide nor right up and down, but quartered betwixt both.

WATER-*Way*, in a Ship, is a ſmall Piece of Timber lying fore and aft on her Deck, cloſe by her Sides, to prevent the Waters running down there.

WATERY *Humour* of the Eye: See *Aqueous Humours*,

WATERY *Meteors*: See *Meteors*.

WAVED, or *Wavy*, a Term in Heraldry, when a Bordure, or any *Ordinary* or *Charge* in a Coat of Arms hath its Out-lines of this Shape

eaſily riſing and falling like the Waves of the Sea.

WAVES *of the Sea*, or *any Water*. Sir *Iſaac Newton* hath demonſtrated, *Lib.* 2. *Prop.* 45. *Princip. That their Velocity is always in half the Ratio of their Breadth*; and their Breadth is eſtimated to be the Diſtance between the two Summits, or top Edges of any two Waves; or a right Line drawn from the middle of one Hollow, to the middle of the other.

Let there be a Pendulum, whoſe Length from the Point of Suſpenſion to the Center of Oſcillation ſhall be the Breadth of any two Waves; then while the Pendulum makes it Oſcillations, the Waves will paſs over a Diſtance equal to their Breadth.

Hence he concludes, That thoſe Waves whoſe Latitude or Breadth is $3\frac{1}{18}$ Pariſian Feet, will paſs over a Diſtance equal to their Breadth in a Second of Time.

And in the Time of one Minute, theſe Waves will run $183\frac{1}{3}$ Feet, and in the Space of an Hour, 11000 ſuch Feet nearly.

WAY of a Ship, is ſometimes the ſame with the *Rake* or *Run* of her forward or aftward on: But 'tis moſtly uſed as to her Sailing: For when ſhe goes a-pace, they ſay, *She hath a good Way*, or makes a freſh Way. Alſo when they keep an Account how faſt ſhe ſails by the Log; they call it *keeping an Account of her Way*: And becauſe moſt Ships are apt to *fall a little to Leeward* of their true Courſe, they always in caſting up the Log-board, allow ſomething for her *Leeward Way*, or *Lee-way*; which is one Point or more according to her Way of Sailing.

WAY *of the Rounds* in Fortification, is a Space left for the Paſſage of the *Rounds* between the Rampart and the Wall of a Fortify'd Town. But it is not ſo much in uſe, becauſe not having a Parapet above a Foot thick, it may be ſoon overthrown by the Enemies Cannon.

WAYWISER, the ſame with Perambulator; which ſee.

WEAPON-SALVE: See *Armarium*.

WEATHER-COYLE; when a Ship being a Hull, has her Head brought about, ſo as to lie that way which her Stern did before, without looſing of any Sail, but only by the bearing up of the Helm, this is called *Weather-coyling* of her.

WEATHER-GAGE, that Ship is ſaid to have the *Weather-gage* of another, when ſhe is to Windward of her.

WEIGHT *of the Air*: See Air. Mr. *Boyle* calculates, That when the Mercury in the common Barometer, ſtands at 30 Inches, the Weight of the whole Atmoſpherical Column of Air, incumbent on an Inch Square of Space, is 18 Pounds $\frac{1}{8}$ *Troy*, or 15 Pounds $\frac{1}{17}$ *Averdupois*.

WEIGHT *of a Cubick-Inch of ſeveral Bodies.*

Mr. *Boyle* found that the Weight of a Cubick-Inch.

Of Water was 256 Grains.
Of Quickſilver 3580 Grains.

	Weight. Oz.	*Magnitude.*	*Weight in Water.*
Gold.	9.91735	0.10083	9.33962
Quickſilver.	7.93388	0.12604	7.35615
Lead.	6.16198	0.16229	5.58425
Silver.	5.50083	0.18179	4.92310
Copper.	4.81342	0.20776	4.23569
Hammered Iron.	4.27715	0.23380	3.69942
Caſt Iron.	3.96321	0.25258	3.29048
Tin.	3.96694	0.25208	3.38921
Marble.	1.59631	0.62644	1.01858
Common Stones.	1.09835	0.91045	0.52062
Honey.	0.79339	1.26042	0.21566
Salt Water.	0.57773	1.79490	
Freſh Water.	0.52773	1.77490	
Oil.	0.47603	2.10069	
Wheat.	0.37628	2.65757	
Dried Oak.	0.40745	2.45609	

The Weight of Bodies on the Surface of the Planets.

Suppoſe in the Sun it weigh 10000 { that ſame Body on the
Earth muſt weigh 01251 $\frac{1}{2}$
Of { *Jupiter*, 00804 $\frac{1}{2}$
Moon, 00630
Saturn, 90536

Weight of a Cubick Foot of ſeveral Bodies.

Averdupois Weight.	lb.	ʒ.	
Wheat of the beſt ſort,	48	8	0
White Oats,	29	8	0
White Peaſe,	50	8	0
Barley,	41	2	0
Malt two Months old,	30	4	0
Field Beans,	50	8	0
Wheaten-meal unſifted,	31	0	0
Rye-meal unſifted,	28	0	0
Pump-water,	62	8	0
Bay-ſalt,	54	1	0
White Sea-ſalt,	43	12	0
Common Sand,	85	4	0
Newcaſtle Coal,	67	12	0
Gravel,	109	5	0
Wood-aſhes,	58	5	0

Our Excellent Sir *Iſaac Newton* ſaith, he found by moſt accurate Experiments on Pendulums, that the

the Quantity of Matter in Bodies, is always proportionable to their *Weight*.

He ſaith alſo, That the *Attractiones Motrices*, or Weights of one Sphere, or Globe, to another at equal Diſtances from the Centers, are as the attracting and attracted Sphere multiplied into one another; or as the Product of thoſe two Spheres But at unequal Diſtances from the Centers, as thoſe Products divided by the Squares of the Diſtances between the Centers, *Prop.* 76. *Corol. Lib.* 1.

A Table of the Foreign Pound Averdupois, *compared with our Pound* Engliſh.

	The Pound *Averdupois* into 100 Parts.
London,	100
Paris,	0.93
Lyon,	1.09
Bologn,	0.89
Amſterdam,	0.93
Antwerp,	0.98
Leyden,	0.96
Lorain,	0.98
Mechlin,	0.98
Middlebourg,	0.98
Strasbourg,	0.93
Bremen,	0.94
Cologn,	0.97
Frankfort,	0.93
Hamborough,	0.95
Leipſick,	1.15
Norimberg,	0.94
Vienna,	0.83
Caſtile,	0.99
Lisbon,	1.06
Gibraltar,	1.03
Toledo,	1.00
Rome,	1.23
Bononia,	1.27
Florence,	1.23
Naples,	1.43
Genoa,	1.42
Mantua,	1.43
Milan,	1.40
Parma,	1.43
Venice,	1.53
Dantzick,	1.19
Copenhagen,	0.94
Prague,	1.06
Cairo,	1.61
Conſtantinople,	0.86

Averdupois Weight, is that by which all Phyſical Drugs, Grocery, Roſin, Wax, Pitch, Tar, Tallow, Soap, Hemp, and all things that have Waſte; all baſe Metals and Minerals, as Iron, Steel, Lead, Tin, Copper, Alom, Coperas, *&c.* are weighed.

A Table of Averdupois Weight.

Scruples.					
3	*Drachms.*				
24	8	*Ounces.*			
384	128	16	*Pounds.*		
43008	14336	1792	112	*Hundreds.*	
860160	286720	35840	2240	20	*Tuns.*

Troy Weight, is that by which Gold, Silver, Jewels, Amber, Electuaries, Bread, Corn, Liquors, *&c.* are weighed; and from this Weight all Meaſures of wet and dry Commodities are taken.

A Table of Troy Weight.

Grains.			
24	*Penny-weight.*		
480	20	*Ounces.*	
5760	240	12	*Pounds.*

A Table of Apothecaries Weight.

Grains.				
20	*Scruples.*			
60	3	*Drachms.*		
480	24	8	*Ounces.*	
5760	288	96	12	*Pounds.*

Foreign Weights.

Generally three ſorts of *Weights* are uſed for Merchandize.

1. Weights of great Content; as Hundreds, Kintals, Centeners, Talents, Thouſands, Weighs, Skippounds, *Charges*, Liſpounds, Rooves, *&c.*

2. Weights of leſſer Content; as Pounds, Mina's, Manehs' Rotuli, *&c.*

3. Small Weighrs as Ounces of 12, 14, 16, 18, 20, 30, *&c.* to the Pound, and the Subdiviſions of the Ounce.

Talents of the *Hebrews*, *Greeks*, are ſeen before.

Cantars, Centeners, or Kintals, ſometimes wrote Quintals, accounted by Merchants as Hundreds; are of 100, 112, 120, 125, 128, 132, and 140 Pounds.

Weighs, or Weys, are commonly 165 Pound, or 180 Pound, or 200 Pound and ½ for a Charge. Skippounds, uſed in many Places, *quaſi Shippound*, or *Shippond*; for as in *Italy*, and other Countries, the *Carga*, *Cargo*, or *Charge*, is the Loading of an

Horſe of 300 or 400 Pound: So is the Skippound taken for the Dividend of a Laſt of Corn laden in a Ship. Skippounds are of 300, 320, 340, and 400 Pound to the Skippound. *Cargo* is often taken for the whole Lading or Burthen of a Ship.

Liſpounds, of 15, 16, and ſometimes 20 Pound to the Liſpound.

Rooves, or Arrobas of 10, 20, 25, 30, and 40 Pound to the Roove.

Stone of 6, 8, 14, 16, 18, 20, 21, 24, 32, and 40 Pound to ſome Stones.

Poade of *Ruſſia*, by *Heylin* is 40 Pound.

Mixias, is commonly underſtood to be 10000 Drachms, of 8 to an Ounce, and 12 Ounces to a Pound.

Seſtertia's of *Cleopatra* in *Egypt*, and other Places in *Africa*, were two Pounds $\frac{1}{2}$, for 50 Seſtertia's make 125 Pound, but in *Thracia* it was but 2 $\frac{1}{2}$ of a Pound.

Pound is divided into more or leſs Ounces.

Mark Weight, commonly 8 Ounces.

Mark Pound 16 Ounces, that is 2 Marks.

Mina Ptolemaica, 1 $\frac{1}{2}$ *Rotuli*, or 18 Ounces, or 144 Drachms, and in leſſer Diviſions thus:

	Rotuli.	*Ounces.*	*Drachms.*	*Scruples.*	*Oboli.*	*Lupines.*	*Siliqua's,* or *Carrats.*	*Aereoli.*
Mina.	1 $\frac{1}{2}$	18	144	432	864	1296	2592	6912
Rotulus.		12	96	288	576	864	1728	4608
Ounce.			8	24	48	72	144	384
Drachm.				3	6	9	18	48
Scruple.					2	3	6	16
Obolus.						1 $\frac{1}{2}$	3	8
Lupine.							2	5 $\frac{1}{3}$
Siliqua, or *Carrat.*								2 $\frac{1}{2}$

Mane, or Maneh, in *Arabia*, double one of 16 Ounces, and one of 20 Ounces.

That called *Alialica*, *Baſaria*, *Alanthalica*, and *Ægyptia*.

This *Romana*, and is indeed of *Alexandria*, the Pound there being 20 Ounces.

Rotulus in *Arabia*, *Syria*, *Aſia Minor*, *Ægypt*, and *Venice*, reckoned for a Pound, is thus divided.

	Sachoſi, or *Ounces.*	*Sextaries,* or *Cicles.*	*Deniers,* or *Aureos.*	*Darching,* or *Drachms.*	*Scruples,* or *Garma.*	*Obolos,* or *Orloffs.*	*Danings,* or *Lupines.*	*Kirats,* or *Siliqua's.*	*Aereolus,* or *Keſtuffs.*
Rotulus, or *Pound.*	12	24	84	96	288	576	864	1728	3456
Sacros, Sachos, or *Ounce,*	2	7		8	24	48	72	144	288
Sextary. or *Cicle.*	3 $\frac{1}{2}$			4	12	24	36	72	144
Denier, or *Aureus, Aunius, Andanakus.*	1 $\frac{1}{7}$	3 $\frac{3}{7}$		6 $\frac{6}{7}$	10 $\frac{2}{7}$	20 $\frac{4}{7}$	41 $\frac{1}{7}$		
Drachm, or *Darching Alky, Oliginat,*	3	6	9		18	36			
Scruple, Garme, or *Kenmer.*	2	3	6	12					
Obolus, Orloff, or *Onolaffat, Onolum.*	1 $\frac{1}{2}$	3	6						
Daning, or *Danic Lupine.*	2	4							
Carrat, Kirat, or *Siliqua.*	2								

Some

Some mention the Phyſick Pound at *Venice* to have but 7 Drachms in the Ounce.

The Lupines at *Venice*, called *Sextula's*, becauſe 1 Ounce hath 72, which is 6 times 12.

Every Keſtuff, or Aereolum (or Areolum) is the Weight of 2 Barly-Corns, ſo is there in the Rotulus 6912 Grains.

The *Alexandrian* Pound 20 Ounces, the Ounce 8 Scruples.

The *Italian* Pound generally is divided into 12 Ounces, 1 Ounce into 2 Staters, and 1 Stater into 4 Drachms; ſo hath 1 Pound 24 Staters, 96 Drachms.

But in Phyſick, there and in other Places, thus.

	Ounces.	*Loots.*	*Sizaynes, or Siliquas.*	*Drams.*	*Scruples.*	*Obolos.*	*Siliqua's.*	*Grains.*
Pound.	12	24	48	96	288	576	1728	5760
Ounce.	2	4	8	24	48	144	480	
Loot.	2	4	12	24	72	240		
Sizayne, or Siliqua.	2	6	12	36	120			
Dram.	3	6	18	60				
Scruple.	2	6	20					
Obolus.	3	10						
Siliqua.	$3\frac{1}{2}$							

Spain, ſome ſay, hath a *Mina Romana*, which contains 20 Ounces: A common Pound of 16 Ounces, and a Phyſick Pound of 12 Ounces, each Ounce divided into 8 Drachms. The Ounce of the *Toletan* Phyſick Pound excepted, which hath, as ſome affirm, 9 Scruples.

	Libra.	℥.	*Duels.*	*Quaterns.*	*Sixths.*	ʒ.	*Syrian Beans.*	϶	*Obolos.*	*Carats.*	*Chalcos.*	*Grains.*
Mina Romana.	$1\frac{2}{3}$	20	60	80	120	160	240	480	960	2880	5700	11520
Libra.	12	℥	36	48	72	96	144	288	576	1728	3456	6912
℥.	3	*Duel.*	4	6	8	12	24	48	144	288	576	
Duel.	$1\frac{1}{3}$	*Quaterns.*	$1\frac{1}{2}$	2	$2\frac{2}{3}$	4	8	16	48	96	192	
Quaterns.	$1\frac{1}{2}$	*Sixth.*	2	3	6	12	36	72	144			
Sixth.	$1\frac{1}{3}$	ʒ.	2	4	8	24	48	96				
ʒ.	$1\frac{2}{12}$	*Syrian Bean.*	3	6	12	36	72					
Syrian Bean.	2	϶	4	8	24	48						
϶	2	*Obolus.*	6	12	36							
Obolus.	3	*Carat.*	8	24								
Carat.	6	*Chalcus.*	12									
Chalcus.	2											

The Common Pound of Spain.

	Marks.	*Ounces.*	*Drams.*	*Adarmes, or Adarams.*
Pound.	2	16	218	256
Mark.		8	64	128
Ounce.			8	16
Dram.				2

The Phyſick Pound of Toledo.

	Ounces.	*Drams.*	*Scruples.*	*Grains.*
Pound.	12	108	324	6480
Ounce.		9	27	540
Dram.			3	60
Scruple.				20

Pound Weights of France.

The Weight us'd by the Merchants for the moſt part, is of 16 Ounces, called *Livre d' Anvers*, tho' in ſome Places but 14, others 18 Ounces. *Cotgrave* writes the *Liure*, or *Bund de Lyon*, to be 15 Ounces, that *de Spaigne* but 14 Ounces, and divides the Pound of 16 Ounces, into 30 Halfs, 64 Sezaines, 128 Treſeaun, 256 Groſs, 512 Demigroſs. And the Pound uſed by the *Farriers*, conſiſting of 12 Ounces into 90 Drams, 270 Scruples, 540 Oboles.

After *Malines*, the Ordinary, or Pound commonly uſed for Merchants, is parted thus.

The Pound Weight of Paris.

	Ounces.	*Groſs.*	*Scruple.*	*Grains*
Pound	16	128	384	9216
Ounce.		8	24	576
Groſs.			3	72
Scruple.				24

The Phyſick Pound of Lyons.

	Ounces.	*Drams.*	*Scruples*	*Grains.*
Pound.	12	96	288	5760
Ounce.		8	24	480
Dram.			3	60
Scruple.				20

Cotgrave mentions a Weight called *Sentule* of 4 *Scruples*, or the ſixth Part of 1 Ounce.

Pound Weights of Germany.

The Pound Weight of Vienna *in* Auſtria.

	Ounces.	*Loots*	*Quints.*	*Pennin.*	*Grains.*
Pound.	16	32	128	512	
Ounce.		2	8	32	
			4	16	
				4	
					25

The German *Phyſick Pound, by* Alſted.

	Ounces.	*Drams.*	*Scruples.*	*Grains.*
Pound.	12	96	288	5760
Ounce.		8	24	480
Dram.			3	60
Scruple.				20

In the *Low-Countries* they uſe Pounds of 12, 14, 15, *&c.* Ounces.

At *Bruges* in *Flanders*, they have 1 Pound of 14 Ounces, and 1 Pound of 16 Ounces; the 100 Pound of 16 Ounces makes 108 Pound of 14 Ounces; but the Ounces of 14 to the Pound are the heavieſt, for 100 of theſe are 105 $\frac{1}{2}$ Ounces of 6 to the Pound; this Pound is thus divided.

	Ounces.	Loots.	Sizaines.	Drams.
Pound.	16	32	64	128
Ounce.	2	4	8	
Loot.	2	4		
Sizaine.	2			

Drachm or *Quint.*

At *Antwerp* they uſe to weigh by the Hundred Pounds even Weight, called *Suttle*, for which commonly at the Weigh-houſe, is allow'd 101 Pound. A Stone is 8 Pound. The Skippound 300 Pound. The Weigh 165 Pound. The Carga, or Charge, 400 Pound, which is two Bales of 203 Pound each, for an Horſe to carry. The Pound there is 16 Ounces.

This 100 *Pound of* Anwerp, *weigheth in the Places following.*

1 3 *Abbevile*, 94 ¾ lb.
2 11 *Achri*, 17 ¼ Rotuli. The 100, a Cantar Tambaran.
Alder, { 138 Ordinary Weight. 91 To weigh Steel, Tin, and Copper.
1 8 *Ailoſt*, 108 lb.
3 1 *Alcario*, or *Cario*, { 164 lb. 78 Minas of 16 *Oz.* to the Mina. 27 Rotuli, of 6 lb. to the Rotuli.
1 Peſo is 1 ½ Metallicum, or a Drachm.
50 Metallici 1 Mark. Our Mark 42 Metallici.
Musk and Amber ſold by this Weight in *Egypt*.
2 11 *Allepo*, 22 Rotuli, of 100 to a Cantar.
1 Rotulus is 60 *Oz.* or 480 Metecalos, or Drachms.
1 *Oz.* is 8 Metecalos, or Drachms.
1 Drachm, or Metecalo, is ½ Peſa.
10 Peſa's are 1 Onga, or Ongia, to weigh Civet.
2 1 *Alexandria*, { 108 Rotuli, of 190 to a Cantar. 78 Mina's of 20 *Oz.*
America Malica, { 90 lb. of 12 *Oz.* to the lb. 36 Mina's Seſtertias of 30 *Oz.*
2 11 *Aman*, as *Aleppo*.
1 8 *Amſterdam*, 94 ⅘ lb. And for Silks they uſe the Weight of *Antwerp*.
1 7 *Aquila*, 147 lb.
1 3 *Aquiſmort*, 102 lb.
2 2 *Arabia*, { 78 Rotuli. 104 Maires, or Minas. 148 Pound. 936 Ounces, or Sachoſi, 12 to 1 Rotulus.
3 1 *Arcadia*, 92 lb. and 83 lb. for *Mavigetto*.
1 5 *Archipelago*, 120 lb.
Armaria bona, { 105 lb of *Oz.* to the lb. 93 lb. of 18 *Oz.* uſed for Silk and Copper. 54 lb. of 32 *Oz.* Fleſh Weight.
2 3 *Armenia*, 130 lb.
1 14 *Arragon*, { 106 lb. 96 lb Great Weight for Wooll.
1 8 *Arſchot*, 100 lb. all one with *Antwerp*.
1 8 *Audenarde*, or *Oudenard*, 110 lb.
1 3 *Avignon*, 111 lb. a Centener is two Frailes of 56 lb.
1 4 *Ausburgh*, 95 lb.
1 8 *Bergen Op Zome*, 98 lb.
1 14 *Barcelona*, { 96 lb. Wooll Weight. 106 lb. Common Weight. 131 lb. Saffron Weight.
1 4 *Baſil*, 96 lb. They uſe Centeners of 100 lb. 120 lb. and 132 lb.
1 7 *Bergamo*, 137 lb. and 108 lb. by the two Quintals.
1 1 *Bergen*, 96 lb. but uncertain weighing with a Sling.
1 4 *Bibrach*, 92 lb. of 16 *Oz.* to 1 lb. as *Conſtance*.
2 11 *Barutti*, 21 Rotuli.
1 7 *Bologna*, 53 lb. of 30 *Oz.* to weigh Wax and Wooll by Rooves of 1 lb.
1 4 *Borgoigne*, as *Abbevile*.
1 4 *Botſen*, { 128 lb. Ordinary Weight. 91 lb. To weigh Steel, Tin, and Copper.
1 3 *Bourdeaux*, as *Abbevile*.
1 4 *Breſlau*, { 120 lb. by the Centerer of 24 lb. to one Stone, and five Stone to to one Centener, and 5 ½ Stone to the Centener of 132 lb. there alſo uſed.
1 7 *Breſcia*, 184 lb. and for *Venice* Gold 136 lb.
1 8 *Bridges*, or *Bruges*. { 100 lb. 93 lb. for Butter and Cheeſe, the Stone 6 lb. and 20 Stone one Weigh; but Wooll Weight is 108 lb. weighed by Stones of 6 lb. called Nails, or Neils, 18 Neils to the Hundred, 45 Neils to the Weigh, 2 Weighs to one Pocket of Wool. *Hunt* ſays, 18 Neils is 144 lb. of our Wooll Weight.
1 8 *Bruſſels*, as *Arſchot*.
Bucca, 44 Ocha's.
1 14 *Burgos*, 93 Rotuli.
2 1 *Burſa*, 88 Rotuli.
3 4 *Cabo Verde*, 107 ½ lb. or Rotuli, a Quintal is 121 of 4 Rooves of 32 lb.
1 7 *Calabria*, 147 lb.
1 3 *Calais*, { 111 lb. Ordinary Weight. 92 lb. Merchants Weight. 114 lb. *Engliſh* Wooll Weight.
2 6 *Calicut*, 80 Aracoles. *Malines*, p. 18, mentioning the Baccar, or Bahar at *Calicut*, to be at *Lisbon* 4 great Quintals of 112 lb. to the Quintal, and that 4 Quintals are 480 Aracoles, that is 120 Aracoles for 1 Quintal. And again, that the Bahar is 20 Faracoles, which is 5 Quintals at *Liſbon* of 32 lb. *per* Roove; which is not well to be underſtood, ſeeing the great Quintal at *Lisbon* is 128 lb. or 4 Rooves of 32 lb. *per* Roove: Whereas 4 Quintals of 112 lb. is but 448 lb. and 5 Quintals of 728 lb. is 640 lb. unleſs there be two ſorts of Bahars at *Calicut*, one of 48 Aracoles, and

and another of 20 Faracoles. Or that the Bahar be 5 great Quintals at 129 ℔. the Quintal; that is 645 ℔. for ſo many Pounds, or *Portugueze* Rotuly, are in in 480 Aracoles, for 100 ℔. of *Antwerp*, which anſwer to 107 ½ ℔. of *Portugal* Weight by his own Conceſſion in the ſame Page a little before.

3 3 *Canary-Iſlands*, 107 ℔. as *Sevil*.

1 5 *Candia*, { 138 ℔. for Gold-Thread. 89 Rotuli, whereof a 100 is a Cantar, or Quintal.

1 7 *Carpi*, as *Aquila*.

1 14 *Caſtile*, 102 ℔.
Cataio, 87 Rotuli 100 to a Cantar.

1 7 *Cenſena*, as *Bergamo*.

1 4 *Collen*, 93 ⅓ ℔.

1 7 *Como*, as *Aquila*.

1 9 *Coninsberg*, 125 ℔. which is a Centener. A Laſt of Wheat there 5200 ℔. a Stone 40 ℔. a Skippound 10 Stone, that is 400 ℔.

1 4 *Conſtance*, 92 ℔. of 16 Ounces, or 32 Loot: Some by the Centener of 100 ℔. and ſome of 120 ℔.

1 5 *Conſtantinople*, { 87 ½ Rotuli, 100 to a Cantar. 39 Ochaa, *Hunt* writes it *Cohaa*.

1 1 *Copenhagen*, 2 ½ Metallici, which is their Drachm, makes 3 of ours.

1 1 *Copenhagen*, 96 ℔. There the Centener is 112 ℔. A Stone is 10 ℔. A Skippound 32 Stone, or 20 Liſpound of 16 Mark Pound, which is a Skippound, or 320 ℔.

1 5 *Corfu*, { 97 ℔. Great Weight. 115 ℔. Small Weight.

1 8 *Cortrycke*, as *Audenarde*.

1 3 *Cracow*, 124 ℔. The Centener there is 136 ℔.

1 7 *Crema*, as *Aquila*.

1 7 *Cremona*, { 143 ℔. of 12 Oz. moſt uſed. 132 ℔. of 12 Oz. being 13 Oz. of the other. 60 ℔. of 28 Oz. to the ℔. uſed for Fleſh.

2 1 *Cyprus*, 20 ¼ Rotuli 100 to the Cantar.

2 11 *Damaſcus*, 26 Rotuli. There 1 Cantar is 5 Zurli, or Stone; and 1 Stone 20 Rotuli; 1 Rivola is 225 ℔. *Antwerp*.

1 9 *Dantzick*, 120 ℔. There one Laſt of Wheat 4528 ℔. The Laſt of Rye 4245 ℔. 1 Skippound 340 ℔. of 10 great Stone, 1 Skippound 320 ℔. of 20 Liſpound. 1 Centener 125 ℔. 1 Stone for Spices 24 ℔. 1 Great Stone for Groſs-Wares 34 ℔. 1 Liſpound 16 Mark Pound.

1 3 *Diepe*, as *Abbevile*.

1 8 *Dixmude*, as *Ailoſt*.

1 8 *Doway*, as *Audenarde*.

1 6 *Dublin*, and in *Ireland* generally. { 91 ½ ℔. by the Great Hundred. 104 ℔. Subtle Weight.

1 12 *Edinbur.* and all *Scotl.* { 96 ℔. and 103 ℔. ½ for 112 ℔.

1 4 *Erfurd*, 85 ℔. as at *Vienna*.

1 7 *Faenza*, 132 ℔.

3 2 *Fez*, or *Feſſe*, 96 ℔. by *Hunt* wrote *Feas*, and noted as in *Portugal*.

1 7 *Ferrara*, as *Bergamo*.
Fio, 96 ¾ Rotuli, or Scutarii.

1 7 *Fiume*, as *Venice*.

1 8 *Flanders*, 110 ℔. for the moſt part.

1 7 *Florence*, 125 ℔. of 12 Oz. to the ℔.

3 1 *Forfori*, 65 Rotuli.

1 7 *Forli*, as *Aquila*.

1 3 *France* generally 111 ℔. except herein excepted.

1 4 *Frankford*, } as *Baſil*.
1 4 *Friburg*, }

1 8 *Gaunt*, as *Ailoſt*.

1 8 *Guelderland*, 99 ℔. The Places herein excepted.

1 7 *Genes*, or *Genoa*, { by Rooves, to a Quintal of 4 Rooves, and 4 ℔. over. 110 ℔. a Quintal of Pepper. 114 ℔. a Quintal of Ginger.

1 7 *Geneva*, { 102 ℔. Weight for Spice. A Carga is 270 ℔. Small weight, 85 ℔. Great weight.

1 4 *Germany*, a Centener of the ſmall Weights is 100 ℔. of the great 120 ℔. and 132 ℔. The Centener of 120 ℔. is 5 Stone, of 24 ℔. *per* Stone.

2 6 *Goa*, as *Portugal*, by Quintals, Arrobes, or Rooves, &c. They have alſo another Weight, called *Mao*, which ſignifieth the Hand, and weigheth 12 ℔. is uſed for Butter, Honey, Sugar, &c. in the *Portugal* Dominions.

1 14 *Granada*, as *Armaria bona*.

3 4 *Guinea*, as *Cabo Verde*.

1 1 *Hamburgh*, 96 ℔. The Centener 120 ℔. of 12 Stone, 1 Stone 10 ℔. A Liſpound 15 ℔. and 20. Liſpound 1 Skippound.

1 4 *Heidelburgh*, as *Baſil*.

1 4 *Hertogenboſh*, as *Arſchot*.

1 8 *Holland*, as *Guelderland*.

1 8 *Hulſt*, as *Ailoſt*.

1 8 *Ipre*, as *Ailoſt*.

1 7 *Iſtria*, as *Venice*.

1 5 *Laarta* 87 Rotuli, 100 to a Cantar.

1 5 *Laconia*, { 138 ℔. 78 ½ Rotuli.

1 7 *Lanſan*, as *Bergamo*.

1 5 *Lavalona*, 131 ℔.

1 4 *Leon*, 109 ℔.

1 5 *Lepanto*, { 156 ℔. 26 Rotuli, 1 Rotulus 6 ℔.

1 4 *Leipſick*, as *Baſil*.

1 10 *Lisbon*: See *Calicut*:

1 8 *Liſle*, as *Audenard*.

1 8 *London*, and all *England*. { 91 ½ ℔. Groſs Weight of the Kintal Weight 112 ℔. 104 ℔. Subtle Weight. 189 ½ Marks of 8 Oz. *Troy*.

1 8 *Louvaine*, as *Arſchot*.

1 1 *Lubeck*, as *Cepenhagen*.

1 7 *Luca*, as *Aquila*.

1 3 *Lyons*, 100 lb. Ordinary Weight. A Centener is 112 lb. 102 lb. Almerick, or Weight of *Geneva* for Spices, abating 8 lb. *per Cent.* 94 ¾ lb. by the King's Weight to pay Custom by. A Quintal is 100 lb. A Charge 300 lb. A Somme 400 lb.

3 3 *Medera*, as *Caba Verdo*.

1 8 *Malines*, or *Mecklin*, as *Arschot*.

1 7 *Mantua*, as *Aquila*.

1 3 *Marseilles*, 111 lb.

3 2 *Maroco*, or *Morocco*, as *Cabe Verdo*.

1 14 *Medina del Camporas Castile*.

1 9 *Melvin*, 124 lb. The Last of Wheat 5200 lb. The Skippound and Stone, as *Coningsberg*.

1 4 *Meysen*, 100 lb. of 16 *Oz.* to the lb. which is the Princes Weight, called *Zigostatica*. 96 lb Merchants Weight. 184 lb. of 12 Oz. to the lb.

1 7 *Milan*, as *Cremona*.

1 3 *Mirabel*, as *Aquismort*.

1 7 *Mirandula*, as *Aquila*.

1 7 *Modena*, as *Faenzo*.

2 7 *Molucco*, 88 Rotuli, 112 a Cantar.

1 3 *Montpelier*, as *Avignon*.

1 4 *Munchen*, as *Ausburg*.

1 7 *Naples*, 120 l. and for *Venice* Gold 134 lb.

1 15 *Nareca*, 120 lb. A Lispound, or Stone, is 20 lb. and 20 Lispound a Skippound, that is 400 lb. used for Rye, but for Wheat but 350 lb. to a Skippound.

1 7 *Nicosia*, or *Nichosia*, as *Archipelago*.

1 5 *Negropont*, 119 lb.

1 4 *Nurenburg*, as *Constance*.

1 4 *Norlingen*, as *Ausburg*.

1 4 *Offen*, or *Buda*, as *Basil*.

3 2 *Oran*, 94 Rotuli, 1 Cantar 5 Rooves, 1 Roove 20 Rotuli. 138 lb. for Spices, 1 Cantar 4 Rooves. 50 Rotuli for Corn, 1 Cantar 6 Rotuli. 61 Rotuli for Cotton-wool, 1 Cantar 15 Rotuli.

1 7 *Otranto*, } as *Bergamo*.
1 7 *Padua*, }

1 3 *Paris*, 93 lb. accounting 4 Quarters of 25 lb. to the Hundred.

1 7 *Parma*, as *Aquila*.

1 4 *Passau*, 87 lb.

1 7 *Pavia*, as *Cremona*.

1 7 *Pisa*, as *Venice*.

1 6 *Piedmont*, } as *Aquila*.
1 7 *Plaissance*, }

1 4 *Posen*, as *Breslau*.

1 8 *Popering*, as *Ailost*.

1 10 *Portugal*, 107 ½ Rotuli, or Araters. The great Quintal is 128 lb. of 4 Rooves, 1 Roove 32 lb. The small Quintal is 112 lb. of 4 Rooves, 1 Roove 28 lb. The Quintal of Wax 168 lb. which is 1 ½ Quintal of 122 lb. of 4 Rooves of 42 lb. the Roove.

1 4 *Prague*, as *Passau*.

1 7 *Puglia*, as *Calabria*.

1 7 *Raguza*, *Raviano*, *Ravenna*, as *Faenza*.

1 7 *Rechanati*, 137 lb. but to Gold-thread, but 112 lb.

1 4 *Regensbourgh*, as *Passau*.

1 15 *Revell*, 120 lb. which is a Centener. The Skippound there is 400 lb.

2 1 *Rhodes*, 19 ½ Rotuli, a Cantar is 100 lb.

1 9 *Riga*, 120 lb. a Lispound is 20 lb. and 20 Lispound a Skippound.

1 7 *Rimano*, as *Faenza*.

1 3 *Rochel*, 111 lb. and 119 lb. by the small Weight

1 7 *Romagna*, as *Naples*.

1 3 *Roven*, or *Roan*. 91 lb. by the *Viconte*, according as at *Paris*. 94 ¾ lb. by the Ordinary Weight, and 4 lb. *per Cent*.

1 4 *Saltzbourg*, 111 lb. small Weight. 83 lb. great Weight.

1 3 *St. Antoine*, 127 lb.

1 8 *St. Omar*, as *Audenarde*.

3 3 *St. Thomas*, as *Cabo Verde*.

1 14 *Saragossa*, 112 lb. And the small *Quintal* 131 lb.

1 7 *Savoy*, 137 lb. 195 lb. small Weight.

1 4 *Saxony* as *Meisen*.

3 1 *Sciba*, as *Antwerp*, 320 lb. is there a *Skippound*.

2 1 *Scio*, as *Fio*.

1 13 *Sequia*, as *Venice*.

1 14 *Sevil* 107 lb. The great Quintal is 144 of 4 Rooves of 36 lb. The lesser Quintal is 120 lb. of 4 Rooves of 30 lb. The small Quintal is 112 lb. of 4 Rooves of 28 lb.

1 7 *Cicilia* 152 lb. of 12 Oz. *per* lb. 61 Rotuli of 30 Oz. is a Cantar of 24 Sestertio's. 54 Rotuli for Flesh by Talents of 12 Serstertio's, is 30 Rotuli.

1 7 *Silesia*, as *Breslaw*.

1 13 *Spoleto*, as *Venice*.

1 4 *Spires*, as *Bibrach*.

1 4 *Stetin* 96 lb. The small Stone 10 lb. The great Stone 21 lb. The Centener 112 lb.

1 15 *Stockholm* 120 lb. The Skippound 320 lb. and also 340 lb. The Centener 120 lb. The Stone 10 lb.

1 4 *Straelsond* 92 lb. The Stone 10 lb. and the Lispound 16 lb.

3 2 *Suus*, or *Sus*, or *Fez*.

2 11 *Syria* 156 Mina's, a Mina 100 Drachms.

1 8 *Tergos* 107 lb.

1 3 *Thoulouse*, as *Avignon*.

3 2 *Thunes*, or *Tunis* 63 Rotuli.

1 9 *Thoren* 120 lb. The Stone is 24 lb.

1 8 *Tournay*, as *Ailost*.

1 7 *Trevisо*, as *Bergamo*.

1 7 *Trieste*, as *Venice*.

3 2 *Tripoli*, as *Tunis*.

2 11 *Tripoli* 26 ½ lb.

1 14 *Valentia* { 106 lb. by Quintals of 4 Rooves of 30 lb. for Spices. / 134 by Quintals of 4 Rooves of 36 lb.

The ſmall Carga is 360 lb. that is, three Quintals of 120 lb.

The great Carga is 432 lb. that is, three Quintals of 144 lb.

1 7 *Venice* { 98 ⅔ lb. Great Weight, called *Ala Groſſa*, uſed for Fleſh, Butter, Cheeſe, Leather, Dates, Yarn, Copper, Thread, Iron, Oil, Brimſtone and Wooll. / 150 lb. Small Weight of 12 Oz. called *Ala Sotile*, moſt uſed for alll Merchandize.

An Ounce is 8 Saſſi, a Saſſi 24 Carrats, 1 Carrat 4 Grains. They alſo account by Thouſands, *&c.* with Allowance of 2 lb. *per Cent.* in the *Cuſtom-houſe.*

1 Thouſand 40 Mixti, 1 Mixti 25 lb.

1 Carga 400 lb. 1 Starre 220 lb. The Starre is Menſural. Starres for Corn 130 lb. Ginger 180 lb. Raiſon, 260 lb. The Starre contains 54 Pottles of Wine at *Antwerp.*

1 7 *Verona* 90 lb. And for Gold-thread 143 lb.

1 4 *Vienna* 85 lb. as at *Erfurd*; where alſo a Somme of Quickſilver is 275 lb.

1 14 *Villaco*, as *Vellica* 80 lb.

1 4 *Ulm*, as *Baſil.*

3 2 *Una* { 65 Rotuli for Cotton: / 75 Rotuli for Spices. / 94 Rotuli for Corn.

1 7 *Urbin*, as *Bergamo.*

Walloons Country, as *Ailoſt.*

1 8 *Walſland*, as *Guelderland.*

1 9 *Wilde*, as *Riga.*

1 4 *Wiſel*, as *Ausburgh.*

3 1 *Zaidin* 77 Rotuli.

1 8 *Zeland*, as *Guelderland.*

3 1 *Zeroi* 50 Rotuli.

1 8 *Zurich-ze* 100 lb.

Foreign Weights for Money.

In *Florence*, they uſe a Weight for Gold and Silver; and at *Geneva* for Silver, called a Pound, of 12 *Oz.* 1 *Oz.* is 24 Deniers, and 1 Denier is 24 Grains: So is there 6912 Grains in the Pound.

In *Naples*, their Pound is likewiſe divided into 12 Ounces, and every Ounce into 8 Octany, or Octavos.

The Mark Weight is uſed in many other Places, and at *Antwerp* containeth 8 Ounces, and is heavier than their ordinary Pound by 5 upon the Hundred, as *Malines* ſaith.

This Mark is divided in a double Manner.

(1) *Mark.*

	Ounces.	*Engliſh.*	*Grains.*
	8	160	5120
Ounce.		20	640
Engliſh.			32

(2) *Mark.*

	Ounces.	*Penny-weights*	*Grains.*
	8	192	4608
Ounce.		24	576
Penny weight.			24

The Mark Weights of ſome other Places ſubdivided.

FRANCE.

	Ounces.	*Groſſes.*	*Deniers.*	*Grains.*	*Primes,* or *Garobs.*	*Seconds.*	*Tercies,* or *Malloquen.*
Mark.	8	64	192	4608	110592	2654208	63700992
Ounce.		8	24	576	13824	331776	7962624
Groſs.			3	72	1728	41472	995328
Denier.			24	576	13824	331776	
Grain.			24	576	13824		
Garob, or *Prime.*				24	576		
Second.					24		

In

In *France*, that Ounce is also divided into 2 Carrats, and every Carrat into 12 Grains.

Dantzick in *Poland*.

	Ounces.	Pence.	Hellers.
Mark.	8	256	512
Ounce.		32	64
		Penny.	2

Geneva for Gold.

	Ounces.	Deniers.	Grains.
Mark.	8	192	4608
Ounce.		24	576
		Denier.	24

Meisen in *Saxony*.

	Ounces.	Deniers.	Grains, or Momenta.
Mark.	8	192	4608
Ounce.		24	576
		Denier, or Penny.	24

Portugal.

	Ounces.	Octavos, or Oitavos.	Great Gains.
Mark.	8	64	288
Ounce.		8	36
		Octavo, or Oitavo.	4 ½

Nurenburgh in *Germany*.

	Ounces.	Loots.	Quints.	Primes	Setertios.
Mark.	8	16	64	256	1024
Ounce.		2	8	32	128
		Loot.	4	16	64
			Quint.	4	16
				Prime, Penny, or Nummulus.	4

Venice.

	Ounces.	Silicos, or Quarts.	Siliquas, or Carrats.	Grains.
Mark.	8	32	1151	4608
Ounce.		4	144	576
		Silico, or Quart.	36	144
			Siliquas, or Carrat.	4

Spain. Gold.

	Ounces.	Castellanos.	Tomines.	Grains
Mark.	8	50	400	4800
Ounce.		6 ½	50	600
		Castellano.	8	96
			Tomine.	12

Spain. Silver.

	Ounces.	Drams, or Octavo.	Grains.
Mark.	8	64	4800
Ounce.		8	600
		Dram, or Octavo.	75

Rome.

	Ounces.	Drams.	Scruples.	Obolos.	Siliquas.	Primi, or Grains.
Mark.	8	64	192	384	1152	4608
Ounce.		8	24	48	144	576
Dram.			3	6	18	72
Scruple.				2	6	24
Obolus.					3	12
					Siliqua.	4

Roman Libra, by *Malines.*

Libra	12 *Guilders. Ounces.*	84 *Denarios.*	162 *Victoriats.*	336 *Seſtertio's.*	840 *Aſſes.*	3320 *Quadrants.*	5040 *Sextantes.*

The Ton of Gold in *Latin*, *Tina*, *ſeu Tonna*, by ſome called *Roman*; but by *Alſted*, *German*, is thus divided.

	Pounds.	*Marks.*	*Ounces.*	*Loots.*	*Drams.*
Ton of Gold.	781 ¼	1562 ½	12500	25000	100000
	Pound.	2	16	32	128
		Mark.	8	16	64
			Ounce.	2	8
				Loot.	4

Scotland divides their Pound into 24 Deniers, 1 Denier 24 Primes, 1 Prime 24 Seconds, 1 Second 24 Thirds, 1 Third 24 Fourths, *&c.*

The Correſpondency of 100 Marks of *Antwerp*, to the Places following.

		Alder	76 ½ lb.
3	1	*Egypt*	94 Beſſes
3		*Africa*	87 Marks
1	7	*Ancona*	103 ¼ Marks
1	7	*Aquila*	71 lb.
1	4	*Ausburgh*	105 2/19 Marks
1	4	*Bambergh*	103 ¼ Marks
1	4	*Bavaria*	
1	4	*Bohemia*	87 Marks
1	4	*Breſlaw*	121 ¾ Marks
1	14	*Burgas*	116 2/3 Marks
1	7	*Calabria*	76 ½ lb.
1	14	*Catalonia*	100 Marks.
1	4	*Cologn*	105 2/19 Marks
1	5	*Conſtantinople*	87 Marks
1	7	*Crema*	103 ¼ Marks
1	9	*Dantzick*	105 2/9 Marks
1	4	*Erfurd*	
1	7	*Florence*	72 lb.
1	4	*Franconia*	103 ¼ Marks
1	4	*Frankford*	105 2/19 Marks
1	4	*Friburgh*	103 4 Marks
1	7	*Genes* for Gold	116 Marks
1	7	*Genes* for Silver	77 Marks lb.
1	7	*Geneva* as *Paris* and *Lyons*	
8	7	*Græcia*	105 2/19 Marks
1	4	*Hungary*	87 Marks
1	4	*Leipſick*	105 2/19 Marks
1	2	*London*	89 8/9 lb.
1	3	*Lyons*	112 Marks, Merchants Weight; 102 ½ Marks, Merchants Weight. The King's Weight.
1	4	*Ments*	
1	4	*Meiſen*	105 1/19 Marks
1	7	*Millain*	
1	7	*Naples*	79 ½ lb.
2	6	*Narſinga*	87 Marks
1	4	*Nurenburgh*	103 ¼ Marks
4	2	*Nova Spagnia*	87 ½ Marks
1	3	*Paris*, as *Lyons*	
2	9	*Perſia*	87 Mina's
4	3	*Peru*	87 ½ Marks
1	7	*Piedmont*	99 Marks
1	7	*Puglia*	76 ½ lb.
1	7	*Rome*	103 ¼ Marks
1	4	*Saxon*	105 2/19 Marks
1	14	*Spain*	107 Marks
1		*Trevers*, or *Triers*	105 2/19 Marks
1	7	*Treviſo*	103 ¼ Marks
1	7	*Turin*	99 Marks
2 3		*Turkey*	87 Marks
1	7	*Venice*	103 ¼ Marks
1	7	*Verona*	
1	7	*Vicenza*	105 2/19 Marks
1	4	*Vienna*	87 Marks
1	4	*Ulm*	105 1/19 Marks
1	4	*Wiſſilbourg*	103 ¼ Marks.

A TABLE of *Grecian* Attick Weights.

		Pounds Minas.	*Ounces. Uncias.*	*Drams Drachmas.*	*Scruples Gram-mata.*	*Obolos.*	*Lupines Termes.*	*Kiratias Siliquas.*	*Aereolas Chalkos.*	*Grains. Sitars.*	*Minutes Leptos.*
Talent.	*Greater.*	80	1000	8000	24000	48000	72000	144000	288000	576000	2016000
	Lesser.	60	750	6000	18000	36000	54000	108000	216000	432000	1512000
Mina.	*New*		12 ½	100	300	600	900	1800	3600	7200	25200
	Old.		9 ⅜	75	225	450	675	1350	2700	5400	18900
a			*Uncia Ounce.* b	8	24	48	72	144	288	576	2016
				Drachm Dram. c	3	6	9	18	36	72	252
					Gramma Scruple d	2	3	6	12	24	84
						Obolus. e	1 ½	3	6	12	42
							Therme Lupine. f	2	4	8	28
								Siliqua Kiration. g	2	4	14
									Chalkus Aerolus. h	2	7
										Sitar Grain. i	3½ k

Grecian Physical Weights.

	Uncias. Ounces.	*Drachmas. Drams.*	*Scruples. Gram-mata.*	*Obolos.*	*Lupines.*	*Carobseeds. Keratias. Siliquas.*	*Aerola. Chalkos.*	*Grains. Sitars.*	*Minutes. Leptas.*
Mina.	16	128	384	768	1152	2304	4608	9216	32256
Litra.	12	96	288	576	864	1728	3456	6912	24192
a a	*Uncia. Ounce.*	8	24	48	72	144	288	576	2016
		Drachm. Dram.	3	6	9	18	36	72	252
			Gramma. Scruple.	2	3	6	12	24	84
				Obolus.	1 ½	3	6	12	42
					Lupine.	2	4	8	28
						Siliqua. Keration. Carobseed.	2	4	14
							Chalkus. Æreolum.	2	7
								Sitar. Grain.	3½

I

Grecian

Grecian Hippatrical or Farriers Weights.

	Ounces.	*Denarions.*	*Drams.*	*Scruples.*	*Obolos.*
Mina.	15	84 3/8	112 1/2	337 1/2	675
Litra.	12	67 1/2	90	270	540
aaa	*Ounce.*	5 5/8	7 1/2	22 1/2	45
		Denarion.	1 1/3	4	8
		bb	*Dram.*	3	6
			cc	*Scruple.*	2
					II

a. The *Mina* of 100 Drachms is called *Solon's Mina*, becauſe thought to be continued by him ſometime turned into *Latin* by *Mina*, often by *Libra*, tho' *Libra* be 4 Drachms lighter, the *Roman Libra* being but 96 *Attick* Drachms. The old *Mina* of 75 Drachms, now obſolete, for Memory ſake, hath found Room in this Table.

aa. The Phyſicians, as by *Dioſcordes* and *Galen* appears, uſed a *Mina*, or Pound of 16 Ounces, and a *Litra* or other Pound of 12 Ounces, conceived all one with the *Roman Libra*, conſiſting of 96 Drachms, as they did; and by Interpreters commonly rendred *Libra*, and ſeldom or never *Mina*; and *Mina*, and *Litra*, as alſo *Libra* commonly engliſhed a Pound.

aaa. The *Hippiatricks* had a *Mina* of 15 Ounces and a *Litera* of 12.

b. Oungia, in *Latin Uncia*, muſt not be taken for our Ounce, but for one of their Ounces, ariſing by the Diviſion of their Pound into Drachms differently, according to the Quantity of Drachms in one Pound.

bb. Among the *Hippatrical* Weights there was a *Denarium* of 4 Scruples, 5 1/2 whereof made one of their Ounces.

c. Drachme, *Drachma*, and *Drægma*, in *Greek* and *Latin*, in *Engliſh* a *Dram*, is the 8th Part of their Ounce, whereby the Pound hath 12 or 16 Ounces therein. By *Alſted* made to equal the *German* Weight *Quinclein*. Some call a Dram *Reſolus* ſome *Holke*, from the *Greek* ὁλκὴ.

cc. The *Ounce Hippiatrick*, that divided as well the *Mina* of 15 Ounces, as the *Litra* of 12 Ounces had but 7 1/2 Drams into it.

d. Drams of all ſorts were parted into 3 Scruples. A Scruple in *Greek* ſometime *Gramma*, ſometimes *Grammata*; in *Latin Scripulum*, *Scriptulum*, and *Scrupulum*.

e. Obolus, ſometime a Weight, ſometime a Piece of Money commonly rendred an Half Penny, becauſe always was the half of a Scruple.

f. Lupine, in *Greek Therma's*, was a Weight equal in poiſe to the *Lupine*, which is a Seed growing in a Cod like to a Peaſe, and both Plant and Seed bear that Name. And ſeeing there are many ſorts, as *Perkinſon's Theater of Plants*, Page 1073. which ſort of *Lupine* is meant, is uncertain; probably, the middle White, which are moſt in uſe, bigger than the Yellow, and not ſo big as the great Blue; and from the nearneſs in Weight thereto, if not exactneſs, might be ſo called.

g. gg. Siliqua, in *Greek Keration*, a Weight, a like heavy to the *Carobſeed* or ſweet Bean, common in many Countries ſubject to the *Grecian* Empire. Sometime called *Carat* or *Caract*, from whence the Word is ſtill in uſe with us.

h. Chalkos, in *Latin Aerolus* and *Aerolum*. *Aerolus* was alſo a Piece of Braſs Money currant in ancient Times among thoſe Countries of the *Grecian* Dominion.

i. Sitar, a Grain of Corn from Σῖτος *Frumentum*, likely to have been the Original of their Weight, two whereof make one *Chalkos*.

k. Lepton, from *Leptos*, in *Latin Minutum*, and *Minutia*, ſuppoſed to be ſome ſmall Scale of the Rhind or Bark of ſome Tree, 3 1/2 balanced the *Sitar*.

l. Beſides theſe, in the Table of Phyſical Weights ſome Books mention the *Aſſarian*, allowed for two Drachms, which is 1/4 part of an Ounce. Alſo, the *Exagion* wrote ſometime *Stagion*, ſometime *Agion* for Brevity, which was the *Roman Sextula*, the 6th part of their Ounce, whereof 12 make the *Litra*. Likewiſe *Orobus*, which was a Grain of a wild Vetch. And *Phaike* a *Lentil*; but whether Weights or no, is not worth the Enquiry.

ll. As the other Weights are divided into leſſer Diviſions, than the *Obolus*, ſo no doubt but the *Hippiatrick* alſo were, and may accordingly be done, when occaſion ſerves. The *Obolus* of all ſorts admitting the like ſmaller Denominations.

Grecian Exotick Weights.

	Mention'd by *Vetruvius*, ſuppos'd to be *Thracian*, or *Byzantium* Talent.	120	*Libras.*
Talents	Several mentioned by *Heſychius*.	100	*Libras.*
		125	
		165	
		405	
		1150	
	Old *Sicilian (m)*	24	*Minas.*
	New *Sicilian (m)*	12	*Minas.*
Talent of	*Alexandria*	12000	*Attick Drams.*
	Aegina	10000	*Attick Drams.*
	Corinth	10000	*Attick Drams.*
	Egypt	8000	*Attick Drams.*
	Babylon	7000	*Attick Drams.*
	Rhodium	4500	*Attick Drams.*
	Euboicum	4000	*Attick Drams.*
	Syria	1500	*Attick Drams.*
Mina	*Alexandria*	20	*Uncias*
	Ptolemaica	18	*Uncias*
Drachma *Egyptia*		1	*Obolus.*

A Table of the *Roman* Weights.

	Minas.	*Libras.*	*Uncias.*	*Semiun:*	*Duellis.*	*Sicilias.*	*Sextulas.*	*Denarios.*	*Drachms.*	*Quinars*	*Scruples.*	*Quadr.*	*Sext.*	*Obol.*	*Siliq.*	*Grains.*
Talent.	75	152	150	3000	4500	6000	9000	10500	12000	21000	36000	42000	63000	72000	216000	864000
Mina.	$1\frac{2}{5}$	2	40	60	80	120	140	160	280	480	560	840	960	2880	11520	
Libra. a	12	24	36	48	72	84	96	168	288	336	504	526	1728	6912		
Uncia	2	3	4	6	7	8	14	24	28	42	48	144	576			
Semiuncia. b	$1\frac{1}{2}$	2	3	$3\frac{1}{2}$	4	7	12	14	21	24	72	288				
Duella c	$1\frac{1}{2}$	2	$2\frac{1}{3}$	$2\frac{2}{3}$	$4\frac{2}{3}$	8	$9\frac{1}{3}$	14	16	48	192					
Sicilium. d	$1\frac{1}{2}$	$1\frac{3}{4}$	2	$3\frac{1}{8}$	6	7	$10\frac{1}{2}$	12	36	144						
Sextula. e	$\frac{1}{8}$	$1\frac{1}{2}$	$2\frac{1}{3}$	4	$4\frac{2}{3}$	7	8	24	96							
Denarius. f	$\frac{1}{7}$	2	$3\frac{3}{7}$	4	6	$6\frac{6}{7}$	$20\frac{4}{7}$	$82\frac{2}{7}$								
Drachm.	$1\frac{3}{4}$	3	$3\frac{1}{2}$	$5\frac{1}{4}$	6	18	72									
Quinar. g	$1\frac{5}{7}$	2	3	$3\frac{3}{7}$	$10\frac{2}{7}$	$41\frac{1}{7}$										
Scruple. h	$\frac{1}{8}$	$1\frac{3}{4}$	2	6	24											
Quadrans i	$1\frac{1}{2}$	$1\frac{5}{7}$	$5\frac{1}{7}$	$20\frac{4}{7}$												
Sextans. k	$1\frac{1}{7}$	$3\frac{3}{7}$	$13\frac{5}{7}$													
Obolus. l	3	12														
Siliqua.	4															

a. *Libra*, called alſo *As*, by Tranſlators commonly rendred a Pound, was divided into 12 Ounces, and for every Number of Ounces under 12, a proper Name uſed, as,

Deunx,	11
Dextans and Decunx,	10
Dodrans,	9
** Bes, Beſſis, and of old, Des,	8
Septunx,	7
Semis, Semiſſis, Semiſſius, Selibra, and Semibella,	6
Quincunx,	5
Triens,	4
Quadrans and Triunx,	3
Sextans,	2
Uncia,	1

} *Ounces.*

Malines, p. 24. of his *Lex Mercatoria*, divides *Pondus*, which he calls the Old Pond of the *Romans*, into

64 Denario's.
129 Quinario's.
256 Seſtertio's.
640 Aſſes.
1280 Semilibella's.
2560 Teruncio's.

A Reaſon is wanting, why *Legat* makes the *Roman Libra* of 12 Oz. but $10\frac{1}{2}$ Oz. *Troy*, ſince if he reckon by the Number of Grains (the Original of Weights) at 5760 Grains of Aſſize in the Pound *Troy*, it can be but 10 Oz. juſt; for 10 times 6912, the Grains in a *Roman* Pound, and 12 times 5760 are equal: But if he count the Pound *Troy* at 7680 Grains, according to the Statute at 32 Grains of Wheat to a Penny-weight, the *Troy* Pound will be $13\frac{1}{3}$ Oz. *Roman*.

** *Bes*, is the Mark Weight, two Thirds of the Pound, *Malines*, p. 24. aforeſaid, makes the *Bes*, or old Mark of the *Romans*, to be divided into

16 Loot, or Tetradrams.
$23\frac{1}{3}$ Tridrams.
32 Didrams.
64 Drachms.
96 Obolos, or Treobolos.
128 Triobolos.
384 Obolos.
768 Miobolos.
3840 Moments.

b *Semiuncia*, or the Half-Ounce, is ſometimes called *Aſſarion*, and *Aſſarius*, and by *Alſted*, *Lotho*, anſwering to a *German* Weight of that Name.

c *Duella* being double to the Weight of the *Sextula*, ſometimes called *Binæ Sextulæ*.

d *Sicilicum*, or *Sicilicus*, and by Abbreviation, *Siclus*, is $\frac{1}{4}$ of an Ounce.

e *Sextula*, us'd promiſcuouſly with *Sextans*, and underſtood by Import of the Name to be the ſixth Part.

f *Denarius*,

f *Denarius*, a Penny-weight, the 7th Part of an Ounce, whether uſed to weigh any thing but Money, as other; the Diviſions thereof, ſomewhat queſtionable, ſee among the Money. *Alſted* compares the *Drachmal Denarius* to the *German* Weight *Quintlein*.

g *Quinar*, was half the Penny-weight, and a Piece of Money ſet afterward among the *Roman* Coin.

h Between the *Quinar* and *Scruple* ſome mention a Weight called *Tremiſſis*, containing 32 Grains, being the 18th Part of an Ounce.

i *Quadrans*, here is $\frac{1}{4}$ of a Penny-weight, and ſo called *Quadrans Denarii*, to diſtinguiſh it from *Quadrans Libræ*, which was 3 Oz.

k *Sextans*, called *Sextans Denarii*, to difference it from *Sextans Libræ*, was the 6th Part of the Penny-weight, and ſometime called *Sextula*.

l *Obolus*, or half a *Scruple*, called ſometimes *Simplium*, weight 12 Grains. If there be another *Obolus*, as ſome ſay, which was the third Part of a *Quinar*, it ſeems to be a Piece of Coin, and muſt weigh $13\frac{5}{7}$ Grains, and ſo is all one with the *Sextans*, according to the *Tabulary* Diviſion; yet this ſort of *Obolus*, they make to contain but 10 Grains.

Between the *Obolus* and the *Siliqua*, ſome mention a *Cerates*, which they ſay contains ſix Grains, and ſo is $\frac{1}{2}$ the *Obolus*, or $\frac{1}{4}$ of the *Scruple*.

A Tabe of the Scripture-Weights, from Biſhop Cumberland.

1. A Shekel of Silver was juſt half the *Roman* Ounce, or our half Ounce *Averdupois*, and was equal to 219 Grains *Troy*; and its Value in our Money was 28 Pence, or 2 Shillings, 4 Pence, Farthing, and near $\frac{1}{8}$ Part of a Farthing; from whence 'tis eaſie to know the half and quarter Shekel.

2. The half Shekel was called *Bekoh*.

3. Its 20th Part was called *Gerah*, *Agurah*, and *Keſhitah*, and is well tranſlated by *Obolus Aticus*.

4. A Talent of Silver was 3000 Shekels, and in our Money its Value was 353 *l.* 11 *s.* 10 *d.* $\frac{1}{2}$.

5. A Talent of Gold was in Value of our Money 5076 *l.* 3 *s.* 10 *d.*

6. The *Maneh* was in Weight 100 Shekels, in Value or Coin 60 Shekels.

7. The Golden Darios or *Perſian* Drachmon, was in Weight 12 Gerahs, in Value 1 *l.* 0 *s.* 4 *d.*

8. The *Roman* Silver Denarius was 7 *d.* 3 *f.* Gold Coins double in Weight.

9. The *Roman* Brazen or Copper *As*, was of $\frac{1}{2}$ an Ounce Weight; in Value 3 Farthings, and one Tenth of our Farthing.

10. *Aſſarium* was the Half of the *As*, *viz.* 1 f. 55 nearly.

11. The *Quadrans* was in Value about 3 quarters of a Farthing.

12. The *Mite* or Λεπτὸν, was the Half of the Quadrans, in Value about $\frac{1}{3}$ of our Farthing.

WENDING, is a Term for bringing a Ship's Head about, and ſeems only to be a Corruption from Winding. They ſay, *How Wends the Ship?* i. e. Which way does her Head lie?

WEST *Erect-Dials*: See *Direct Dials*.

WHEEL, or Way-wiſer, an Inſtrument to meaſure Lengths upon the Ground: See *Perambulator*.

WHEEL-*Barometer*: See *Barometer*.

WHEEL-*Fire*, is the ſame with what the Chymiſts call *Ignis Rotæ*; that is, a Fire which covers the Crucible, Copple, or Melting-pot, entirely over; at Top, as well as round the Sides.

WHELPS; ſo the Seamen call thoſe Brackets which are ſet up on the Capſtan, cloſe under the Bars, and they give the Sweep to it, and are ſo contrived, that the Cable winding about them, may not *ſurge* ſo much as it would do, if the Body of the Capſtan were quite round and ſmooth.

WHIP, or *Whip-ſtaff*, in a Ship, is a Piece of Wood faſtned into the Helm, for him that ſteers to hold in his Hand, thereby to move the Helm, and ſteer the Ship. It goes through the Rowl, and is made faſt to the Tiller with a Ring. But this is not uſed in great Ships.

WHITE-LEAD, how made: See *Ceruſe*.

WHITENESS: This Colour, Mr. *Boyle* thinks, doth chiefly depend upon this, That the Surfaces of white Bodies are ſeparated into innumerable ſmall Planes or Superficies, which being of a Nature nearly ſpecular, are alſo ſo placed, that ſome looking one way, and ſome another, do reflect the Rays of Light falling upon them, not towards one another, but outwards, towards the Spectator's Eye. But the Account of Whiteneſs, according to the *Newtonian* Hypotheſis of Light and Colours, is, That 'tis the Reſult of the Mixture of all ſorts of Rays of Light together: See *Colours* and *Light*.

WHOODINGS, in a Ship, are thoſe Planks which are joined and faſtned along the Ship's Side into the Stern.

WILL, or *Laſt Will*: See *Teſtament*.

WIND, at Sea, they call bringing a Ship's Head about, *Winding of her*; and when ſhe comes to ride at Anchor, ſhe is ſaid to *Wind up*: Alſo when ſhe is under Sail, they uſe to require, *How ſhe Winds*, i. e. which way ſhe lies with her Head? So, to *Wind the Boat*, is to turn her Head about.

WIND is defin'd to be the Stream, or Current of the Air; and where ſuch Current is perpetual and fix'd in its Courſe, 'tis neceſſary that it proceed from a permanent unintermitting Cauſe. Wherefore ſome have been inclined to propoſe the Diurnal Rotation of the Earth upon its Axis, by which, as the Globe turns Eaſtwards, the looſe and fluid Particles of the Air, being ſo exceeding light as they be, are left behind, ſo that in reſpect of the Earth's Surface, they move Weſtwards, and become a conſtant Eaſterly Wind. This Opinion ſeems confirmed, for that theſe Winds are found only near the *Equinoctial*, in thoſe Parallels of Latitude, where the Diurnal Motion is ſwifteſt; but the conſtant Calms in the *Atlantick Sea*, near the *Æquator*, the Weſterly

Westerly Winds near the Coast of *Guinea*, and the periodical Westerly *Monsoons* under the *Equator* in the *Indian Seas*, seemingly declare the Insufficiency of that Hypothesis.

Besides, the Air being kept to the Earth by the Principle of *Gravity*, would in time, acquire the same Degree of Velocity, that the Earth's Surface moves with, as well in respect of the Diurnal Rotation, as of the Annual about the Sun, which is about 30 times swifter.

It remains therefore to substitute some other Cause, capable of producing a like constant Effect, not liable to the same Objections, but agreeable to the known Properties of the Elements of Air and Water, and the Laws of the Motion of Fluid Bodies. Such an one is the Action of the Sun's Beams upon the Air and Water, as he passes every Day over the Oceans, consider'd together with the Nature of the Soil, and Situation of the adjoyning Continents.

Therefore, according to the Laws of *Siaticks*, the Air, which is less rarified or expanded by Heat, and consequently more ponderous, must have a Motion round those Parts thereof, which are more rarified, and less ponderous, to bring it to an *Equilibrium*; also, the Presence of the Sun continually shifting to the Westward, that Part towards which the Air tends, by reason of the Rarefaction made by his greatest Meridian Heat, is with him carried westward, and consequently the Tendency of the whole Body of the lower Air is that way.

Thus a general Easterly Wind is formed, which being impressed upon all the Air of a vast Ocean, the the parts impel one the other, and so keep moving till the next Return of the Sun, whereby so much of the Motion as was lost, is again restored, and thus the Easterly Wind is made perpetual.

From the same Principle it follows, that this Easterly Wind should on the North-side of the *Equator*, be to the Northwards of the East, and in South Latitudes to the Southwards thereof; for near the Line, the Air is much more rarified, than at a greater distance from it; because the Sun is twice in a Year vertical there, and at no time distant above 23 Degrees $\frac{1}{2}$; at which Distance the Heat being at the *Sine of the Angle of Incidence*, is but little short of that of the perpendicular Ray. Whereas under the Tropicks, though the Sun stay long vertical, yet he is a long 47 Degrees off; which is a kind of Winter, wherein the Air so cools, as that the Summer Heat cannot warm it to the same Degree with that under the Equator. Wherefore the Air towards the Northward and Southward being less rarified than that in the middle; it follows, that from both sides it ought to tend towards the Equator. This Motion compounded with the former Easterly Wind, answers all the *Phænomena* of the general Trade Winds; which, if the whole Surface of the Globe were Sea, would undoubtedly blow all round the World, as they are found to do in the *Atlantick* and *Æthiopick* Oceans.

But seeing that so great Continents do interpose and break the Continuity of the Oceans, regard must be had to the Nature of the Soil, and the Position of the high Mountains, which are the two principal Causes of the several Variations of the Wind from the former general Rule; for if a Country lying near the Sun, prove to be flat, sandy, and low Land, such as the Deserts of *Libya* are usually reported to be, the Heat occasioned by the Reflexion of the Sun's Beams, and the Retention thereof in the Sand, is incredible to those that have not felt it; whereby the Air being exceedingly rarified, it is necessary that this cooler and more dense Air should run thitherwards to restore the Æquilibrium: This is supposed to be the Cause, why near the Coast of *Guinea* the Wind always sets in upon the Land, blowing Westerly instead of Easterly, there being sufficient Reason to believe, that the inland Parts of *Africa*, are prodigiously hot, since the Northern Borders thereof were so intemperate, as to give the Ancients cause to conclude, That all beyond the *Tropicks* was made uninhabitable by Excess of Heat.

From the same Cause it happens, that there are so constant Calms in that part of the Ocean, call'd the *Rains*; for this Tract being placed in the middle, between the Westerly Winds, blowing on the Coast of *Guinea*, and the Easterly Trade Winds blowing to the Westwards thereof, the Tendency of the Air here, is indifferent to either, and so stands in *Æquilibrio* between both, and the weight of the incumbent Atmosphere, being diminished by the continual contrary Winds blowing from hence, is the Reason that the Air here holds not the copious Vapour it receives, but lets it fall in so frequent Rains.

But as the cool and dense Air, by reason of its greater Gravity, presses upon the hot and rarified, 'tis demonstrative, that this latter must ascend in a continued Stream, as fast as it rarifies, and that being ascended, it must disperse it self to preserve the *Æquilibrium*; that is, by a contrary Current the upper Air must move from those Parts where the greatest Heat is; so by a kind of Circulation, the North-East Trade-Wind below, will be attended with a South-westerly above, and the South-easterly and North-west Wind above; that this is more than a bare Conjecture, the almost instantaneous Change of the Wind to the opposite Point, which is frequently found in passing the Limits of the Trade-Winds, seems to assure us; but that which above all confirms this Hypothesis, is the *Phænomenon* of the *Monsoons*, by this means most easily solv'd, and without it hardly explicable.

Supposing therefore such a Circulation as above, 'tis to be considered, that to the Northward of the *Indian* Ocean, there is every where Land within the usual Limits of the Latitude of 30, *viz. Arabia*, *Persia*, *India*, *&c.* which for the same Reason, as the *Mediterranean* Parts of *Africa*, are subject to unsufferable Heats, when the Sun is to the North, passing nearly vertical; but yet are temperate enough when the Sun is remov'd towards the other *Tropick*, because of a Ridge of Mountains at some distance within the Land, said to be frequently in Winter covered with Snow, over which the Air as it passes, must needs be much chilled.

Hence it comes to pass, that the Air coming according to the general Rule, out of the North-East in the *Indian Sea*, is sometimes hotter, sometimes colder, than that which by this Circulation is return'd out of the South-west, and by consequence sometimes the under Current, or Wind, is from the North-East, sometimes from the South-West.

That this has no other Cauſe, is clear from the Times wherein theſe Winds ſet in, *viz.* in *April*, when the Sun begins to warm thoſe Countries to the North, the South-weſt *Monſoons* begin, and blow during the Heats till *October*; when the Sun being retired, and all things growing cooler Northward, and the Heat increaſing to the South, the North-Eaſt enter and blow all the Winter till *April* again: And it is undoubtedly from the ſame Principle that to the Southward of the *Equator* in part of the *Indian* Ocean, the North-Weſt Winds ſucceed the South-Eaſt, when the Sun draws near the *Tropick of Capricorn*.

But in this latter occurs a Difficulty, not well to be accounted for, which is, why this Change of the *Monſoons*, ſhould be any more in this Ocean, than in the ſame Latitudes in the *Æthiopick*, where there is nothing more certain than a South-Eaſt Wind all the Year.

'Tis likewiſe very hard to conceive why the Limits of the Trade Wind ſhould be fix'd about the thirtieth Degree of Latitude all round the Globe; and that they ſhould ſo ſeldom tranſgreſs or fall ſhort of thoſe Bounds; as alſo that in the *Indian* Sea, only the Northern Part ſhould be ſubject to the changeable *Monſoons*, and in the Southern there ſhould be a conſtant South-Eaſt.

This Account of Wind is from the Learned Captain *Halley*'s Diſcourſe on this Subject. *Philoſoph. Tranſ. N.* 183.

WIND-GUN. Of this Inſtrument there are ſeveral Deſcriptions extant, but the following of Mr. *Papins* is in all reſpects the beſt. (See Continuation of Mr. *Boyle*'s *Phyſico-Mechanical Experiments*. Part 2. Iconiſm. 2. Fig. 4.)

A A, is a Copper Globe, hollow within; B B is a Tube, faſtned to that Globe. F is a Valve opening inwardly, and ſhutting the Globe B B; G is the Spring depreſſing the foreſaid Valve. H is a Gnomon affixed to the Globe A A, and making faſt the Spring G.

C C, is a Tube of Iron, faſtned to the Tube B B, and the Globe A A. D D is a Plug exactly adapted to the aforeſaid Tube. E E E is another Plug, fitted alſo to the Tube B B with an Iron Wire, reaching almoſt to the Valve F. R is the Protuberance of the Tube C C, ſomewhat hollowed above to receive the End of the Iron L L; and L L, is a crooked Iron, moving about the Extremity in R, ſo that it is like a Leaver to lift up the Plug E E E. O P O is a crooked Iron, faſtned in M, that the Thumb ſticking in the Angle P, the reſt of the Fingers may attract the Leaver L, and ſo force the Plug E E E upwards. But the Uſe of the Curvature is, that the one End O might be applied to the Shoulder, if it be thought fit to aim at any Mark.

T T, is a Rectangle of Iron, encompaſſing the Leaver L L, and the Iron O P O, to keep the Leaver in that Poſture which the preſent Scheme holds forth; for otherwiſe the Plug E E E would be thruſt out far away, whilſt we intrude the Air into the Globe A A.

I I, is an Elliptick Hole in the upper Part of the Globe very well ſhut with a Valve, opening inwardly, whoſe Uſe is to give liberty of Inſpection and of amending what is amiſs; for the Valve may be drawn through the Hole, by reaſon of its Elliptick Figure.

S S, is a metalline Plate tranſverſly placed above the Hole I I, and perforated to tranſmit the Screw V, by whoſe help the Valve ſhutting, the Hole I I is ſuſtained, and is applied cloſely to the Hole.

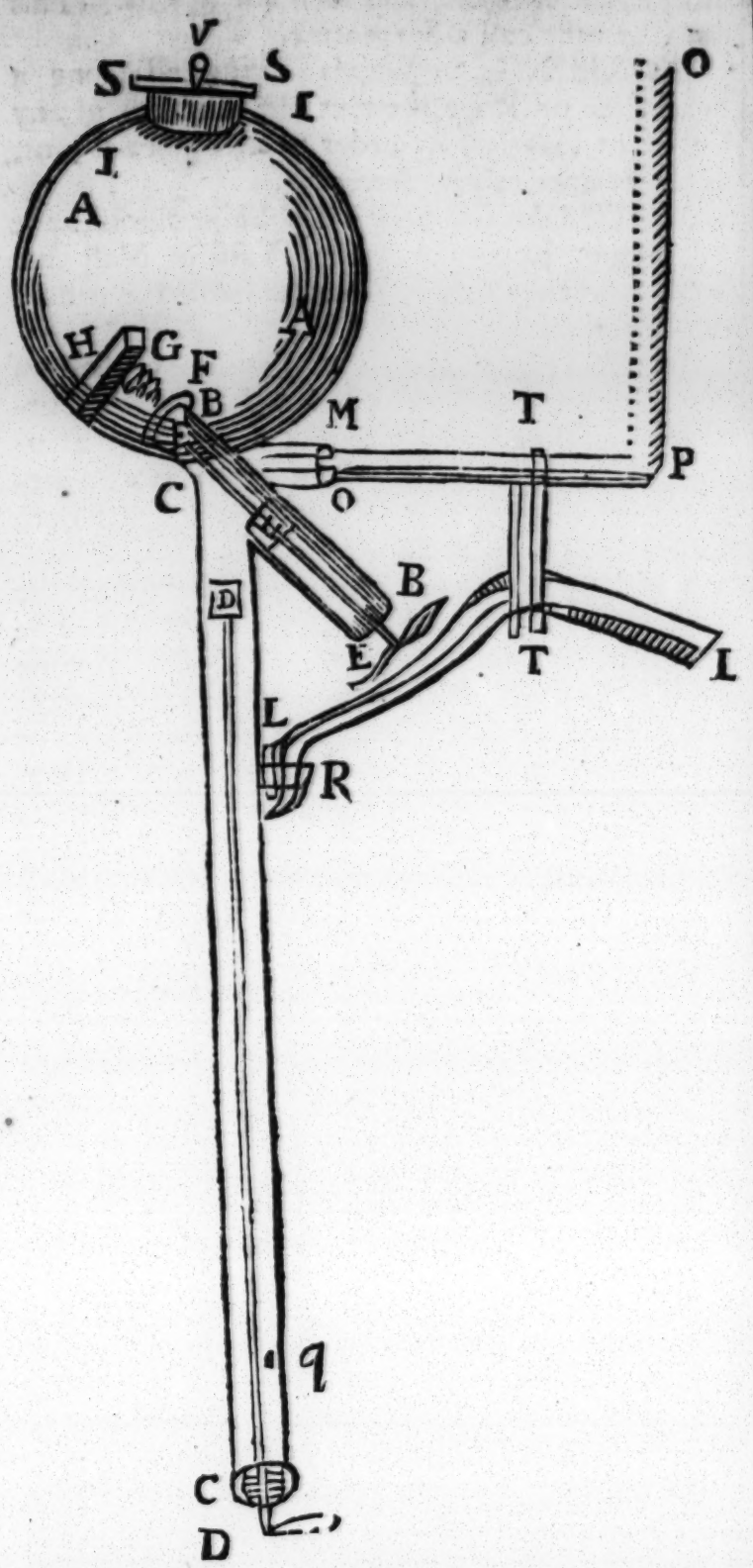
Q, is an Hole in the inferior part of the Tube C C, by which the Air enters into the Tube, whilſt the Plug D is brought to the loweſt part of the Tube.

The Air is thruſt into the Engine after this manner: The crooked End of the Plug D D is preſſed upon with the Foot, that it mayn't ſtir from the Ground; and the Engine being lifted upward till the upper part of the Plug be found below the Hole Q; then the Air entring through the aforeſaid Hole, doth wholly fill the Tube C C.

Then the Engine being forcibly depreſſed, the Air contain'd in the Tube C C, opens the Valve F, and is thruſt into the Globe A A; whence it cannot return, becauſe the Valves preſently ſtop the Paſſage; and thus by iterated Turns, we may condenſe the Air in the Globe, until the Force of its Spring cannot be overcome by our Strength.

Now to diſcharge the Air, ſo condenſed, the Plug D D is wholly to be drawn out, and a Bullet of Lead to be put into the bottom of the Tube C C, then by means of the Leaver L L L, the Plug E E E is to be impelled upward, as beforemention'd, and then the Extremity of the Iron Wire opens the Valve B, and the Air breaking out therefrom, expels the Leaden Bullet through the Tube C C with great Violence.

Note, That before the Plug D D is again put into the Tube C C from the Compreſſion of the Air, about half an Ounce of Water is to be poured into the foreſaid Tube. For by this means no Air at all can eſcape out by the Plug; and moreover, that Water filling exactly the upper part of the Tube C C, will cauſe that the whole compreſſed Air will be intruded within the Cavity A A, and ſo the Condenſation will be perfected much ſooner than if at every Turn part of the compreſſed Air did remain below the Valve F. See the Figure following.



This Engine is much better than any Wind-Guns hitherto mention'd in Print.

1. Becauſe that ſeeing one only Valve ſerves both for letting in, and diſcharging forth of the Air, it is leſs ſubject to be ſpoiled or impaired, than if two Valves were uſed for that Purpoſe.

2. If any Diſorder happen in other Guns, the Engine remains uſeleſs; but here by the Elliptick Hole, a Man may take out the Spring and the Valve, and ſo mend whatſoever is amiſs.

3. In other Guns, the Valves being cover'd with Leather, were put in before the Engine was on every ſide ſhut, and therefore Silver Solder could not be uſed in cementing the Parts, but only Lead Solder; by which the Air, being much compreſs'd, could by no means be reſtrain'd: But here all things are well cemented with Silver Solder, without danger of Burning, in regard the Valve cover'd with Leather is put in afterward through the Elliptick Hole II.

4. But this Engine is chiefly to be preferred before others on this account, becauſe we emit ſeveral Bodies into the Receiver, through the Elliptick Hole, and ſo make many Experiments in highly compreſſed Air.

WIND-*Taught*, a Sea Term, implying as much as Stiff in the Wind; for they ſay a thing is *Taught*, when 'tis Stiff. Thus too much Rigging, all high Ropes, or any thing catching or holding Wind aloft, is ſaid to hold a Ship *Wind-taught*; by which they mean, that ſhe ſtoops too much in her Sailing in a ſtiff Gale of Wind. So alſo, when a Ship rides in a main Streſs of Wind and Weather, they ſtrike down her Topmaſts, and bring her Yards down alongſt the Ship, which elſe would hold too much Wind, or be *Wind-taught*.

WINDING *Tackle-Blocks*; ſo the Seamen call thoſe *double Blocks*, with three *Shivers* in each, which are ſeized faſt to the End of a ſmall Cable which is brought about the Head of the Maſt, and ſo ſerves inſtead of a Pendant. This hath a *Guy* brought to it from the Foremaſt. Into the Block is reeved a Hawſar, which is alſo reeved through another double Block, having a Strap at the End of it, which being put through the Eye of the Slings, is lock'd into it with a *Fidd*, in order to hoiſe in Goods. The *Fall* of this Tackle is reeved into the *Snatch Block*, and ſo is brought to the Capſtan, whereby the Goods are heaved.

WINDLASS, in a Ship, is a piece of Timber having ſix or eight Squares, and is fix'd abaft the Stern aloft, where the Cables come in from the one Side of the Ship to the other, uſed now in ſmall Ships only, and in the *Flemiſh* Ships, which are highly mann'd: But this *Windlaſs* will purchaſe more by much than any Capſtan in the weighing of an Anchor, and without any Danger to thoſe that heave, becauſe they heave here about with Handſpikes put into the Hole at either End of the *Windlaſs*; of which, tho' one ſhould happen to break, yet would the *Windlaſs* paul of it ſelf, without any farther Danger.

WING: The *Romans* called by the Name of *Alæ*, the *Wings*, two Bodies of Men in their Army, one on the Right, and the other on the Left, conſiſting each of 400 Horſe, and 4200 Foot uſually; and being wholly made up of Confederate Troops: Theſe were deſign'd to cover the *Roman* Army, as the Wings of a Bird cover its Body. The Troops in theſe Wings they call *Alares*, and *Alares Copiæ*; and we at this Day diſtinguiſh our Armies into the Main Body, the Right and Left Wings.

WINGS, in Fortification, are the large Sides of Horn-works, Crown-works, Tenailles, and the like Out-works; that is to ſay, the Ramparts and Parapets, with which they are bounded on the Right and Left, from their Gorge to their Front. Theſe Wings or Sides are capable of being flank'd either with the Body of the Place, if they ſtand not too far diſtant; or with certain Redoubts, or with a Traverſe made in their Ditch.

WINTER *Solſtice*: See *Solſtice*.

WITHERNAM, is the taking or driving of a Diſtreſs to the Hold, or out of the County, ſo that the Sheriff cannot upon Replevin make Delivery thereof to the Party diſtrained: In which Caſe, a Writ of *Withernam* is directed to the Sheriff for the taking of as many of his Beaſts that did thus unlawfully diſtrain, or as much Goods of his into his keeping, until he hath made Deliverance of the firſt Diſtreſs. Alſo, if the Beaſts be in a Fortlet or Caſtle, the Sheriff may take with him

the Power of the County, and beat down the Caſtle.

Withernam, in ſome Statutes, ſeems alſo to ſignifie an unlawful Diſtreſs made by him that has no Right to Diſtrain.

WITT. Mr. *Locke*, in his *Eſſay on Humane Underſtanding*, B. II. C. XI. Sect. 2. defines *Witt* (and thereby diſtinguiſhes it from *Judgment*) to be a quick and ready Aſſemblage of Idea's; and putting thoſe together with great Facility and Variety in which can be found any Reſemblance and Congruity, thereby to make up pleaſant Pictures and agreeable Images in the Fancy. Hence it is that Metaphors and Alluſions are ſo generally entertaining and pleaſing; becauſe their Beauty appears at firſt ſight, and there is required no Labour and Toil of Thought to examine what Truth or Reaſon there is in them.

WOOD and *Wood*, a Sea Term of two pieces of Timber; being ſo let into each other, that the Wood of one joins cloſe to the other.

WORM; is that winding long Pewter Pipe which Apothecaries and Diſtillers place in a Tub of Water to cool and condenſe the Vapours in Diſtillations of Spirits. Formerly, and ſometimes now, this Worm, or ſomething like, was placed above the Head of the Still, and then a Refrigeratory at the upper end of it, which is very good to diſtil Spirit of Wine, and ſuch fine Spirits. This the Chymiſts call a Serpentine.

WORMING, at Sea, is laying all along a ſmall Line or Rope betwixt the Shrouds of any Cable or Hawſar, in order to ſtrengthen it; or, as the Seamen call it, *Succour it*.

WOULDING, a board a Ship, ſignifies the winding of Ropes faſt about a Yard or Maſt that is *fiſhed* (as they call it) in order to make it hold the better.

WREATH, in Heraldry, ſignifies a Roll of fine Linnen or Silk (like that a Turkiſh Turbant) conſiſting of the Colours born in the Eſcucheon, which in an Atchievment is placed between the Helmet and the Creſt, and which doth immediately ſupport the Creſt.

WRECK, is where a Ship has periſhed on the Sea, and no Man eſcapes alive out of it. The Civilians term it *Naufragium*. This *Wreck* being made, the Goods that were in the Ship brought to Land by the Waves, belong to the King, or whom he aſſigns it to. But if a Man, or a Dog, or a Cat eſcape alive, and that the Party to whom the Goods belong, come within a Year and a Day, and prove the Goods to be his, he ſhall have them again, by the Proviſion of the Statute of *Weſtm.* 1. cap. 4.

WRIGHT'S *Sailing*. See *Mercator's Sailing*.

XIP XYS

XEROPHTHALMY, a dry *Ophthalmy*, or Blood-ſhot of the Eyes, without Weeping, which happens uſually in dry Weather. *Blanchard.*

XIPHIAS, according to ſome, is a ſort of Comet, ſhaped like Swords; the Head being like the Hilt, and the Tail ſtreight and pointed, yet ſometimes bending like a Cymiter, but when it is of a leſſer, and of a more contracted Form, 'tis like a Knife, or Dagger.

XYPHOIDES, is a pointed Cartilage of the Breaſt, called *Cartilago Enſiformis*,

XYSTER, is a Surgeons Inſtrument to ſhave and ſcrape Bones with.

YARDS of a Ship, are thoſe long pieces of Timber which are made a little tapering at each End, and are fitted each to its proper Maſt to carry the Sails which are faſtned to theſe Yards at their Head, and are hoiſed up and let down together with the Yards, by the Halliards.

For the Proportions of the Yards of a Ship, they commonly allow $\frac{5}{6}$ of the Length of her Keel, or $\frac{6}{7}$ of the Length of her Main-maſt, for the Length of her Main-yards; and for the Thickneſs of them, they allow $\frac{3}{4}$ of an Inch for every Yard in Length; the Top-yard is $\frac{3}{5}$ of the Main-yard, and the Fore-yard is $\frac{4}{5}$ of the Main-yard, or as ſome ſay $\frac{8}{9}$: The Spritſail-yard and Croſs-jack, are of the ſame Length, *viz.* $\frac{1}{2}$ the Miſſen-yard; and the Thickneſs of the Miſſen-yard and Spritſail-yard is $\frac{1}{2}$ Inch to a Yard in Length.

All ſmall *Yards* are half the great Yards from Cleat to Cleat: When a great Yard is down a *Portlaſt*, it gives the Length of all Topſail-ſheets, Lifts and Ties, Jeers and Bunt-lines; as alſo of the Leech-lines and Halliards, meaſuring from the Hounds to the Deck: And when it is hoiſed, it gives the Length of Clew-lines, Braces, Clew-garnets, Tackles, Sheets and Bow-lines.

The Terms belonging to the *Yards*, are, 1. *Top the Yards*; that is, make them hang even. The Clew-lines do moſt properly Top the Main and Fore-yards; but when the Top-ſails are ſtowed, then the Topſail-ſheets will Top them. 2. *Brace the Yard*, i. e. Traverſe aft the Yard-Arm, whoſe Brace is haled. So that *Traverſe the Yard*, is the ſame as to ſay, *Brace it aft*. 3. *Square the Yards*, *i. e.* ſee that they hang right acroſs the Ship, and one Yard-Arm not traverſed more than the other.

YARE, is the Sea word for Nimble, Ready, Quick, or Expeditious.

YAWES. At Sea, they ſay a Ship makes *Yawes*, when through the Fault of him at Helm ſhe is not kept *ſteady* in her Courſe, but makes Angles in and out; to prevent which, the Conner crys, *Steady*, *Steady*, keep her Thus, Thus.

YEAR: The Time the Sun takes to go through the twelve Signs of the Zodiack. This is properly the Natural or Tropical Year, and contains 365 Days, 5 Hours, and 12 Minutes.

The *Sydereal Year*, is that Time in which the Sun departing from any fixed Star, comes to it again; and this is in 365 Days, 6 Hours, and almoſt 10 Minutes. But according to Sir *Iſaac Newton*'s New Theory of the Moon, the *Sydereal Year* is 365 D. 6 H. 9′ 14″; and the *Tropical*, 365 D. 5 H. 48′ 57″.

The *Civil Year*, which is commonly uſed by all Nations, is very various, both as to its Beginning, and alſo as to its Length, according as they follow the Courſe of the Sun, Moon, or both.

The *Civil Lunar Year* contains 12 Lunations or Synodical Months, and contains but 354 Days: This being 11 Days leſs than the Solar Year, its Head in about 33 Years will run through all the Months and Seaſons of the Year. This kind of Year is now uſed by the *Turks*, and ſeems to have had its firſt Riſe in Countries where the Difference between Summer and Winter is not ſo ſenſible as it is with us; and where, for want of Aſtronomy, they know not how to eſtimate the Solar Year, and therefore began their Account of Months from the Phaſes of the Moon. And hence, as the learned Aſtronomer Dr. *Gregory* hints, it came to paſs, that they began the Account of their Civil Day at Sun-ſet; for their Day muſt begin when their Month and Year did, and that was with the New Moon, which being to be determined by view, could not be diſcovered till after Sun-ſet.

The *Jews* had their *Secular Year*, which began at the Autumnal Equinox; and their *Sacred Year*, which began at the Vernal one.

The *Egyptians*, *Chaldeans* and *Aſſyrians*, firſt meaſured the Year by the Courſe of the Sun, which they ſuppoſed to contain but 360 Days; afterwards 5 more were added by *Mercury*, which he called ἐπαγομέναι, i. e. *added*; but yet no notice was taken of the 6 Hours; by which means the *Egyptian* Year hath fixed no place in reference to the true Solar Year; but anticipating a Day every four Years, runs quite round in 1460 Years.

This way of reckoning continued till *Egypt* becoming a Province of the *Roman* Empire, they took the *Julian* Account, only they kept the Names of their Months ſtill, and order'd their matter ſo, that their *Thot*, the firſt Day of the Year, always happen'd on the 29th of *Auguſt* in the *Julian Year*. So that the *Egyptian* or *Coptick Year* is 4 Months and 3 Days before the *Roman Year*, which begins with the Calends of *January*.

The *Perſians* account (according to the *Egyptian* way) 365 Days.

The *Arabs*, *Saracens* and *Turks*, count their Year by the Motion of the Moon, and make it conſiſt of 12 Moons or Months, whereof ſome have 30, and ſome 29 Days alternately; and theſe altogether make but 354 Days; ſo that their Month *Muharran*, in which they place the Beginning of the Year, in leſs than 34 Years will run quite round, and be in all Seaſons. The *Arabs* indeed, by a Cycle of 30 Years, do remedy this by means of an *Intercalation* or *Emboliſm* of 11 Days.

The *Greeks* counted their Year by the Motion of both Sun and Moon, and finding that there was 11 Days difference between the Lunar and Solar Year; at firſt they added an Intercalary Month every two Years, containing 22 Days, which therefore they called ἐμβολιμαῖον, the *added* or *inſerted* Month. Afterwards conſidering the 6 Hours alſo, they put their *Emboliſm* off till 4 Years end; and then making the 3 firſt Years to contain 354 Days a-piece, (which is the Lunar Year) this made the 4th Year to have 399 Days. And to make this *Intercalation* the more remarkable, they inſtituted the *Olympick Games* on every ſuch 4th Year; whence came the Computation by *Olympiads*; each of which contain'd 4 Years.

Nevertheleſs they found that this would not do in proceſs of Time; and therefore they firſt reduced the *Intercalation* to 8, and then to 11 Years; but ſtill there was great Confuſion, till one *Meto*, a Citizen and famous Aſtronomer of *Athens*, thought of joining the two laſt Periods 8 and 11 together;

together; which doing, he made a Period of 19 Years, in which the two Motions of the Sun and Moon are wholly accommodated, and the Moon changes on the ſame Day of the Month that ſhe did 19 Years before. This Diſcovery, for its Fulneſs, was much celebrated, and the Number of the Period 19, the *Athenians* ordered to be ſet up in a publick Place, and to be written in Characters of Gold; whence it took the Name it ſtill retains, being called the *Golden Number*.

The *Athenians* began their Year at the New Moon after the Summer Solſtice; in their Month *Hecatombæon*, as *Plutarch* ſays.

There were alſo ſome Nations who made their Year to conſiſt only of 4, or of but 3 Months, as *Macrobius* tells us in his *Saturnalia*, Lib. 1.

The *Carians* and *Acharnanians*, ſaith *Juſtin*, made their Year to conſiſt of 6 Months, and reckoned but 15 Days to their Month.

The *Romans* had three ſorts of Years: 1. That of *Romulus*, which contained but 10 Months; from whence the laſt Month of our Year retains the Name of *December*, as being the Tenth of his. This Year begun in *March*. 2. *Numa Pompilius* his Year; which had *Romulus* his groſs Miſtake corrected, and two more Months added to it, *viz.* *January* and *February*; and then it contained only 355 Days, or 12 Lunar Months. 3. The Year of *Julius Cæſar*, who diſcovering that there were 10 Days more than *Numa* reckoned, made the Year 365 Days: And reſerving the 6 Hours till every fourth Year, they then made another Day, which was added before the ſixth of the Calends of *March*; ſo that in this fourth Year they accounted the 6th of the Calends of *March* twice; *Bis-ſexto-calendas*, whence came the Word *Biſſextile* or Leap-year, as we call it; which hath 366 Days. This Account is now uſed in *England*, and is the *Julian* or *Old Stile*.

But becauſe there was ſtill found an Error in this Calculation, and that the *Equinoxes* did plainly, tho' inſenſibly recede from the Points where *Cæſar* had fixed them; as alſo, that the Year was diſcover'd to want about 11 Minutes of 365 Days and 6 Hours; which 11 Minutes will in 131 Years make the Equinoxes go back about a Day; Pope *Gregory* XIII. to reform (as he thought) this Error, ordered 10 Days to be taken from the Year, to bring the Equinoxes that Year (which was 1582) to *March* 21, and *Sept.* 22, 23. And this is what is called the *Gregorian* Account or New Stile, as is uſed by the Popiſh Nations every where.

The Great Year, or the *Annus Magnus*, about 25000 or 26000 Years; in which Time the fixed Stars will appear to come to the ſame Point again, exactly after one entire Revolution.

YEAR *and Day*, in Law, is a Time that determines a Right in many Caſes; and in ſome Works an Uſucaption, in others a Preſcription; as in Caſe of an Eſtray, if the Owner (Proclamations being made) challenge it not within that Time, it is Forfeit: So is the *Year and Day* given in caſe of Appeal, in caſe of Deſcent after Entry or Claim, and in caſe of a Man ſo bruiſed and wounded; of Protection, Eſſoigns in reſpect of the King's Service; of a Wreck, and divers other Caſes. *Co. Vol.* 6. *Fol.* 107.

YEAR, *Day* and *Waſte*, is a Part of the King's Prerogative, whereby he challengeth the Profits of their Lands and Tenements for a Year and a Day, that are attainted of Petty Treaſon, or Felony, whoever is Lord of the Mannor whereto the Lands or Tenements belong; and not only ſo, but in the End may waſte the Tenements, deſtroy the Houſes, root up the Woods, Gardens, Paſture, and plow up the Meadows, except the Lord of the Soil agree with him for Redemption of ſuch *Waſte*, afterwards reſtoring it to the Lord of the Fee.

YOKE: See *Sea-Yoke*.

ZENITH, or Vertex, is the Point in the Heavens, right over one's head, being neceſſarily 90° Degrees diſtant from the Horizon.

ZENITH *Diſtance*, is the Complement of the Sun, or Stars Meridian Altitude, or what the Meridian Altitude wants of 90 Degrees.

ZERNA : See *Lichen*.

ZETETICK Method in Mathematicks, is the Analytick, or Algebraick way, whereby the Nature and Reaſon of the thing is primarily inveſtigated and diſcovered.

ZEUGMA, is a Figure in Grammar, when an Adjective or Verb, agreeing with a nearer Word, is alſo by way of Supplement referred to one more remote. Thus, ſaith *Terence*, *Utinam aut hic ſurdus, aut hæc muta facta ſit.*

ZOCCO : See *Plinthus*.

ZOCLE, is a ſquare Member in Architecture, being lower than its Breadth, which ſerves to ſupport a Pillar, or any other part of a Building, inſtead of a Baſe, Plinth, or Pedeſtal.

Continued Zocle, is a kind of continued Pedeſtal, on which a Structure is raiſed, but hath no Baſe or Corniſh.

ZODIACK, is a great Circle of the Sphere, dividing it into two equal Parts, cutting the Equator in the Eaſt and Weſt Points of the Horizon. It cuts the Horizon and Equinoctial obliquely; making with the former an Angle equal to the Sun's greateſt Meridian Altitude in any Latitude; and with the Equinoctial, an Angle of 23° 30′ Minutes, which is the Sun's greateſt Declination.

This is a broad Circle, and through the middle of it is drawn a Line, called the Ecliptick, or *Via ſolis*, the Way of the Sun, becauſe the Sun never deviates from it in his Annual Motion; as the Planets do all more or leſs, (whence it hath its Breadth.)

The *Zodiack*, in the Globe, is mark'd with the Characters of the Twelve Signs, and in it is found out the *Sun's Place*, which is *under what Star or Conſtellation he appears to be at Noon.*

By this are determined the four Quarters of the Year; and accordingly it is divided into 4 Parts, and as the Sun goes on here, he hath more or leſs Declination, North and South.

Alſo from this Circle, the Latitudes of the Planets and fixed Stars are accounted, from the Ecliptick towards its Poles.

And thoſe Poles are 23 Degrees 30 Minutes diſtant from the *Poles of the World*, or of the *Equinoctial*; and by their Motions are the Polar Circles deſcribed.

In theſe Poles all the Circles of Longitude which are drawn through the *Zodiack*, do terminate, (as the Meridians and Hour Circles do in the Poles of the World) and as the Azimuth Circles do in the Zenith and Nadir.

The Breadth of this Circle, or rather Zone in the Heavens, is 20 Degrees, for beyond 10 Degrees North, or 10 Degrees South, the Latitude of no Planet ever reaches.

It ſeems to have been divided into 12 Parts, (which they call Signs) becauſe while the Sun in a Years time is running thro' the Zodiack or Ecliptick, there happen to be 12 Lunations: Or the Moon undergoes all her Changes and Phaſes, 12 times, pretty near. Each Sign is divided into 30 Degrees, ſo that the whole makes 360: And they begin to reckon at the Eaſtern Interſection of the Equinoctial and Ecliptick; or at the Vernal Equinox, where they place the firſt Point of *Aries*; going on thence to *Taurus*, *Gemini*, *Cancer*, *&c.* and when you count thus forward on according to the uſual Order and Courſe of the Signs, they call it, *in conſequentia*, but if you count backwards from *Taurus* to *Aries*, *&c.* they ſay, 'tis *in Antecedentia*.

The Reaſon of the Name of this Circle, and its Origin, was this.

The ancient Aſtronomers obſerved the Sun in his (apparent) annual Motion to deſcribe always one and the ſame Line or Track in the Heavens, and never to deviate from this Path either to the North or the South, as all the other Planets, they found, did more or leſs. And becauſe they obſerved the Sun to ſhift as it were backwards, thro' all the Parts of this Circle or Path, ſo that in his whole Years Courſe, he would Riſe, Culminate, and Set with every Point of it, they diſtinguiſhed the fixed Stars which appeared in or near this Circle into 12 Conſtellations or Diviſions, which they called Signs, becauſe they were Marks to diſtinguiſh whereabout the Sun was. Theſe Signs they painted uſually in the Form of Animals, and thence came the word *Zodiack*; and the very middle Line of it is called the Ecliptick, becauſe the Eclipſes only happen when the Moon alſo is in that Line.

ZODIACK of the Comets; *Caſſini* hath obſerved a certain Tract in the Heavens, within whoſe Bounds (by many Obſervations) he hath found moſt Comets, tho' not all, to keep. This he makes as broad as the other *Zodiack*, and marks it with Signs or Conſtellations like that, which are *Antinous*, *Peſagus*, *Andromeda*, *Taurus*, *Orion* the leſſer Dog. *Hydra*, the *Centaure*, *Scorpion*, and *Sagittary*.

ZONE, in Geography, is a Space contained between two Parallels; of theſe Zones there are five commonly reckon'd, *viz.* two *Frozen*, two *Temperate*, and one *Burning Zone*.

The *Frozen Zones*, are thoſe Parts of the Globe comprehended between the Pole and the Polar Circle; therefore one muſt be towards the North, the other towards the South: The *Frozen*, or *Frigid Zone*, towards the North, lying between the North Polar Circle, and the North Pole, contains part of *Iſland*, and *Norway*, *Lapland*, *Finmark*, *Samojeda*, *Nova-Zembla*, *Greenland*, and ſome other Parts of *North America*. The *Frigid Zone*, toward the South, lying between the South Polar Circle, and the South Pole, is not yet known whether it contains Land or Water.

The *Temperate Zones* are one on the North ſide of the Equator between the Arctick Circle, and the Tropick of *Cancer*; another on the South ſide beween the Tropick of *Capricorn*, and the Antartick Circle.

Torrid Zone, or *Burning Zone*, contains all that Space of Earth that lieth between the two Tropicks.

ZOOGRAPHY, is a Deſcription of the Nature and Properties of Animal Bodies, ſuch as Beaſts, Birds, Fiſhes, Inſects, *&c.*

ZOOTOMY, is an Artificial Diſſection of Brute-Animals, as *Androtomy* is of the Bodies of Men.

ZUGOMATICUS, is a Muſcle of the Face, ſo called by *Riolan*, becauſe it ariſes from the *Os Jugale*, or *Zugoma*. Its Origination is round and fleſhy from the external Part of the ſaid Bone; whence deſcending obliquely forwards, is inſerted near the Angle of the Lips. Whence the Muſcle and its Partner act, they draw both Lips upwards, and make a pleaſant Countenance.

ZYGOMA. or *Os Mali*, is one of the Bones of the Upper Jaw, it is of a triangular Figure; on the upper part it joins to the *Os Sphænoides*, on the lower to the *Os Maxillare*; its external part hath a long Proceſs, called *Proceſſus Zygomaticus*; it joins with the *Os Frontis*, at the Corner of the Eye.

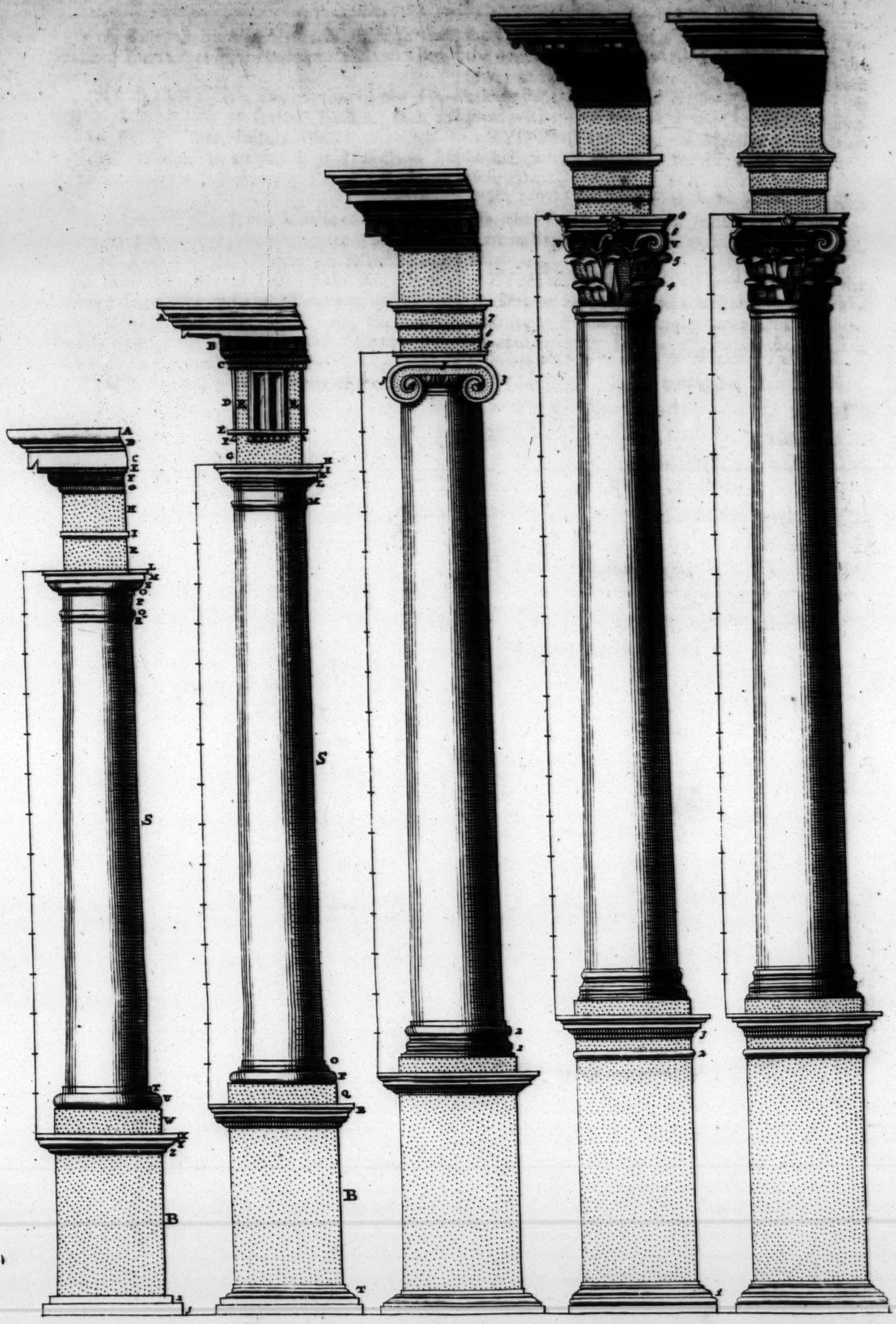
ZYGOMATICUM, are Muſcles which draw both Lips obliquely to either ſide, and are otherwiſe called *Jugale*.

ZYMOMA, is any Ferment, as the Nitrous Air, the Watry Juice in the Mouth, the Acid Liquor in the Stomach, the Blood in the Spleen, *&c. Blanchard*.

ZYMOSIMETRE, is an Inſtrument whereby the Degree of the Fermentation ariſing from the mixture of divers Liquors, is meaſured; or the Temperament or Degree of Heat in the Blood of Animals, *&c.*

ZYMOSIS: See *Fermentation*.

F I N I S.


S
B
S
B
S
B
TUSCAN
DORICK
IONICK
CORINTHIAN
COMPOSITE

The Explanation of the Plate for the Five Orders of Architecture.

In the Tuſcan *Column.*

a The *Ovolo* or *Egg:* In the *Ionick* and *Corinthian* Orders, and every where by ſome 'tis called the *Echinus.* The *French* call it the *Quart de rond.*

b The *Aſtragal* or *Baguette*, as the *French* call it: The *Italians* the *Tondino* or *Round*; below which is a ſmall Liſt, Reglet or Fillet.

c Is the *Crown*, the *French* call it the *Larmier.*

e The *Liſt* or *Fillet* under that.

f The *Gula* or *Talon* in *French.*

g The *Liſt* of the *Gula.*

H The *Frieze.*

i The Liſt of the *Architrave.*

k The *Architrave,*

l The Liſt of the *Abacus.*

m The *Abacas Cymatium* or *Saillou*, as the *French* call it.

n The *Ovolo* or *Echinus.*

o The *Liſt*, *Ring* or *Fillet* under that.

p The Frieze of the Capital: The *French* call it the *Gorgerin* or *Collarin.*

q The *Aſtragal* of

r The *Conge* or *Ceinture*, as the *French* call it; or of the Neck of the Column.

s The *Body* of the Column; in *French* the *Fuſt* or *Vif.*

t The *Liſtel* of the Baſe, or the *Netherband* or *Swath.*

u The *Tore*, or the *Gros Baton*, in *French.*

w The *Plinth.*

x The *Riglet*, *Liſt* or *Fillet.*

y The *Gula* reverſed, or the *Talon.*

z The *Ring*, *Liſt* or *Fillet.*

B The *Die* of the Baſe.

2 The Reglet or *Fillet.*

3 The Baſe of the *Pedeſtal*; in *French* the *Zocle.*

In the Dorick *Column.*

a The *Gula*, ſometimes the Grove or hollowing of the upper Liſt.

b The *Dentils* or Teeth.

c The *Capital* of the *Trygliph.*

d The *Trygliph*, of which thoſe Parts that are framed inwards or hollowed, are called *Flutes:* And the Square of the Frieze between the *Trygliph* is called the *Metops*, as *r*; and ſometimes the outermoſt towards the Right-hand is called a *Demi-Metops.*

e The *Cymatium* or *Bandelette.*

f The *Guttæ* or *Drops.*

g The *Platteband* or *Face.*

h The *Reglet.*

i The *Talon* or *Gula.*

k The *Ovolo* or *Echinus.*

l Three *Annulets* or *Fillets.*

m The *Frieze*, *Gorgerin* or *Collarin.*

S The *Fuſt*, *Shaft* or *Body* of the Pillar.

o The *Liſtel.*

p The *Tore.*

q The *Pinth.*

r The *Fillets* and *Gula.*

B The *Die* of the Baſe.

t The *Fillets* or *Reglets* of

u The Baſe of the *Pedeſtal.*

In the Ionick *Column, the Things in which it differs from the former, are theſe.*

1. The *Firſt Scotia.*
2. The *Second Scotia.*
3. The *Bands* or *Canal* of the *Volutæ.*
4. The *Volutæ.*
5. The Firſt or *Little Face.*
6. The Second or *Middle Face.*
7. The Third or the *Great Face.*
9. The Figure of *Eggs* carved there.

In the Corinthian *Column, the Things peculiar are.*

1. A *Tore*, *Reglet* and *Gula* finely wrought.
2. A *Reglet* and *Aſtragal*, with
3. *Frieze* about it.
4, 5, 6. The Ranks or Rows of Leaves, ſome ſay of the *Acanthus* or *Great Dock*, others of *Olive*, and others of *Palm.*
8. The *Abacus* of the *Capital.*
9. The *Flower.*

In the Compoſite Order.

The *Pedeſtal* of this *Column*, is the ſame with that of the *Corinthian*, except in the Members of the *Cymatium* and *Baſe.*

And the *Compoſite Capital* differs from the *Corinthian* only in this, That it hath *Volutæ* or *Scrolls* like the *Ionick*, when the *Corinthian* hath curled Stalks; and therefore 'tis called *Compoſite*, becauſe compoſed of the *Ionick* and *Corinthian* together.

The Explanation for the Plate of Fortification.

A *A Single Baſtion.*

B *A Double Baſtion* or *Cavalier*, to overlook the Enemy's Baſtions, and to ſcour their Trenches.

C *A Platt Baſtion*; which is made when the Line of Defence is too long; *i. e.* exceeds 150 Fathom, which is the Diſtance a Musket will be ſure to do Execution. Wherefore this *Platt-Baſtion* is placed in the middle of the Curtain.

D *A Half-Baſtion* placed on the Side of a River.

E *A Baſtion Tenailled*; when the Angle of the Baſtion is leſs than 70 Degrees

F *A Ravelin* which covers the Gates, Bridges and Curtains. Sometimes theſe Ravelins have Flanks made to them, as G.

G *A Ravelin* with Flanks.

H *An Half-Moon*, made to cover the Flanked-Angle of the Baſtion. The *Gorges* of *Half-Moons* are circular.

I *Counter-Guard*, which are raiſed inſtead of *Half-Moons.*

K *A Single Tenaille.*

L *A Queue D'yronde*, or *Swallow's-Tail:* So called, becauſe its Sides inſtead of being paralliel, open or ſpreads towards the Head, and grow narrow at the *Gorge.*

M *A Bonnet, a Peſtre*, or *Prieſt's-Cap:* Some call them *Double Tenailles.* But they differ from a *Tenaille*, becauſe its Sides are not parallel, but ſpread or open out towards the Campaign like a *Swallow's Tail.* This Work hath two Angles *Saillant*, and two Inwards.

N *A Horn-work*, whoſe Heads is fortified with two Demi-Baſtions, or *Epaulments*, joyn'd by a Curtain, and cloſed by parallel Sides ending at the *Gorge* of the Work. Theſe *Horn-works* are uſed to cover the Gates, *&c.* inſtead of *Tenailles.*

N 2, *A Horn work*, whoſe Sides are not parallel.

O *A Crown-work*, whoſe Deſign is to cover ſome large Spot of Ground to defend a Riſing-Ground, or to defend the Head of a Camp that is intrenched: 'Tis the largeſt of all Outworks, having a large *Gorge*, and two Sides, ending towards the Campaign in two Demi-Baſtions; each of which joyns by a Curtain, to an entire Baſtion that is at the Head of the Work.

P *Tenailles* to defend the Ditch.

Q *An Half-Moon* covered with two *Counter-Gaurds* R R, to make it the ſtronger.

S S *Places of Arms* on the *Counterſcarp*, being open Spots of Ground for the Garriſon to Rendezvous on an Alarm, *&c.*

↗ The *Ditch.*

Γ T, *&c.* The *Counterſcarp*, or *Covered-way.*

g g, &c. The *Glacis.*

V *A Retrenchment* within or behind a Breach; as X.

W *A Place* for a *Magazine.*

l l l Palliſades.

a a Redoubts.

b b b Batteries.

c Lines of Communication.

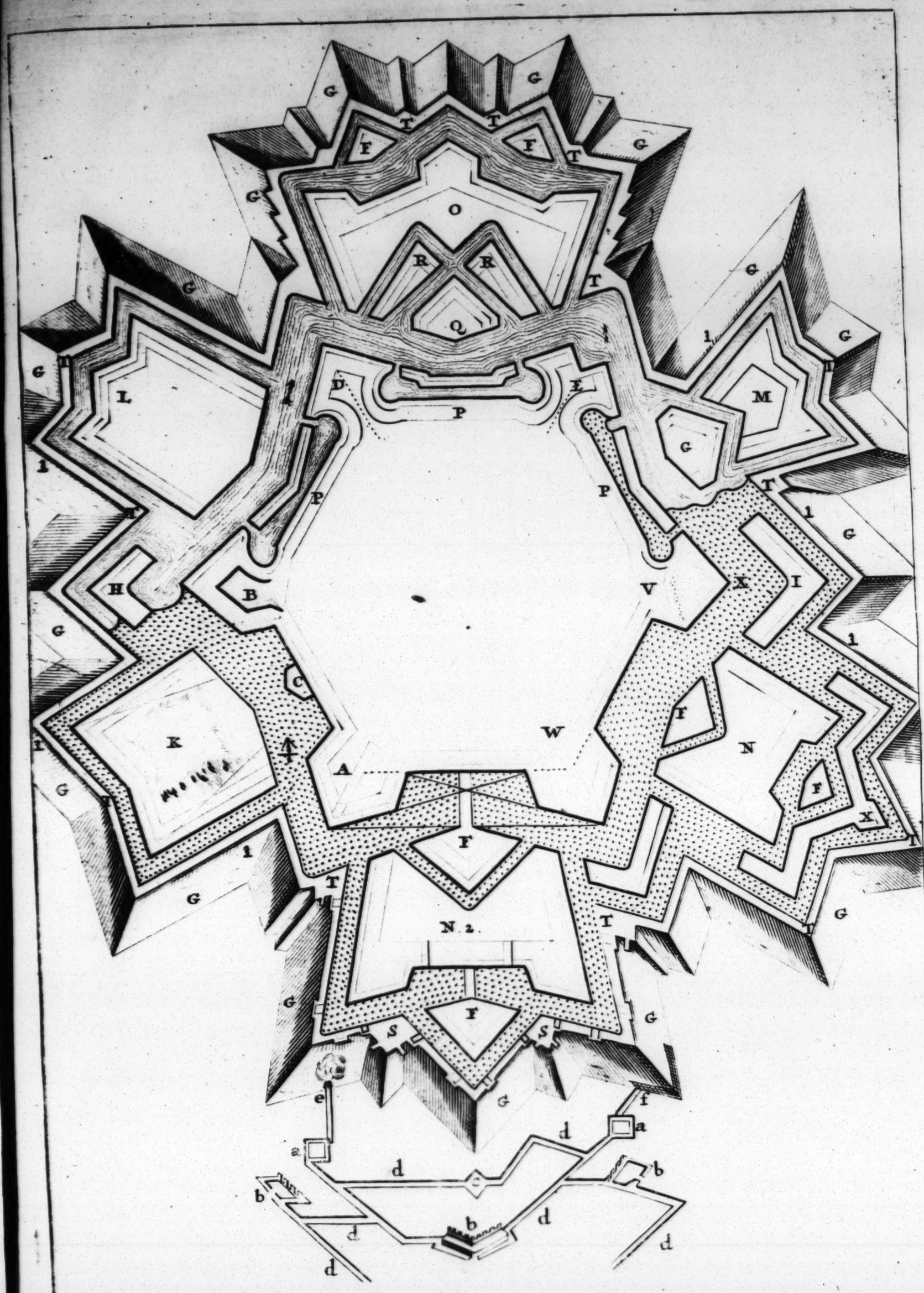
d d Trenches, by which the Approaches are carried on.

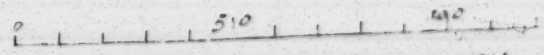
e Mine under the Glacis and Covered-way of the *Horn-work.*

f A Lodgment at the Foot of the *Glacis.*

Explanation of the Profile.

r a	The Baſe of the *Rampart*	70 Feet	*a e*	The *Berme*	3 Feet
t s, *q o*	Its Height	16	*e g*	The Breadth of the Moat	112
r s	The Inward *Talu*	16	*i f*	Its Depth	12
o a	The Outward *Talu*	8	*f h*	Its Breadth at the Bottom	88
l q	The Baſe of the *Parapet*	21	*e s k g*	The *Talus*'s, each	12
Z d	The Inward Height	6	*c g*	The little Ditch at the Bottom of the Moat	18
n p	The Outward Height	4	*q w*	Its Depth	5
n q	The Outward *Talu* of the *Parapet*	2	*g c*	The *Covert-way*	18
o d	The Inward	1	*c d*	The Seat of the *Parapet.*	60
y l	The Breadth of the *Foot-Bank*	3	*c f*	Its Height	6
y x	The Height of it	1½	*f d*	The *Glacus*	
t y	The *Terre-Plane.*	25			





Scale of Feet for the Profile

Fig. 1.

Fig. 2.

Fig. 3.

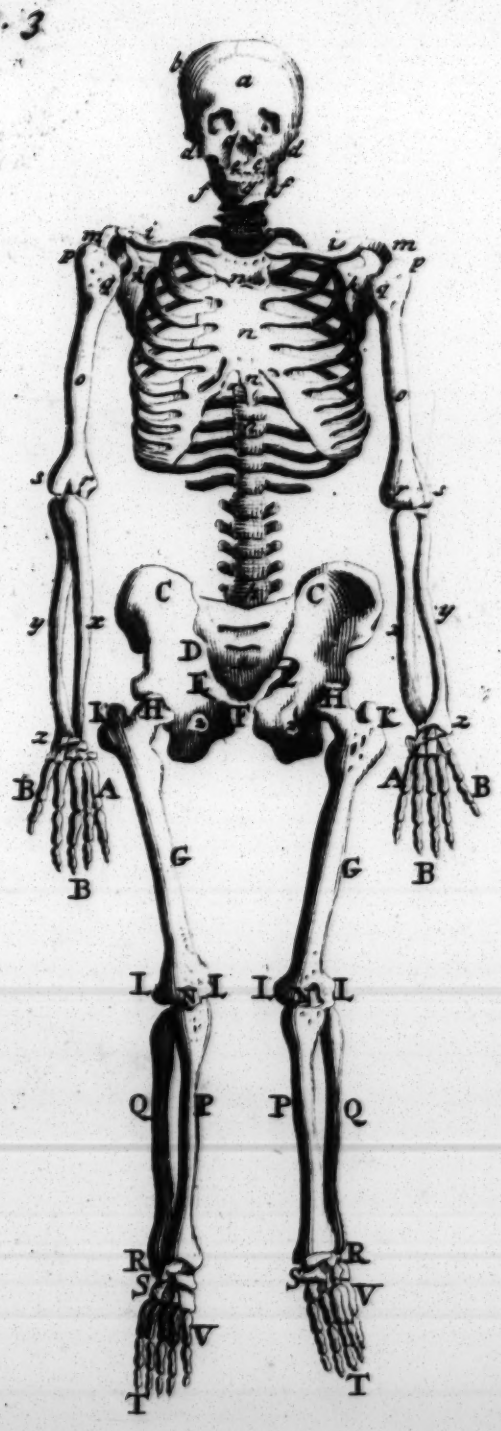
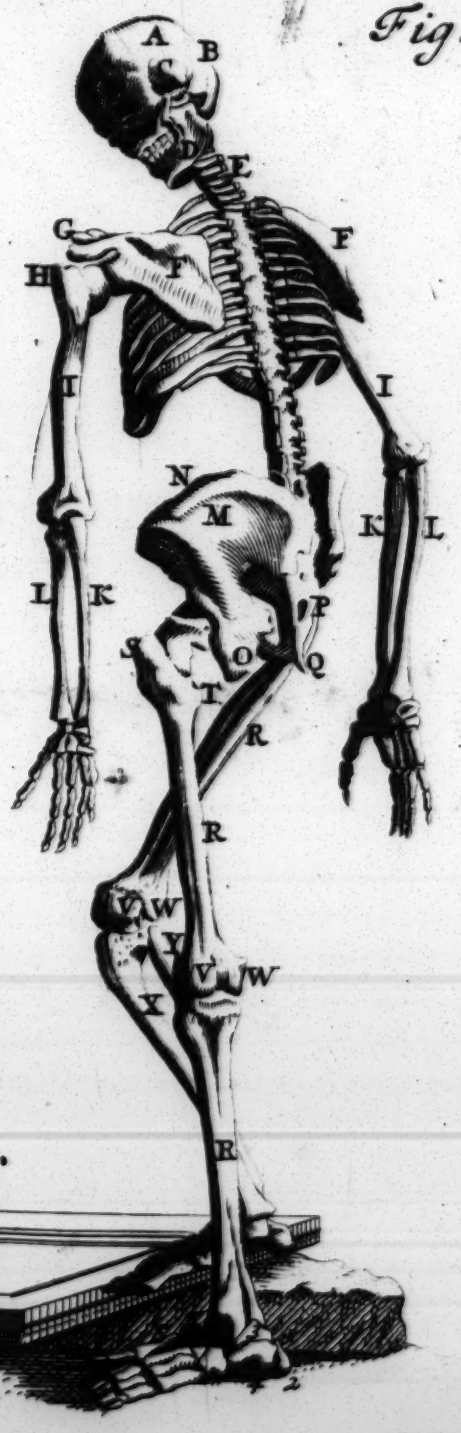


Fig. 4.



A Deſcription of the Anatomical Plate.

FIGURE I.

Repreſenting the Muſcles of the Fore-part of an Humane Adult Body.

a The *Muſculus Frontalis.*
b The *Temporalis.*
c The *Muſculus* called *Maſſeter.*
d The *Deltoides.*
f The *Biceps.*
g The *Extenſor Carpi.*
h The *Flexor Carpi.*
i The *Extenſor tertii Internoäii Pollicis.*
k The *Flexor Pollicis.*
l l The *Muſculi Pectorales.*
m m The *Muſculi Recti* of the *Abdomen.*
n n The *Linea Alba.*
u u The *Muſculi obliqui deſcendentes* of the *Abdomen.*
o o The *Muſculus Sartorius*, or *Faſcialis.*
p p The *Muſculi Recti Femoris.*
q q The *Triceps.*
r Part of the *Muſculus Membranoſus.*
s s The *Vaſtus internus.*
t The *Vaſtus externus.*

FIGURE II.

Repreſenting the Muſcles of the Hinder-part of the Body.

a a The *Trapezius Muſculus.*
b The *Deltoides.*
c The *Supra Spinatus.*
d The *Infra Spinatus.*
e The *Teres Major.*
f The *Extenſor Brachii.*
g The *Muſculus Brachialis.*
h The outward *Extenſor Carpi.*
i The other *Extenſor Carpi.*
k The *Muſculus Radii longus.*
l l The *Latiſſimus Dorſi.*
m m The *Muſculi obliqui deſcendentis Abdominis.*
n The *Muſculus Quadratus.*
o o The *Glutæus Maximus.*
p The *Vaſtus Externus.*
q Part of the *Membranoſus.*
r r The *Seminervoſus.*
s s The *Semimembranoſus.*
t The *Gracilis.*
u The *Triceps.*
x The *Biceps.*
y The *Subpoplitæus.*
z z The *Gaſterocnemii.*
w The *Peronæus.*

FIGURE III.

FIGURE III.

Repreſenting the Skeleton of an Adult Humane Body on the Fore-ſide.

a The *Os Frontis.*
b The *Os Temporis,*
c c The *Oſſe Naſi.*
d d The *Oſſa Jugalia.*
e e The Bones of the Upper-Jaw.
g The Teeth.
f f The Bones of the Lower-Jaw.
h h h The *Vertebræ* of the *Neck, Thorax,* and *Os Sacrum.*
i i The *Claviculæ.*
k k The *Scapulæ.*
l The Articulation of the *Scapulæ,* with the *Os Humeri.*
m m The Second Proceſs of the *Scapulæ,* call'd *Acromium.*
n n n The Bones of the *Sternum.*
o o o The *Os Humeri.*
p p The Upper and Outer Head of the *Os Humeri,* which ſerves to implant the Ligaments upon.
q q The Upper and Inner Head of it, which Articulates with the *Scapula*
r r The Innermoſt Head of its Lower *Appendix,* which receives the *Ulna.*
s s The Outer Head of the ſame Appendix, which receives the *Radius.*
x The *Ulna.*
y The *Radius.*
z z The Eight Bones of the *Carpus.*
A A The Four Bones of the *Metacarpus.*
B B The Four Fingers and Thumb, each conſiſting of three Bones.
C C The *Os Ilium.*
D The *Coxendix.*
E The *Os Sacrum.*
F The *Os Pubis.*
G G The *Os Femoris.*
H H The Upper Head of it, which is received into the *Acetabulum* of the *Coxendix.*
K K The Outer *Trochanters.*
L L The two Lower Heads of the Thigh-Bone.
N N The *Patella.*
P P The *Tibia.*
Q Q The *Fibula.*
R R The *Talus.*
S S The *Os Naviculare.*
V V The Five Bones of the *Tarſus.*
T T The Fourteen Bones of the Toes.
2 2 The *Foramena* of the *Os Iſchium* and *Pubis.*

FIGURE IV.

Repreſenting the Back-ſide of an Humane Adult Skeleton.

a The *Os Scincipitis.*
b The *Os Occipitis.*
c The *Os Squammoſum.*
d The Lower Jaw.
e The *Vertebræ* of the Neck.
f The *Scapulæ.*
g The *Spina Scapulæ.*
h The Outward Head of the *Os Humeri.*
i The *Os Humeri.*
k k The *Radius.*
l l The *Ulna.*
m The Back of the *Os Ilium.*
n The Spine of the *Ilium.*
o The Protuberance of the *Os Iſchium,* whence the Muſcles ariſe which bend the Leg.
p The *Os Sacrum,*
q The *Os Coccygis.*
r r The *Os Femoris.*
s The *Trochanter Major.*
t The *Trochanter Minor.*
u u, *w w* The two Inferior Protuberances of the Lower Appendix of the *Os Femoris.*
x The *Tibia.*
y The *Fibula.*
2 The *Os Calcis.*
3 The *Os Aſtragali.*
4 The *Os Cuboides.*
5 The three *Oſſa Cuneiformia.*
6 The *Oſſa Metatarſi.*